

# Sick-Visit Immunizations and Delayed Well-Baby Visits



**WHAT'S KNOWN ON THIS SUBJECT:** Parent or provider reluctance to immunize infants during sick visits is a common reason why infants fall behind on the recommended schedule. One previous study suggested that immunizations at sick visits discouraged parents from making up missed well-baby visits.



**WHAT THIS STUDY ADDS:** Delaying immunizations at sick visits can lower immunization rates without improving rates of well-baby visits. Many infants will not return to makeup well-baby visits missed because of a sick visit, regardless of whether immunizations were delayed or given.

## abstract

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**OBJECTIVE:** Giving recommended immunizations during sick visits for minor and acute illness such as acute otitis media has long been an American Academy of Pediatrics/Advisory Committee on Immunization Practice recommendation. An addition to the American Academy of Pediatrics policy in 2010 advised considering whether giving immunizations at the sick visit would discourage making up missed well-baby visits. This study quantifies the potential tradeoff between sick-visit immunizations and well-baby visits.

**METHODS:** This study was a retrospective cohort analysis with a case-control component of sick visits for acute otitis media that supplanted normal well-baby visits at age 2, 4, or 6 months. Infants were stratified for sick-visit immunization, no sick-visit immunization but quick makeup well-baby visits, or no sick-visit immunizations or quick makeup visits. Immunization rates and well-baby visit rates were assessed through 24 months of age.

**RESULTS:** For 1060 study cases, no significant difference was detected in immunization rates or well-baby visits through 24 months of age between those with or without sick-visit immunizations. Thirty-nine percent of infants without a sick-visit shot failed to return for a quick makeup well-baby visit; this delayed group was significantly less likely to be up-to-date for immunizations (relative risk: 0.66) and had fewer well-baby visits (mean: 3.8) from 2 through 24 months of age compared with those with sick-visit shots (mean: 4.7).

**CONCLUSIONS:** The substantial risk that infants will not return for a timely makeup well-baby visit after a sick visit should be included in any consideration of whether to delay immunizations. *Pediatrics* 2013;132:44–48

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### KEY WORDS

early childhood immunizations, otitis media, sick-visit shots, well-baby visits

### ABBREVIATIONS

AAP—American Academy of Pediatrics  
ACIP—Advisory Committee on Immunization Practice  
AOM—acute otitis media  
CI—confidence interval  
DTaP—diphtheria-tetanus-acellular pertussis  
IIS—Immunization Information System  
OHP—Oregon Health Plan  
RR—risk ratio

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Giving timely immunizations to children against vaccine-preventable disease is 1 of the most useful preventive services performed by clinicians.<sup>1</sup> However, the complexity of the American Academy of Pediatrics (AAP)/Advisory Committee on Immunization Practice (ACIP) early childhood immunization schedule, in which multiple shots are due on  $\geq 5$  visits before age 2 years, can have the unintended consequence that children who fall behind the vaccination schedule are difficult to catch back up.<sup>2</sup> Missed opportunities to give any or all due shots at provider visits are 1 reason that children fail to have adequate immunization levels.<sup>3–5</sup> Such missed opportunities to immunize are a global issue, with many nations and care systems facing problems of similar scope.<sup>6</sup> As an example, 1 recent US study found that 64.5% of undervaccination up to age 2 years was attributable to missed opportunities, whereas another recent study in India found that 79.6% of undervaccination up to age 6 years was related to missed opportunities.<sup>7,8</sup> One common type of missed opportunity is when a child presents sick when shots are due, with the added possibility that the sick visit will take the place of a routine or well-baby visit.<sup>9</sup> This problem has long been recognized as among the more difficult barriers to address, and it can account for the majority of true missed opportunities at a practice.<sup>10</sup> Although AAP/ACIP standards call for immunization during sick visits for mild illnesses, 1 recent study among a low-income population found that administering immunizations at sick visits decreased the chances that any missed well-baby examinations would be made up later.<sup>11</sup> To date, there is no evidence that making up well-baby visits missed because of sick visits has any benefit. However, out of concern that decoupling immunizations from well-baby visits in the instance of sick visits could lower parent's motivation to

return for makeup well-baby examinations, in 2010 the AAP modified immunization recommendations to allow consideration of the impact of missed well-baby examinations in deciding whether to give sick-visit shots.<sup>12</sup>

