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Emergency Department Visits in the Neonatal Period in the United States

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Abstract

Objectives—To estimate the incidence of emergency department (ED) visits in the neonatal period in a nationally representative sample and examine variation by race.

Methods—The National Hospital Ambulatory Medical Care Survey is a nationally representative survey of utilization of ambulatory care services including EDs. We studied all ED visits for patients < 28 days from 2003 to 2008. Using National Birth Certificate data, we calculated visit rates by race. ED visits were also characterized by age, insurance status, diagnosis category, region, and hospital type (safety-net vs. non-safety net).

Results—There was an average of 320,540 neonatal ED visits in the U.S. per year, with an estimated 7.6% of births visiting the ED within 28 days. Estimated rates of ED visits were highest among Non-Hispanic Blacks, with 14.4% (95% CI 10.0-19.2) of newborns having an ED visit in the neonatal period, compared with 6.7% (95% CI 4.9-7.2) for Whites and 7.7% (95% 5.7-9.8) for Hispanics. Hispanic and Black neonates were more likely to be seen in safety-net hospitals (75.8-78.2%) than White (57.1%) patients (p=0.004).

Conclusions—In this first nationally representative study of neonatal visits to the ED, visits were common, with the highest rates in Non-Hispanic Blacks. Hispanic and Black neonates were more commonly seen in safety-net hospitals. Reasons for high visit rates deserve further study in order to determine whether hospital discharge practices and/or access to primary care are contributing factors.

Keywords

Neonatal; Emergency department; Racial disparity

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Introduction

The neonatal period (< 28 days old) is a vulnerable period of pediatric health.(1) Although emergencies can certainly occur during this time period, many emergency department (ED) visits or urgent care visits may be preventable with adequate preventive hospital care in the newborn period and appropriate follow-up with a primary care provider. Non-urgent use of emergency departments may be a source of increased costs and inefficient resource utilization in healthcare.(2)

For newborns, hospital care after birth and early primary care may have a significant influence on healthcare utilization in the neonatal period. For instance, early discharge of newborns from the hospital has been shown to result in increased ED utilization in the first 10 days of life without a corresponding increase in re-hospitalization.(3, 4) Interventions to provide a coordinated care program with early discharge have been shown to limit ED use in infancy.(5) This indicates that some of the excess ED visits may have been preventable.

Previous study has also shown that non-urgent ED visits account for up to 60% of ED visits in the first 3 months of life, with a higher proportion of use by younger and non-White mothers.(6) In another study, ED visits by babies born to mothers who are single and did not attend prenatal classes were less likely to be admitted to the hospital, suggesting that those visits were not necessary, or could have been seen in a primary care setting.(3) However, these studies on ED use in infancy have typically been smaller single center or health care system studies, aside from a few state-based studies and / or encompassing a period of time longer than the first month of life.(3-9)

Race and ethnicity may play a role in ED use, as Black patients in particular are more likely to visit the ED for a variety of conditions and age groups, although these differences are often attenuated after risk adjustment for various socio-demographic factors.(10-12) The racial distribution of ED visits in the first month of life is not well known.

Our objective was to assess, in a nationally representative sample, the incidence of ED visits in the first 28 days of life overall and by race, the patient and hospital characteristics associated with neonatal ED visits, and the diagnoses seen in this group.

Methods

The National Hospital Ambulatory Medical Survey (NHAMCS) is a nationally collected survey on the utilization and provision of ambulatory care services in hospital emergency and outpatient departments. We used 2003-2008 data, the most recent NHAMCS data. We chose to use six years worth of data in order to have a large enough sample size to make comparisons between various socio-demographic groups.

In order to derive nationally representative and unbiased estimates, the NHAMCS uses a multistage probability design, which involves probability samples of primary sampling units within geographic areas, hospitals within those units, and patient visits within the hospital. (13)

To examine neonatal emergency department visits, we limited our analysis to those patients who were < 28 days old at the time of the visit, and to ED visits, excluding non-ED outpatient clinic visits. This data set included 619 patient visits, from which population rates were estimated, using NHAMCS survey weights. We examined visit rates and relationship to various patient and hospital characteristics of the study population as follows: race, ethnicity, sex, payer, and safety-net vs. non-safety net hospital.(13) Safety-net status is defined by the Centers for Disease Control and Prevention as facilities having more than 30% of visits with Medicaid as the source of payment, more than 30% of visits with self-pay or no charge as the source of payment (i.e. uninsured), or a combined Medicaid and uninsured patient population greater than 40%.(14)

The NHAMCS data allows for estimation of visit rates per 1,000 persons. Because the number of births in the United States is able to be determined by birth certificate data, we were able to determine a denominator for the eligible number of newborn infants that could potentially visit the ED soon after birth. We used national data on births from the National Center for Health Statistics to calculate the total number of visits per live birth using birth certificate data.(15) We used birth certificate data from the corresponding years that we had NHAMCS data, 2003 to 2008. Using the birth certificate data, we estimated ED visit rates according to self-reported maternal race / ethnicity groups. Analyses were performed with SAS 9.2 (Cary, NC) and Sudaan, version 10.0.1 (Research Triangle, NC).

