Comparison of Length of Stay for Asthma by Hospital Type

Barbara N. Samuels, MD, MPH*; Alvin H. Novack, MD†§; Diane P. Martin, PhD‡; and Frederick A. Connell, MD, MPH¶§

ABSTRACT. Objective. To determine whether length of stay (LOS) for asthma admissions at a local university-affiliated children’s hospital (UACH) is similar to that of community hospitals within the same county.

Methods. A retrospective analysis was performed using computerized hospital abstract records from 1989 through 1994. The study population was children 1 to 18 years old whose first or only hospitalization for a primary diagnosis of asthma occurred during the study period at either the UACH or one of the 17 community hospitals in King County, WA, that admit pediatric patients (n = 2491). Transfers and patients with chronic obstructive asthma or secondary diagnoses such as cystic fibrosis were not included in the study. Asthma patients were compared by sociodemographic and health risk characteristics such as age, sex, insurance status, and a comorbidity severity score. Differences between the two hospital populations were tested by χ2 and t tests. The effect of hospitalization at the UACH or the community hospitals on LOS was determined using analysis of covariance after adjusting for the sociodemographic and health risk covariates.

Results. Sixty-two percent (62%) of the asthma patients in the study population were discharged from the UACH. Compared with patients discharged from the community hospitals, the UACH patients were significantly younger, more often male, used public insurance, and resided in areas with lower median household incomes. The severity of comorbidities was not different between the two hospital groups. Overall, adjusted mean LOS was not significantly longer at the UACH (2.1 days) than at the community hospitals (2.0 days); however, adjusted mean LOS for specific subgroups, most notably poor children and those with public insurance, was significantly longer at the UACH.

Conclusion. LOS for first or only asthma hospitalizations during 1989 through 1994 at the UACH was similar to local community hospitals within the same county. Specific subgroups of children were hospitalized for a longer period at the UACH, but children with private insurance and from areas with higher median household incomes had similar LOS, and presumably costs, at the UACH and the community hospitals.

ABBREVIATIONS: LOS, length of stay; UACH, university-affiliated children’s hospital; CHAR, Comprehensive Hospital Abstract Reporting System; KCCH, community hospitals in King County; ICD-9, International Classification of Diseases, Ninth Revision.

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5 years ago. For example, a recent unpublished study found that community hospitals in King County are increasingly likely to admit pediatric patients. In addition, the same evaluation, based on 1991 discharges, showed that the UACH had higher mean costs for many, but not all, diagnosis-related groups, although the analysis did not take case mix into account.

Using a larger data set than the 1991 analysis and a measure of case-mix, this study compares LOS between the UACH and the 17 community hospitals that discharged pediatric patients with the diagnosis of asthma between 1989 and 1994.

METHODS

Data for this study were obtained from the 1989–1994 Washington State Department of Social and Human Services Comprehensive Hospital Abstract Reporting System (CHARS), a mandatory reporting system for all Washington State hospitals. Hospital and patient information were collected at discharge for every hospitalization. Race and ethnicity were not available from this data set. In a comparison of the CHARS computerized abstract and hospital records at 23 hospitals throughout the state of Washington, the hospital discharge abstracts that form the basis of CHARS had a median discharge accuracy of 90%.

The study design was a retrospective comparison of LOS of children discharged between 1989 and 1994 with the primary diagnosis of asthma from the children’s hospital (the UACH) or one of the 17 community hospitals in King County (KCCH) without pediatric teaching affiliations. The KCCH did not include either of the two major teaching hospitals that are also affiliated with the University of Washington. Although both admit pediatric patients, one of the hospitals specializes in neurosurgery, burns, orthopedics, rehabilitation, and trauma, while the other admits pediatric patients mostly for pregnancy-related and newborn services. Only 8 pediatric patients with asthma were discharged from these two hospitals between 1989 and 1994. Attending physicians and practicing physicians at the UACH generally do not admit patients to the community hospitals.

There were 4583 discharges of pediatric patients from King County, who ranged in age from 28 days to 19 years, with a primary diagnosis of asthma (International Classification of Diseases, Ninth Revision [ICD-9] codes 493.0, 493.1, 493.2 and 493.9) from the UACH and the KCCH during the time frame of the study. In this descriptive study, children with obstructive asthma (ICD-9 code 493.2), and 73 because of a primary diagnosis of chronic obstructive asthma during the study period, 80 were excluded because of a primary diagnosis of chronic asthma at the UACH or the KCCH (Table 2).

Several sociodemographic and health risk characteristics were chosen because many pediatricians are reluctant to diagnose asthma in children <3 years old, and teenagers hospitalized for asthma demonstrate different patterns of hospitalization and LOS than younger children.