The current study examined the trade-offs between missing immunizations and missing well-baby examinations when sick visits supplant regular well-baby visits, using an Oregon Health Plan (OHP) population. Sick visits for acute otitis media (AOM) that took the place of a routine well-baby visit at 2, 4, or 6 months of age were examined for immunizations, made-up well-baby visits, and longer term immunization and well-baby visit levels. AOM was selected because it is the most common reason for a sick visit among infants and has been singled out as not constituting a reason to avoid immunizations.<sup>13</sup> A concern for developing policy regarding delaying immunizations at sick visits is whether children who do not make up missed well-baby visits after sick visits were unlikely to return anyway, regardless of whether a shot was given. If providers screen and give sick-visit shots to those less likely to return for makeup visits, then correlations between sick-visit shots and lower well-baby visit rates are not meaningful. To examine this hypothesis, study infants were matched to controls on demographic, health plan, and health care features before AOM. Immunizations and well-baby visits through 24 months of age were compared between cases and controls for those with and without sick-visit shots, and for those without a sick-visit shot but who had or did not have a quick makeup well-baby visit after AOM.

## METHODS

The design of this study was a retrospective cohort analysis with a case-control component within a data set of linked immunization and provider

encounter records. The study population for cases and controls was Oregon children born in 2007 with enrollment in the OHP, consisting of Medicaid and expanded State Children's Health Insurance Program populations, administered by Oregon's Division of Medical Assistance Programs. OHP enrollment accounts for  $>40\%$  of Oregon infants. OHP eligibility during the study period was based on a family income of up to 185% of the US federal poverty level. The majority of OHP children are placed into managed health care plans with capitated payments. More than 95% of pediatricians and 75% of general or family practice physicians in Oregon see OHP patients, with pediatricians accounting for 19% of primary care providers. A further description of the OHP population, along with a comparison of missed opportunities to immunize versus missed visits to providers, has been previously published for this population.<sup>7</sup> Immunization records for study children were extracted from the ALERT Immunization Information System (IIS). IIS is a population-based data system capturing immunization doses administered by participating providers within a given area. The ALERT IIS receives immunization records from 100% of public providers and 95% of private providers in Oregon.

Cases were selected for provider office visits for uncomplicated AOM that occurred at either 2, 4, or 6 months of age before due immunizations or well-baby visits for each period. The eligible period for each AOM visit was matched to the defined eligible periods for immunizations at 2, 4, and 6 months of age according to AAP/ACIP standards, starting at the first day of each period minus a 4-day grace period at 2, 4, or 6 months. Selection of cases was made based on *International Classification of Diseases, Ninth Revision*, coding of AOM as the primary diagnosis, with no other reported comorbidity. Cases from urgent and emergent sites were excluded.

Immunization receipt was measured based on diphtheria-tetanus-acellular pertussis (DTaP)-containing vaccines. DTaP is a proxy for timely receipt of early immunizations and was selected as a single indicator to avoid biasing outcomes by differential acceptance of vaccines by type, use of combination vaccines, or potential issues with partial delivery of due vaccines.<sup>14</sup> DTaP-containing vaccine is the most frequently administered immunization in Oregon infants and is well received even among those infants whose parents' are limiting or avoiding other vaccines.<sup>15</sup> Sick-visit shots were counted if a DTaP-containing immunization was due and administered during the AOM sick visit; a further stratification for those without a sick-visit shot was made depending on whether a makeup well-baby visit occurred within 4 weeks after the AOM visit. Cases without at least 24 days from any previous DTaP to the AOM visit were excluded, as were those with  $\geq 3$  previous DTaP immunizations. If  $>1$  qualifying AOM visit existed, the earliest was selected. To only count each child once for numerators and denominators, if  $>1$  qualifying AOM visit existed per child, only the earliest was selected. This method may slightly skew AOM ages in the data. A 4-week interval for makeup well-baby visits was used because usually this would allow the infant to proceed on schedule with further immunizations and well-baby visits.