We obtained all primary diagnoses for these visits in the neonatal period. The primary diagnosis as recorded in the NHAMCS record is considered one of the most important items to note in the form. While a pediatric diagnostic grouping system in the ED has been described, the system was developed using all pediatric visits types and so does not categorize the more specific concerns of the neonatal period.(16) In order to categorize the neonatal visits for this study, two of the investigators independently reviewed each primary diagnosis and grouped them into categories of similar illness and systems. In cases of disagreement, there was further discussion until agreement was reached. These were broadly categorized into mild, moderate, and severe diagnoses. This process is similar to that used previously to categorize neonatal conditions either by presenting complaint or final diagnosis in ED settings.(3, 6, 7, 9)

Diagnoses that were indicative of a birth occurring in the ED or just prior to ED arrival were excluded. Some diagnoses (n=4) were indicative of an adult diagnosis, potentially referring to a maternal condition, and were also excluded.

As data for this study were from publicly available, anonymous sources, this study was not considered human subjects research according to guidelines of the University of California, San Francisco Committee on Human Research.

Results

There were an estimated total 1,923,245 visits over 6 years in the first 28 days of life, based on a sample of 619 records, representing an average 320,540 neonatal ED visits in the U.S. per year. This was in the context of 25.2 million births overall recorded in Birth Certificate

data in the United States during the study period, for an overall rate of 7.6%. Estimated rates of ED visits were highest among Non-Hispanic Blacks, with 14.4% (95% CI 10.0-19.2) of newborns having an ED visit in the newborn period, compared with 6.7% (95% CI 4.9-7.2) for Whites and 7.7% (95% 5.7-9.8) for Hispanics.

Estimated numbers of ED visits for Non-Hispanic White, Black, and Hispanic infants by various demographic categories are shown in Table 1. While the most common age group of visits for White and Hispanic infants was at 0-7 days of age, Black infants were more likely to be seen at 15-21 days of age, a relatively less common period of ED visits for White infants.

Most neonatal ED visits occurred in safety-net hospital EDs (67%), compared with 53% of visits occurring at safety-net hospital EDs for all ages. Hispanic and Black neonates were more likely to be seen in safety-net hospitals (76-78%) than White (57%) patients (p=0.004, Table 1). Insurance type amongst ED visit patients was not significantly different by race / ethnicity (Table 1). Patients on Medicaid represented the highest proportion for each race with neonatal ED visits.

Common reasons for “mild” ED visits included skin problems, benign gastrointestinal symptoms including jaundice, and routine care (Table 2). There were no significant differences by diagnostic category and race.

Discussion

Our study is the first nationally representative sample estimating ED visits in the neonatal period. We found that in the United States, ED visits in the neonatal period (infants < 28 days old) were common, representing 7.7% of live births. Patients who were non-Hispanic Black were twice as likely to be seen in the ED in early infancy as White and Hispanic infants. Most neonatal ED visits occurred in safety-net hospitals, which had higher representation of Hispanic and Black patients.

For Black infants, who were twice as likely to have a neonatal ED visit, the timing of the ED visit was more likely to be not in the first week after birth, which was the most common timing of White and Hispanic infants. Interestingly, the most common timing of the ED visit for Black infants was at 15-21 days (Table 1). The difference in timing of the ED visit for non-Hispanic Blacks deserves further study to understand if this is due to differences in hospital care, primary care access, or some other social or biological differences. Incidence of ED visits for Black infants was also over-represented in the South (Table 1).

Non-urgent use of EDs may represent inefficient resource utilization in healthcare.(2) We were not able to assess whether ED use in the NHAMCS population was non-urgent or unnecessary as it is an administrative database. While some diagnoses may appear benign, they may have presented with more worrisome symptoms. Further study is needed to assess what proportion of neonatal ED visits may be avoidable. Some visits to the ED in this period may have been more appropriate for evaluation in a non-ED / primary care clinic setting. However, the neonatal period is a vulnerable time for families and the threshold to visit an ED may be lower for this population. Ultimately, the labeling of ED visits as “unnecessary”

or “non-urgent” may be an assessment that differs by parental perception of illness or injury, with some parents needing the visit and reassurance more than others. However, the finding of differences in visits by race suggests that ED visits could be reduced in those groups with higher rates. The study of infant ED visit prevention might lead to more efficient and higher quality care.

