Timing of Initial Well-Child Visit and Readmissions of Newborns

Julie Shakib, DO, MS, MPH, Karen Buchi, MD, Elizabeth Smith, MD, Kent Korgenski, MS, MT (ASCP), Paul C. Young, MD

BACKGROUND AND OBJECTIVES: Recommendations for the timing of the first well-child visit (WCV) after discharge from a well-baby nursery (WBN) suggest that the visit occur within 48 hours of discharge for those with a WBN length of stay of ≤48 hours and within 3 to 5 days for those with a WBN length of stay of >48 hours. The purpose of these early visits is to detect conditions that may cause readmission in the first weeks after birth, but the effectiveness of early visits to accomplish this has not been shown. The objectives of this study were to determine (1) the frequency of early visits and (2) to compare readmission rates for those who had an early visit compared with those who did not.

METHODS: Using data from a large health care system in Utah, we determined the readmission rates newborns with an estimated gestational age ≥34 weeks and compared the rates for those who had an early WCV with those who did not.

RESULTS: Of 79,720 newborns, 50,606 (63%) were discharged within 48 hours of birth. Of these, 7638 (15%) had a visit within 72 hours of discharge. The readmission rate for newborns who had a visit within the recommended time frame was 15.7 per 1000 compared with 18.4 for those with a later visit (odds ratio 0.85; 95% confidence interval 0.73–0.99)

CONCLUSIONS: The frequency of first WCVs that occurred within the recommended time frames was low. Early visits were associated with a 15% reduction in the rate of readmissions.

WHAT’S KNOWN ON THIS SUBJECT: Current recommendations for the first outpatient visit for newborns are based on known health risks during the first week of life. Knowledge of the relationship between early well child visits and hospital readmissions may inform newborn health policy interventions.

WHAT THIS STUDY ADDS: Newborns who have a first well child visit within the recommended time period after hospital discharge are substantially less likely be readmitted. Obstacles to early follow-up should be addressed to reduce the risk of readmission in this population.
Since 1994, the American Academy of Pediatrics (AAP) Committee on the Fetus and Newborn (COFN) has recommended that newborns whose well-baby nursery (WBN) stay was <48 hours should have a well-child visit (WCV) within 48 to 72 hours. According to the policy statement, “the purpose of the follow-up visit is to weigh the infant; assess the infant’s general health, hydration, and extent of jaundice; identify any new problems; review feeding pattern and technique; and obtain historical evidence of adequate urination and defecation patterns for the infant.”

In 2008, Bright Futures: Guidelines for Health Supervision of Infants, Children, and Adolescents recommended that newborns discharged after a stay of ≤72 hours be seen within 3 to 5 days after discharge. The principal reasons cited for this visit are to evaluate the newborn for “jaundice, feeding difficulties (hydration problems, excessive weight loss), sepsis, and significant congenital malformations that are not apparent on the initial examination but become symptomatic during the first weeks of life.”

Additional reasons for an early WCV include screening for hearing and inherited metabolic diseases if not done in hospital, screening for maternal postpartum depression, identifying social determinants of health, and providing appropriate anticipatory guidance.

Recommendations that the first outpatient visit occur within a few days after discharge differ from the previous standard practice of the first WCV at 2 to 4 weeks of age. Several studies have reported a relatively low frequency of early visits for both those discharged within 48 hours and for those with longer stays in the WBN.

Two of the conditions (jaundice and feeding problems) cited by the COFN and Bright Futures recommendations as reasons for an early WCV are likely, if undetected, to result in an admission to the hospital. Thus, 1 potential way to evaluate the value of early visits would be to compare the readmission rates of those newborns who did and did not have a visit within the time frame recommended by Bright Futures and COFN.