Up to 4 controls were matched to each case based on county of residence; month of birth; race; ethnicity; participation in the Supplemental Nutrition Program for Women, Infants, and Children; and initiation and length of OHP enrollment. In addition, controls were restricted to those with the same level of DTaP receipt before the case's qualifying AOM visit. Those children who did not receive immunizations at their AOM visit are in need of a quick follow-up

visit to stay in compliance with US ACIP immunization recommendations as well as to comply with age-based AAP-recommended health supervision visits.<sup>16</sup> For those who received shots at the AOM visit, the value of a makeup well-baby visit has not been established, and whether a makeup visit is needed according to AAP standards has not been clearly defined.

Frequencies for sick-visit shots, no sick-visit shots but quick makeup visits, and no sick-visit shots or quick makeup visits were calculated for all cases in total and by period. Outcome measures selected were the timely completion per AAP schedule of 4 DTaP by 19 months of age; completion of 4 DTaP by 24 months of age; completion of a 4:3:1:3:3:1 series consisting of 4 DTaP, 3 polio, 1 measles-mumps-rubella, 3 *Haemophilus influenzae* type b, 3 hepatitis B, and 1 varicella immunization at 24 months of age; and the total number of well-baby visits from 2 through 24 months of age. Cases were compared with controls based on risk ratios (RRs) for immunization levels and with paired *t* tests for the mean of well-baby visits.

## RESULTS

Of a base OHP population of 21 741 infants born in 2007, a total of 6533 (30.0%) had at least 1 office visit for AOM during their first year of life. Of those, 1060 (16.2%) had qualifying AOM visits in the 2-, 4-, or 6-month periods before any due DTaP immunizations or well-baby visits. Cases were 67% white, non-Hispanic; 30% Hispanic, any race; and 3% non-white, non-Hispanic.

Overall, 11% of AOM cases occurred at the 2-month period, 30% of cases occurred at the 4-month period, and 59% of cases occurred at the 6-month period. Because a  $\chi^2$  test of the 3 AOM periods against the 3 outcomes did not reject independence ( $\chi^2 = 3.05$ ,  $df = 4$ ), the cases for the 3 AOM periods were merged for analysis. The overall rate of sick-visit shots among cases was 7.5%, whereas 56.7% of cases did not have a sick-visit shot but had a makeup visit within 4 weeks of AOM, and 35.8% of cases did not have a sick-visit shot or a quick makeup visit. Provider types by medical degree and specialty were identifiable for 84.2% of AOM cases, with pediatricians accounting for 48.3% of AOM case reports. Although rates of sick-visit shots were low, pediatricians were more likely to give sick-visit shots than were family or general practitioners (RR: 3.29 [95% confidence interval (CI): 1.38–7.99]). No other significant difference was found by provider type. Children of Hispanic ethnicity were more likely to receive a sick-visit shot (RR: 1.58 [95% CI: 1.04–2.42]). Those of non-Hispanic ethnicity were more likely to have neither sick-visit shots nor quick makeup visits (RR: 1.31 [95% CI: 1.09–1.58]).