Insurance status was dichotomized into a public and a private group. Private insurance status included Medicaid, Medicare, self-pay, and charity care. Medicaid accounted for 98% of this category. The private category included health maintenance organizations, other commercial insurance, health care service contractors, and other sponsored patients. Median household income based on zip code was assigned to each patient, and quartile ranges were determined based on the distribution of those values. These were also used as a measure of socioeconomic status.

A comorbidity severity score was assigned to each patient based on an assessment of the effect of listed comorbidities on the length of an asthma hospitalization. A score was generated for each patient by using a panel of 11 pediatricians (including two of the authors, B.N.S. and A.H.N.). The panel were given a list of all comorbidities that occurred at least one time among all patients in the order of their ICD-9 code. The instructions asked them to rate all listed comorbidities as 0 (no effect on the LOS), 1 (mild or modest effect on LOS), 2 (moderate effect on LOS) to 3 (strong/strongest effect on the LOS), and examples were provided. Respiratory arrest might be assigned a 3 and ringworm, a 0. Interrater reliability was 95% (Cronbach’s α). Every patient could have 0–8 listed comorbidities, so a score could be assigned to each patient using the score of the highest rated comorbidity among all listed secondary diagnoses for that patient.

Procedures were dichotomized into two groups based on coding: no procedures coded or at least one procedure coded. Other health risk variables constructed or used included the number of times an individual was discharged from the hospital for asthma during 1989 through 1994, and readmissions for asthma within 1 week after the initial asthma discharge.

χ² and t tests were used to test significance among the sociodemographic and health risk variables between the two hospital groups (Table 1). An adjusted mean LOS for each sociodemographic and health risk characteristic was generated using analysis of covariance with the adjustment to detect differences between each variable at the UACH and the KCCH (Table 2). Other descriptive statistics for LOS included median, interquartile range, and 95th percentile. Mean LOS was used as the dependent variable in an analysis of covariance to examine the effect of the independent variable of interest, hospital type, adjusting for four other covariates: age, gender, insurance status, and the comorbidity severity score (Table 3). All statistical analyses were performed using Statistical Analysis Software (SAS Institute, Cary, NC).

We also examined several transformations of LOS including the log, square, and square root to see if we could improve the distribution of the LOS variable.

RESULTS

Of the original 4583 discharges with a primary diagnosis of asthma during the study period, 80 were excluded because of a primary diagnosis of chronic obstructive asthma (ICD-9 493.2), and 73 because of their transfer status. Two hundred fifty (250) were discharged from hospitals outside of King County. Other exclusions included nonexistent zip codes or zip codes outside of King County (n = 145), children <1 year old (n = 385), and patients with secondary diagnoses that could be a complicating factor in the diagnosis of asthma in infants. Patients with secondary diagnoses that could be a complicating factor in the diagnosis of asthma were also excluded. These secondary diagnoses included cystic fibrosis, bronchiolitis, respiratory syncytial virus infection, bronchopulmonary dysplasia, gas-trostomies, congenital heart defects other than ventricular septal defect, and mental retardation. We then limited the study population to first or only asthma discharges during 1989 through 1994.

Several sociodemographic and health risk characteristics were used or constructed from the CHARS data set to compare the population of the UACH and KCCH: age, gender, insurance status, median household income based on zip code of residence, the severity of listed comorbidities, whether or not a procedure was coded on the abstract, and readmissions for asthma within 1 week and within the period of the study.

Age groups of children 1 to 2 years old, 3 to 9 years old, and 10 to 18 years old were used for several of the analyses. These age groups were chosen because many pediatricians are reluctant to diagnose asthma in children <3 years old, and teenagers hospitalized for asthma demonstrate different patterns of hospitalization and LOS than younger children.

Insurance status was dichotomized into a public and a private group. Public insurance status included Medicaid, Medicare, self-pay, and charity care. Medicaid accounted for 98% of this category. The private category included health maintenance organizations, other commercial insurance, health care service contractors, and other sponsored patients. Median household income based on zip code was assigned to each patient, and quartile ranges were determined based on the distribution of those values. These were also used as a measure of socioeconomic status.

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We also examined several transformations of LOS including the log, square, and square root to see if we could improve the distribution of the LOS variable.
Sixty-two percent (62%) of the patients were discharged from the UACH. The number of patients discharged from the 17 community hospitals between 1989 and 1994 ranged from 1 patient (two hospitals) to 306 patients. Seventy-two percent (72%) of all children discharged from the KCCH were from the three hospitals; 88% from five hospitals.

Sociodemographic and health risk characteristics for each hospital type are presented in Table 1. Patients discharged from the UACH were significantly more likely to be <10 years old, male, have public insurance, and reside in areas with lower median household incomes. Comorbidity severity scores and the percentage of patients with at least one procedure were not significantly different between the UACH and the KCCH (Table 1). Forty-nine percent (49%) of patients at the UACH and 44% at the KCCH had no secondary diagnoses recorded.