An unplanned, unexpected readmission of a newborn after discharge from a WBN is an undesirable event from the perspectives of new parents, physicians, hospitals, and payers; thus, an intervention that would reduce them is desirable. In a recent study, we found that the rate of readmissions of term and late preterm newborns within the first month after discharge from 21 WBNs was 17.9 per 1000 live births. The most common diagnoses associated with readmissions were feeding problems (41%), jaundice (35%), respiratory distress (33%), “rule out sepsis” (24%), and infection (28%). Of note, readmissions for feeding problems and jaundice were heavily concentrated in the first 1 to 2 weeks after discharge; the others were evenly distributed over the month.

In this article, we report the results of a study from a large health care system with >79,000 newborns over an 11-year period. The study had 2 objectives: first, to determine the frequency of and factors associated with newborns having their first outpatient visit within the recommended time frame; second, to examine whether those babies who had a visit within the early visit time period were less likely to be readmitted in the first month of life. Because feeding problems and jaundice are common reasons for readmission and these conditions, if identified at an early visit, are potentially susceptible to outpatient interventions that could reduce the need for hospitalization, we hypothesized that readmission rates for these 2 conditions would be decreased among newborns who had an early visit, whereas readmissions for the other causes, which are less likely to be prevented by a primary care visit, would not.

METHODS

Overview
We analyzed data from the Enterprise Data Warehouse of Intermountain Healthcare (IH) and from SelectHealth (SH). IH is a large health care system in Utah and Idaho that includes 21 hospitals and numerous primary care and specialist clinicians. SH is a nonprofit health insurance organization serving >600,000 members in the same region.

Sample
We identified all newborns with an estimated gestational age (EGA) ≥34 weeks who had been discharged from an IH WBN between January 1, 2001 and December 31, 2011 and who were insured by SH. Newborns who had a NICU stay of ≥24 hours were excluded.

Measures and Analysis

Objective 1: Frequency of Early WCV
To accomplish the first objective, we determined the number of days between WBN discharge and the first WCV. For those whose WBN stay was ≤48 hours, we defined the first WCV as occurring within the recommended time if it took place within 3 days of discharge; for those whose WBN stay was >48 hours, we defined the first WCV as occurring within the recommended time frame if it occurred within 5 days of discharge. We calculated the proportion of newborns who had their first WCV within the recommended time frames. We compared the proportions having their first WCV in the recommended time frames for each year of the study. We used logistic regression to calculate odds ratios (ORs) for the relationship between the primary outcome variable of having a first WCV within the recommended time frames and the following independent (predictor) variables: year of WBN discharge, EGA, whether the baby was the mother’s firstborn, the presence of jaundice or feeding problem in the 5–7 days, etc.
WBN, and whether a copay was required for the WCV.

Objective 2: Relationship of Early WCV and Readmission

The primary outcome variable for the second objective was admission to an IH hospital within 30 days of WBN discharge. We identified all newborns who were admitted and the International Classification of Diseases, Ninth Revision, diagnoses associated with the readmission. The main predictor variable was whether the newborn had a WCV within the recommended time frame. We used \( \chi^2 \) to compare the overall readmission rates and the rates for the 5 most common reasons for readmission for newborns who had a visit within the recommended time frames with those whose first visit was later. We used logistic regression to calculate the crude ORs for readmission if an early visit had or had not occurred. To adjust for the possible confounding effects of other factors that might influence the likelihood of readmission, we created a multivariate logistic regression model to calculate adjusted ORs for readmission. We included all variables in the model that were available in the data set and that could potentially affect the likelihood of readmission: year of delivery, EGA, whether the baby was the mother’s firstborn, the length of stay (LOS) of the birth hospitalization, and the presence of jaundice or feeding problem in the WBN.

The Institutional Review Boards of Intermountain Healthcare and the University of Utah Health Sciences Center and the Privacy Board of Select Health approved the study.