Table 1 presents a comparison of immunization and well-baby levels between those with and without a sick-visit shot. A comparison between those with sick-visit shots and the 2 subcategories of no sick-visit shots, of quick makeup visits within 4 weeks, or else a longer delay is also presented in Table 1. Overall, at 19 months of age, those with sick-visit shots had higher

**TABLE 1** Immunization and Well-Baby Outcomes by Sick-Visit Outcome

| Outcome Type                            | DTaP (19 mo)                  | DTaP (24 mo)                  | 4:3:1:3:3:1 Series (24 mo)    | Well-Baby Visits              |
|-----------------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| Sick-visit shot ( <i>n</i> = 80)        | Ref (1.0)                     | Ref (1.0)                     | Ref (1.0)                     | 4.71 (4.24–5.18)              |
| No sick-visit shot ( <i>n</i> = 980)    | 0.80 <sup>a</sup> (0.66–0.97) | 0.92 (0.8–1.05)               | 0.88 (0.70–1.12)              | 4.54 (4.42–4.66)              |
| Quick makeup visit ( <i>n</i> = 601)    | 0.98 (0.81–1.19)              | 1.07 (0.94–1.22)              | 1.02 (0.81–1.30)              | 5.01 (4.87–5.15)              |
| No quick makeup visit ( <i>n</i> = 379) | 0.51 <sup>a</sup> (0.40–0.65) | 0.69 <sup>a</sup> (0.58–0.80) | 0.66 <sup>a</sup> (0.50–0.86) | 3.80 <sup>a</sup> (3.60–4.00) |

Data are presented as risk ratio (95% CI). 4:3:1:3:3:1 series consists of 4 DTaP, 3 Polio, 1 MMR, 3 Hib, 3 HepB and 1 Varicella vaccines.

<sup>a</sup> Significant at the 95% level.

rates of having all 4 DTaP immunizations than those without. Cases without sick-visit shots but who had a quick makeup visit were not significantly different from those with sick-visit shots for 4 DTaP vaccines at 19 or 24 months of age, as well as for a larger 4:3:1:3:3:1 series at 24 months of age. However, those who had neither a sick-visit shot nor a quick makeup visit had lower immunization rates for all 3 measures.

For the mean of well-baby visits as an outcome, those with a sick-visit shot had a small but not significantly higher mean number of well-baby visits. Those without a quick makeup visit, however, had a significantly lower number of well-baby visits (3.8) at 24 months of age than either those with sick-visit shots (4.7) or those with a quick makeup visit (5.0).

A total of 4123 controls were matched to cases. For immunization outcomes, no significant differences were observed between cases and controls for those with sick-visit shots or those with a quick makeup visit. Cases without sick-visit shots or quick makeup visits had significantly lower immunization rates than their controls on all measures. For the mean of well-baby visits at 24 months of age, cases with sick-visit shots had a slight but nonsignificant difference from their controls (4.71 vs 4.87) (Table 2). Similarly, those without a sick-visit shot had a slight but nonsignificant increase in well-baby visits compared with their controls (4.54 vs 4.46). However, within the 2 categories of cases without a sick-visit shot, both had significant differences from their controls; those with a quick makeup visit had more well-baby

visits (5.01 vs 4.74), whereas those without a quick makeup visit had fewer visits (3.80 vs 4.05).

## DISCUSSION

This study found no decreases in either immunizations or well-baby visits when a needed immunization was given during sick visits for AOM. Those children who did not receive sick-visit shots were clearly divided in outcomes based on whether they received a quick makeup well-baby visit or had longer delays. Those who did not receive sick-visit shots and did not quickly make up the missing well-baby visit or immunizations fell behind schedule for both well-baby visits and immunizations. Overall, 39% of those who did not get a sick-visit shot did not have a quick makeup visit, resulting in lower immunization rates and fewer well-baby visits. As a policy, foregoing a sick-visit shot out of concern for potential missed well-baby examinations is not supported by the current study or by the observation that a substantial proportion are at risk for falling behind on both schedules.