Surprisingly, only 8 patients had one or more procedures recorded on the computerized abstracts; 4 at each hospital type. The most common procedure (n = 5) was other mechanical ventilation. Other procedures included fiber-optic bronchoscopy (3), other bronchoscopy (3), insertion of endotracheal tube (2), and respiratory medication administered by nebulizer (2).

The mean number of hospitalizations during the study period was not significantly different. Over 75% of patients at both the UACH and the KCCH were hospitalized only once for asthma (Table 1). The maximum number of hospitalizations for asthma was 21 at the UACH and 20 at the KCCH (1 patient each). Four patients from each hospital group, were readmitted within 1 week for asthma. Three patients at the UACH and 2 patients at the KCCH were readmitted for another diagnosis within 1 week of their asthma hospitalization.

LOS was skewed with 42% of patients at both the UACH and the KCCH hospitalized for only 1 day. Transformations of the LOS variable did not improve the distribution. Six percent of the UACH and 5% of KCCH patients were hospitalized 5 or more days, the 95th percentile for LOS. Minimum LOS was 1 day at both hospital types. The longest hospitalization was 14 days at the UACH and 11 days at the KCCH.

Median LOS was 2 days overall and 1 or 2 days for most sociodemographic and health risk subgroups. Median LOS was 3 days for patients with comorbidity severity scores of 3 at both hospital groups. Interquartile range was 1 day overall and 1 or 2 days among all subgroups except for patients with a comorbidity score of 3 at the UACH who had an interquartile range of 3 days.
Table 2 summarizes adjusted mean LOS for each sociodemographic and health risk subgroup by hospital type. LOS was longer at the UACH than at the KCCH for five characteristics: female, public insurance, residence in poorer areas, older age, and higher comorbidity severity scores, although the differences were significant at the <.05 level only for the first three of these characteristics.

Table 3 presents the results for the analysis of covariance. Coefficients represent the effect on LOS. After adjusting for age, sex, insurance status, and comorbidity severity score, LOS was only .06 days longer for patients hospitalized at the UACH. The difference was not significant. Older age, public insurance, and a higher comorbidity severity score all increased LOS significantly.

When we looked at first order interactions (Table 3), two were significant: comorbidity severity score and hospital type and comorbidity severity score and age. This can be interpreted as follows: as comorbidity severity score increased from 0 to 3, LOS increased more for patients hospitalized at the UACH than for those hospitalized at the KCCH, as was suggested by the adjusted mean LOS for the comorbidity severity score in Table 2. The same relationship occurs between increasing comorbidity severity score and older age.

DISCUSSION

We compared asthma discharges from a pediatric tertiary care referral center with asthma discharges from community hospitals in the same county without major teaching affiliations in pediatrics. Eliminating patients with chronic obstructive asthma and other diseases that complicate the diagnosis of asthma allowed us to compare discharges for the more common, less severe forms of asthma. Major deviations in measurable outcomes such as LOS may thus signify a substantial difference in practice patterns for the routine asthma patient for one of the hospital types.

Because LOS is skewed, we did look at transformations of the variable, including the log, square, and square root of LOS. None of the transformations improved the normality of the distribution, so we used the LOS variable for its readily understandable interpretation. Median LOS, the better statistic for the skewed LOS variable, was similar not only for the two hospital types, but its value (2 days) was also similar to the adjusted mean LOS generated by the analyses of covariance.

Our analysis showed similar LOS statistics for children with asthma, whether hospitalized at the UACH or the KCCHs. Among subgroups where differences in LOS did exist, the values for the UACH were usually longer. Using LOS as a proxy for cost, the analysis suggests that overall the UACH can care for many hospitalized children with asthma at a cost similar to the KCCH, although the UACH may be more expensive for specific subgroups of children.

The largest differences in mean LOS between the UACH and the KCCH occurred in children with sociodemographic and health risk traits that have been found to increase LOS: older age, female sex, public insurance, residence in poorer neighborhoods, and more severe comorbidities, although not all these differences were significant in our study. In general, the subgroups with longer LOS statistics at the UACH are precisely those who are admitted to the UACH in higher proportions. The exception was patients with more severe comorbidities. Patients with higher comorbidity severity scores in our study population were hospitalized at similar rates at each of the two hospital types, but those hospitalized at the UACH had longer LOS. As suggested by the analysis of covariance, there appeared to be a small, but significant interaction between higher comorbidity severity scores and hospitalization at the UACH that increased LOS, although the nature of this interaction is unclear. Whether the longer LOS for these asthma patients reflects an appropriate need for longer hospitalizations or superfluous, unnecessary days of inpatient care at the UACH cannot be determined from the data available to us.