RESULTS

Objective 1: Frequency of Newborns Having Their First Outpatient Visit Within the Recommended Time Frame

Table 1 provides a description of the study population. During the 10-year study period, there were 79,720 newborns meeting inclusion criteria: Discharged alive from an IH hospital WBN, insured by SH, EGA between 34 and 42 weeks, and either no NICU stay or a stay of <24 hours. Of the total sample of newborns, 50,606 (63%) were discharged from the WBN in ≤48 hours. Of these, 7,638 (15%) had a visit within the recommended time frame (within 3 days of discharge). Of the 29,114 (37%) whose WBN stay was >48 hours, 5,920 (20%) had a visit within the recommended time frame (within 5 days of discharge). Fifty-one percent (14,779) of those whose WBN stay was >48 hours were born by cesarean delivery; there was no difference in the rate of having a visit within 5 days between those born by cesarean delivery or vaginally. Of the 50,606 newborns with an initial stay of ≤48 hours, 28% were born to primiparous mothers; they were more likely than those born to multiparas to have a first visit within 3 days of discharge (19% vs 14%; \( P < .001 \)). A copay requirement decreased the likelihood of a visit within 3 days from 22% for those who did not have a copay to 14% of those who had a copay (\( P < .001 \)).

Factors Associated With the Timing of the First WCV

As shown in Fig 1, the proportion of those with a WBN stay of ≤48 hours having their first WCV within the recommended time frame increased
TABLE 2 ORs for Having a 3-Day Visit for Those Infants With ≤48-Hour LOS and a 5-Day Visit for Those With >48-Hour LOS

<table>
<thead>
<tr>
<th>Factor</th>
<th>OR for 3-Day Visit (95% CI)</th>
<th>OR for 5-Day Visit (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EGA</td>
<td>0.96 (0.94–0.98)</td>
<td>0.89 (0.87–0.90)</td>
</tr>
<tr>
<td>Mother’s firstborn</td>
<td>1.5 (1.42–1.58)</td>
<td>1.6 (1.54–1.73)</td>
</tr>
<tr>
<td>Jaundice during birth hospitalization</td>
<td>0.98 (0.91–1.04)</td>
<td>1.14 (1.07–1.2)</td>
</tr>
<tr>
<td>Feeding problem during birth hospitalization</td>
<td>1.18 (0.99–1.41)</td>
<td>1.98 (1.81–2.2)</td>
</tr>
<tr>
<td>Copay required for WCV</td>
<td>0.59 (0.54–0.63)</td>
<td>0.61 (0.56–0.67)</td>
</tr>
</tbody>
</table>

Objective 2: Readmissions in the First Month After Discharge From the WBN

Of the 79,720 newborns, 1431 (18 of 1000) were readmitted within 48 hours. For the total group of newborns, readmission rates were significantly lower for those who had a visit within 3 or 5 days (15.7 of 1000) compared with 18.4 of 1000 for those who had a later visit. ORs comparing the readmission risk for the 2 cohorts (LOS ≤48 and >48 hours) if a 3- or 5-day visit had occurred were similar but did not achieve statistical significance.

Table 5 shows the readmission rates for those with a readmission diagnosis of jaundice for both the ≤48 and >48 hour cohorts depending on whether they had a visit within the recommended time frame. The readmission rates for both cohorts were significantly lower for those who had a first visit at the appropriate time, and the ORs remained significant after adjusting for delivery year, EGA, whether the infant was a mother’s firstborn, and whether there was jaundice during the birth hospitalization.

There were no differences in the readmission rates associated with the occurrence of an early WCV for feeding problems, respiratory distress, rule out sepsis, other infectious disease, or any of the other causes of admission listed in Table 3.

DISCUSSION

The objectives of our study were to assess the frequency of newborns having their first WCV within the time frame recommended by the AAP COFN and Bright Futures and to determine whether having an early WCV visit was associated with a reduced risk of rehospitalization within the first 30 days. We found that only 15% to 20% of newborns were seen for a WCV within the recommended time frames and that having a visit within the recommended time period was associated with reduced rates of rehospitalization; this association was particularly striking for readmissions for jaundice with rates ~50% less for those who had an early visit compared with those with a later visit.