Improving the quality of care may prevent ED visits in three potential contexts: 1) prevention of newborn illness through quality of inpatient care. For example, clinicians caring for the newborn during the initial hospitalization may be able to prevent ED visits for various conditions including jaundice, infection and feeding issues, both by providing anticipatory guidance and by completing appropriate screening evaluations; 2) prevention of illness through quality of primary care and improved access to primary care. For example, early connection to a primary care provider could presumably lead to reduced ED visits, particularly for high risk populations. However, studies have been mixed on the impact of primary care programs on ED use, with one study actually showing increased ED use;(8, 17) and 3) prevention of ED visits through counseling of a parent in the hospital or clinic to recognize how and when to access primary care vs. going directly to the ED. For example, appropriate follow-up and anticipatory guidance during the newborn check-up may be particularly important in high-risk socio-demographic populations, and potentially result in reduced ED visits.(18) Considering the relatively large number of neonatal ED visits, the role of each of these three areas for intervention is worthy of further study.

Patients who were on Medicaid had the highest proportion of visits for every race, with more than half of visits for Black and Hispanic infants covered by Medicaid (Table 1). Therefore, this group of patients may represent an important target for further research and interventions in the above areas.

A limitation of this study is that it is a retrospective analysis and that it analyzes a sample of all visits, though they were sampled so as to provide national estimates. In addition, we were not able to account for whether the ED visit was an initial visit or a return visit, although it would be unlikely that one patient would have been sampled twice in NHAMCS during the first month of life. Data on mothers were not available, as the records were only for the infant seen in the ED. Therefore, we could not examine potentially relevant factors such as maternal age, marital status, and conditions related to the perinatal period. We also lacked data on the parental perception of illness. Although we characterized diagnoses by clinical categories, the severity of illness was ultimately not able to be determined from our data.

Because we used age as an eligibility criterion for inclusion, preterm infants who were hospitalized for a longer period of time would be less likely to be seen in the neonatal period in the ED. Preterm infants have been shown to be at higher risk of ED visits / morbidity in the first several months of life.(9)

There are a large number of ED visits in infants prior to 28 days old. Racial disparity exists in neonatal ED visits, with non-Hispanic Blacks having significantly higher visit rates. ED visit prior to 28 days of age may be a useful quality measure to assess hospital care and primary care in the newborn period. Tracking ED visits in the neonatal period locally and

regionally may help promote improvements in the quality of care of newborns to reduce such visits, which disproportionately affect the non-Hispanic Black population.

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Abbreviations

ED	emergency department
NHAMCS	National Hospital Ambulatory Medical Survey

Table 1

Patient and Hospital characteristics of neonatal emergency department visits by race.

		Race / Ethnicity (Column %'s)			
	Total	**Non-Hispanic White**	**Non-Hispanic Black**	**Hispanic**	**P**
N	1,826,777	841,180	524,949	460,648	
Age of presentation					
0-7 days	624,912	333,943 (40%)	103,962 (20%)	187,007 (41%)	0.0024
8-14 days	444,379	210,470 (25%)	129,087 (25%)	104,822 (23%)	
15-21 days	420,244	123,875 (15%)	175,072 (33%)	121,297 (26%)	
22-27 days	337,242	172,892 (21%)	116,828 (22%)	47,522* (10%)	
Insurance					
Private	496,641	292,789 (35%)	120,207 (23%)	83645 (18%)	0.053
Medicaid	864,622	317,523 (38%)	280,860 (54%)	266,239 (58%)	
Uninsured	298,307	148,469 (18%)	70,676 (13%)	79,162 (17%)	
Other	167,207	82,399 (10%)	53,206 (10%)	31,602 (7%)	
Region					
Northeast	341,740	167,871 (20%)	65,476 (13%)	108,393 (24%)	0.0002
Midwest	387,398	207,099 (25%)	119,143 (23%)	61,156* (13%)	
South	850,782	363,251 (43%)	307,332 (59%)	180,199 (39%)	
West	246,857	102,959 (12%)	32,998* (6%)	110,900 (24%)	
Hospital status					
Safety-net	1,240,305	480,731 (57%)	410,376 (78%)	349,198 (76%)	0.004
Non-Safety-net	586,472	360,449 (43%)	114,573 (22%)	111,450 (24%)	

Cells marked with "" are estimates based on < 30 visits—considered unreliable by the National Center for Health Statistics.

Table 2

Most common diagnostic categories of neonatal emergency department visits.

Mild (n = 242, 37% of total)	**% of category**
Benign gastrointestinal problem	29%
Routine infant care	24%
Non-emergent rash or skin problem	11%
Opthalmologic problem	7%
Jaundice	25%
Non-specific pain / minor injury	5%
Moderate (n = 258, 39% of total)	% of category
Moderate infection	36%
Gastrointestinal problem	22%
Potential serious newborn problem (observation and unspecified or ill-defined conditions)	25%
Respiratory problem	11%
Moderate injury	6%
Severe (n = 157, 24% of total)	% of category
Serious disease or problem related to newborn period (such as leukemia and temperature abnormalities)	20%
Serious infection	20%
Respiratory problem, potentially requiring admission	17%
Surgical condition	11%
Major injury	10%
Drugs or toxins	4%
Seizure / neurologic problem	5%
Cardiac problem	3%
Bleeding	5%
Dehydration / shock	4%