Although the rate of sick-visit shots in the current study was low, it is comparable to other published findings.<sup>17</sup> More importantly, the use of shot reminders at sick visits through electronic health record systems has already been demonstrated to substantially improve sick-visit shot rates.<sup>18</sup> Previous work has also shown that most parents are agreeable to sick-visit shots if their providers recommend them.<sup>19</sup> In the United States, many providers who support immunization

are also reluctant to adopt practices of giving or checking for immunizations at sick visits.<sup>17,20</sup> This reluctance is not globally generalizable, and in the United States, it is likely due in part to a lower perceived risk of vaccine-preventable disease. Waiting to give shots as a strategy to encourage a makeup well-baby examination is dependent on provider certainty that parents will return and that feasible scheduling for timely makeup appointments is available. In the current study, those sick-visit cases with a quick makeup well-baby visit did not have significantly better immunization or well-baby outcomes than those with sick-visit shots, but they did have more well-baby visits than their controls. Therefore, if all parents brought their infants back for a quick makeup visit, a slightly superior outcome might be possible, although at some cost of additional visits, parental time, and waiting room congestion. However, the chance of this slight benefit in outcome needs to be balanced against the observation that many do not return for makeup visits and thus experience substantially lower achieved levels of immunizations and well-baby visits. The value of quickly making up well-baby visits that are missed due to illness has not been established. However, as timely compliance with well-baby visit schedules in the United States is both recommended by the AAP and is an easily measured feature of care delivery, it has been incorporated into quality assessment standards such as the Healthcare Effectiveness Data and Information Set.<sup>16,21</sup> Thus, administrative incentives to making up missed well-baby visits may exist even if the added medical benefit is unclear. One recent retrospective study in a large population found a potential benefit to well-baby schedule compliance for those with chronic conditions, but it did not address the issue of extra well-baby visits in addition to sick visits.<sup>22</sup>

**TABLE 2** Case-Control Comparisons for Well-Baby Visits

| Case Type             | Controls (Mean) | Well-Baby Visits From 2 to 24 Months |          |           |                   |
|-----------------------|-----------------|--------------------------------------|----------|-----------|-------------------|
|                       |                 | Ratio of Case/Control                | <i>t</i> | <i>df</i> | <i>P</i>          |
| Sick-visit shot       | 4.87            | 0.97                                 | −0.675   | 79        | .502              |
| No sick-visit shot    | 4.46            | 1.02                                 | 1.297    | 979       | .195              |
| Quick makeup visit    | 4.74            | 1.06                                 | 3.310    | 600       | .001 <sup>a</sup> |
| No quick makeup visit | 4.05            | 0.94                                 | −2.115   | 378       | .035 <sup>a</sup> |

<sup>a</sup> Significant at the 95% level.

Our findings differ from at least 1 previous study,<sup>11</sup> which found that sick-visit shots were correlated with lower numbers of well-baby visits; caution is therefore warranted in generalizing this result. It is possible that previous study results reflect providers accurately assessing who was likely to return for a quick makeup visit, and giving shots accordingly. As in the previously cited study, this finding was derived in a lower income population. However, although the previous study reflected an inner-city population with a high proportion of African-American clients seen in a single-clinic system, the current study population reflects a state-wide population seen across

a variety of clinic systems and health care settings, with lower racial diversity but with a higher proportion of clients of Hispanic ethnicity. Resolution of differences in findings between studies may depend on further research with randomized controlled trial designs in generalizable populations. In the interim, however, the distinction in outcomes between those who have quick makeup visits versus those who do not and who fall off schedule is likely to apply well beyond the current study population.

## CONCLUSIONS

Currently, AAP standards for immunization delivery during sick visits state

that mild illnesses such as AOM, with or without fever, are not reasons to delay due shots. However, AAP standards also allow providers to justify a delay based on concerns of whether sick-visit shots remove parental incentives to return for missed well-baby examinations. This study found no benefit to delaying immunizations at sick visits. For a substantial proportion of the population, delaying due shots resulted in both lower immunization and well-child visit levels. Increasing the delivery of needed immunizations at sick visits should remain as a goal to decrease the number of infants who fall behind and do not catch up with the recommended schedule.

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