We found disappointingly low numbers of first WCV occurring in the time frame recommended by AAP/COFN and Bright Futures. The data available to us lacked the granularity to determine the reasons for this finding. Community primary care pediatricians care for the vast majority of newborns in the IH system. Typically, they or one of their partners see their newborns both in the hospital and in their offices. Possibly, this continuity of care provides an opportunity for the physician to individualize the need for an early visit that differs from a WBN where babies are seen by a hospitalist or a provider who is not connected to the primary care office. Although there were significant associations between several factors: parity, EGA, and presence or absence of a copay, nearly 80% of the first WCVs occurred after the recommended time periods. Of particular concern is the fact that only 14% to 19% of late preterm newborns who had a WBN stay of ≤48 hours had a visit in the recommended time period. There is ample evidence that late preterm newborns are at increased risk for mortality and morbidity. One positive finding was the gradual increase over time in the proportion of newborns having a WCV in the
recommended time period, from 5% in 2001% to 23% in 2011. We had expected an increase after the 2008 Bright Futures recommendation, and that appears to have occurred. However, the COFN recommendations for follow-up of those with a WBN LOS of <48 hours were made nearly 20 years ago and have been reiterated twice since.1–3

Our study supports the value of an early WCV. There were significantly lower readmission rates among those newborns who had an early WCV compared with those who did not. For the entire cohort, there was a reduction from a readmission rate of 18.4 to 15.7 per 1000, an absolute risk reduction of 15%. The reduction was similar for those discharged after a short stay, although the difference did not reach significance.

Several investigators have studied the relationship between early WCVs for newborns the risk of rehospitalization, with differing results. O’Donnell et al found no association between having a first office visit within 3 days of discharge and emergency department visits or hospitalizations in the first 2 weeks of life.12 Tomashok reported that late preterm infants were more likely to be readmitted after early discharge (within 48 hours of birth) than term infants but did not evaluate the impact of an early office visit.11 Meara and colleagues studied the likelihood of readmission within the first 10 days after discharge from a WBN among a population of 155 000 newborns covered by Medicaid in Ohio and found that those who had a first WCV within 4 days of WBN discharge were 64% less likely to be rehospitalized.13

Considering the financial and emotional costs associated with the readmission of a newborn, a 15% reduction represents a substantial benefit. An absolute risk reduction of 15% suggests that it would require about 7 early WCVs to eliminate 1 readmission. As hypothesized, readmissions for jaundice were reduced by nearly 50% suggesting that an early visit was associated with an intervention such as home phototherapy that prevented a readmission. Unfortunately, the use of home phototherapy was not captured in the Enterprise Data Warehouse, so we are unable to confirm this. We had anticipated that an early visit might reduce the number of readmissions for feeding problems because of the potential for an intervention such as home lactation support to benefit these newborns, but we found no significant reduction in readmissions. One possible confounding factor was that newborns identified as having feeding problems in the WBN had a substantially longer stay (105 hours compared with 50 hours for those without feeding problems). This may have provided sufficient time for the clinicians to manage feeding problems before discharge.

Our study has several strengths: the sample is large and includes multiple hospitals in urban, rural, and frontier areas. The main variables (LOS in the WBN, timing of the first WCV, and readmission data) are likely to be accurate. Limitations include the fact that it is from a single health care system in Utah and includes only newborns who were commercially insured. Thus, our findings showing a substantial benefit associated with an early WCV may not be generalizable to other locations or to populations insured by Medicaid. The potential effect of Medicaid on the likelihood of an early visit is complex. Lack of a copay may increase the likelihood of an early visit, but other factors may decrease access for this population. The findings of Meara suggest that an early WCV is associated with a reduced risk of readmission in an exclusively Medicaid population.13

Another limitation is related to our choice of a visit within 3 days rather than 48 hours as recommended by COFN for those with a WBN stay of ≤48 hours. This was done to provide a window for a first WCV that was independent of the day of the week of discharge allowing for a visit on a regular office workday. This may have biased our findings to show a higher number of early WCVs than if we had required that the first WCV occur within 48 hours as a definition of an early WCV. This, in turn may have altered the relationship between having an early visit and a lower rate of readmission. Finally, our finding that an early WCV was associated with a reduced risk of readmission does not provide evidence of cause

<p>| TABLE 4 Thirty-Day Readmission Rates per 1000 for Newborns With a Visit Within 3 Days (LOS ≤48 Hours) or Within 5 Days (LOS &gt;48 Hours) |</p>
<table>
<thead>
<tr>
<th>Visit within 3/5 d</th>
<th>Visit after 3/5 d</th>
<th>OR (95% CI)</th>
<th>Adjusted ORa (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total (W = 79 720)</td>
<td>15.7</td>
<td>18.4</td>
<td>0.85 (0.73–0.98)</td>
</tr>
<tr>
<td>≤48 h stay (50 606)</td>
<td>15.7</td>
<td>18.7</td>
<td>0.84 (0.68–1.02)</td>
</tr>
<tr>
<td>&gt;48 h stay (29 114)</td>
<td>16.6</td>
<td>17.6</td>
<td>0.94 (0.75–1.2)</td>
</tr>
</tbody>
</table>

a Adjusted for delivery year, EGA, mother’s firstborn, jaundice during hospitalization, and feeding problem during hospitalization.

<p>| TABLE 5 Readmission Rates per 1000 for Jaundice Overall and for Those With a WBN Stay ≤48 Hours With and Without a 3-Day WCV and for Those With a WBN stay of &gt;48 Hours With and Without a WCV Within 5 Days |
|-----------------|-----------------|-------------|-----------------------|</p>
<table>
<thead>
<tr>
<th>Visit Within 3 (5) Days</th>
<th>Visit After 3 (5) Days</th>
<th>OR (95% CI)</th>
<th>Adjusted ORa (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall (79 720)</td>
<td>2.3</td>
<td>4.2</td>
<td>0.54 (0.37–0.80)</td>
</tr>
<tr>
<td>≤48 h stay (50 606)</td>
<td>2.5</td>
<td>4.9</td>
<td>0.51 (0.32–0.82)</td>
</tr>
<tr>
<td>&gt;48 h stay (29 114)</td>
<td>2.0</td>
<td>3.2</td>
<td>0.63 (0.34–1.2)</td>
</tr>
</tbody>
</table>

a Adjusted for EGA, delivery year, mother’s firstborn, and jaundice during birth hospitalization.
and effect. It is possible that unmeasured factors may have influenced both the likelihood of an early WCV and a decreased risk of readmission. However, in the absence of a randomized trial of early versus later first WCV, an observational study such as that reported here does suggest a measurable benefit to visits that comply with the AAP recommendations.

Our study provides support for efforts to increase adherence to AAP guidelines for visits within a few days of discharge from a WBN. At the practice level, this may require modifying scheduling policies. Readmission of a newborn is an uncommon event, and any single clinician or practice is unlikely to experience enough readmissions to encourage a change in his or her practice for the timing of the first WCV. However, evidence that such visits are associated with a reduction of hospital readmissions should encourage payers and health care systems to support early WCVs by, for example, removing barriers such as copays as has now been done by Select Health and for professional organizations to continue to encourage adherence to existing recommendations.

REFERENCES

ERRATA


On page 340, under Eligibility Criteria, lines 1 to 11 read, “Secondary outcomes included (1) preventable adverse drug events (ADEs; preventable errors that reached a patient and resulted in harm as defined by the Institute for Safe Medication Practices [ISMP] categories 5, 6, or 7 [significant temporary harm, permanent harm, near death, or death])23 and (2) serious preventable ADEs including ISMP categories 6 or 7 only (permanent harm, near death, or death).23 This should have read: “Secondary outcomes included (1) preventable adverse drug events (ADEs; preventable errors that reached a patient and resulted in significant temporary harm, permanent harm, near death, or death) and (2) serious preventable ADEs (permanent harm, near death, or death). These definitions are based on medication error severity categories created by the Frederick Memorial Healthcare System.”23


doi:10.1542/peds.2015-1344


T: torso;
E: ear;
N: neck; and
4: in children less than or equal to 4 years of age and in ANY infant under 4 months of age.”

The last item should have read “4: in children less than 4 years of age and ANY BRUISE in an infant under 4 months of age.”

doi:10.1542/peds.2015-2010


An error occurred in the article by Shakib et al titled “Timing of Initial Well-Child Visit and Readmissions of Newborns” published in the March 2015 issue of
ERRATA

Pediatrics (2015;135(3):469–474; doi:10.1542/peds.2014-2329). On page 473, under Discussion, the decrease in the readmission rate from 18.4 to 15.7 per 1000 among those who had an early well-child visit should be described as a 15% relative risk reduction (2.7/18.4), not a 15% absolute risk reduction. The absolute risk reduction was 18.4 minus 15.7, or 2.7 per 1000 readmissions. The calculation of the number of early well-child visits associated with a reduction of a single readmission should have been calculated based on the absolute risk reduction (1000/2.7) and was 371 rather than 7 as stated in the article. The authors thank medical student Wade Harrison from the Geisel School of Medicine, Hanover, NH, for pointing out these errors. The corrections have been made to the online edition of the published article.

doi:10.1542/peds.2015-2067


An error occurred in the article by Rana et al, titled “Hydroxyurea and Growth in Young Children With Sickle Cell Disease” published in the September 2014 issue of Pediatrics (2014;134(3):465–472; doi:10.1542/peds.2014-0917). On page 467, under the heading Results, on line 2, this reads: “See Table 1 for demographic information.” This should have read: “See Table 1 in the main BABY HUG paper.”

doi:10.1542/peds.2015-2188


Errors occurred in the article by Mitchell et al, titled “Weapon Involvement in the Victimization of Children” published in the July 2015 issue of Pediatrics (2015;136(1):10–17; doi:10.1542/peds.2014-3966). On page 13, under the heading ‘Experiencing Victimization With a Weapon: Lifetime Prevalence and Youth Characteristics,’ this reads: “More than 1 in 4 youth (26.5%) reported at least 1 victimization that involved a weapon in their lifetime, such as a knife, gun, stick, or rock; 12.5% reported at least 1 direct victimization with a weapon, and 13.1% at least 1 indirect (or witnessed) victimization with a weapon.” This should have read: “More than 1 in 4 school-age youth (ages 6–17, 26%) reported at least 1 victimization that involved a weapon in their lifetime; more than 1 in 5 youth when including younger children (ages 2–17 years, 21.2%). Among 2–17 year olds, 12.5% reported at least 1 direct victimization with a weapon, and 13.1% at least 1 indirect (or witnessed) victimization with a weapon.”

This change also impacts the Abstract and Discussion as follows:

On page 10, in the Abstract, it reads: “Results: Estimates from the Second National Survey of Children’s Exposure to Violence indicate that >17.5 million youth in the United States have been exposed to violence involving a weapon in their lifetime as witnesses or victims, or >1 in 4 children.” This should have read: “Results: Estimates from the Second National Survey of Children’s Exposure to Violence indicate that almost 14 million youth, ages 2–17, in the United States have been exposed to violence involving a weapon in their lifetimes as witnesses or victims, or >1 in 5 children in this age group.”

On page 13, in the Discussion section, it reads: “NatSCEV II estimates that >17.5 million youth in the United States have been exposed to violence involving
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The online version of this article, along with updated information and services, is located on the World Wide Web at:
/content/early/2015/01/28/peds.2014-2329
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