Boys, children with private insurance, and those residing in more affluent neighborhoods had similar mean, median, and interquartile range values for LOS, suggesting that care for these patients with routine asthma was comparable at the UACH and the KCCH. It appears from our data that the UACH treated this group of children at costs similar to the KCCH, despite the perception that teaching hospitals are more costly for the routine patient.

The differences in sociodemographic characteristics between the UACH and the KCCH were expected and confirmed to findings in the literature. The UACH, like many teaching hospitals admitted a proportionally larger percentage of poor children and children with public funding sources.

The similarities between the two hospitals types for severity of comorbidity were more surprising. Removing patients with chronic obstructive asthma from the analysis, which was not done in other studies, had an effect on these findings, because they often have long hospitalizations and more severe comorbidities. Over the entire range of ICD-9 codes (493.0–493.9), the UACH may hospitalize a sicker group of children, but removing children with chronic obstructive asthma from the analysis allowed us to compare a group of patients with similar illness between the UACH and the KCCH, which was the intent of this study.

The limitations of our study include the lack of data that would help to better describe the patient populations and to find more precise proxies for cost in addition to LOS. Charges, although included in the data set, vary among all hospitals making comparisons difficult and were not available for one of the largest hospital systems in the county. Although we used LOS as a proxy for cost, we could not measure the intensity or quality of the care provided nor could we make judgments on whether longer LOS at the UACH for specific groups was appropriate or inappropriate for the illness that required hospitalization. Procedures were rarely coded in this patient population, and thus, not useful as a proxy for cost.
CONCLUSION

Using LOS as a proxy for cost, the UACH appeared overall to provide care for children hospitalized with asthma at the same cost as KCCH. The results for some subgroups of children, however, were not comparable. Specifically, children with public funding sources or from poor neighborhoods, who tend to gravitate preferentially to UACHs, and patients with more severe comorbidities were hospitalized longer at the UACH. Whether these children in larger numbers would be hospitalized for significantly shorter periods at the community hospitals is not clear. On the other hand, children with a primary diagnosis of asthma who resided in more affluent neighborhoods and had private insurance had similar lengths of stay whether hospitalized at the UACH or the KCCHs.

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e1 ABSTRACT. Control of Hyperbilirubinemia in Glucose-6-Phosphate Dehydrogenase-deficient Newborns Using an Inhibitor of Bilirubin Production, Sn-Mesoporphyrin. Timos Valaes, MD; George S. Drummond, PhD; and Attallah Kappas, MD. Background. Hyperbilirubinemia in newborns with glucose-6-phosphate dehydrogenase (G6PD) deficiency is a serious clinical problem because of the severity and unpredictability of its course. An innovative approach to this problem is suggested by previous experience with Sn-mesoporphyrin (SnMP), a potent inhibitor of bilirubin production, in moderating neonatal hyperbilirubinemia caused by ABO incompatibility, immaturity, and unspecified mechanisms.

Objective. To compare the effectiveness of the preventive and therapeutic uses of SnMP in ameliorating the course of bilirubinemia of G6PD-deficient neonates.

Methods. Neonates born at the Matera Maternity Hospital, Athens, Greece, and found to be G6PD-deficient by cord blood testing were stratified by sex and gestational age (210–265 days and >265 days) and randomized in pairs to receive SnMP (6 mmol/kg birth weight, intramuscularly) either on the first day of life (preventive use) or if and when the plasma bilirubin concentration (PBC) level reached an age-specific threshold level for intervention (therapeutic use). In the case of failure of SnMP to control the rise of PBC levels, the protocol defined precisely the threshold PBC levels for switchover to phototherapy (PT) and, if necessary, exchange transfusion. PBC was measured daily until a declining value was obtained and the case was closed.

Results. A total of 86 G6PD-deficient neonates were randomized: 42 in the preventive arm and 44 in the therapeutic arm. Of the latter, 20 (45%) reached PBC levels requiring therapeutic intervention and thus received SnMP. Regardless of the trial arm, none of the 86 neonates required PT, whereas in a previous study in the same population, 33% of G6PD-deficient neonates required PT. In the intrapair sequential analysis, the favored arm was decided on the criterion of the age at closure of the case being shorter by at least 1 day. After plotting 30 untied pairs in the sequential analysis graph, the preventive use of SnMP proved to be the favored arm, and the trial was stopped. At this point, there were 2 unpaired neonates, 12 tied pairs, 22 pairs in which the preventive use of SnMP was favored and 8 pairs in which the therapeutic use of SnMP was favored. In the group analysis, infants in the preventive group, compared with those in the therapeutic group, had a lower maximum PBC level (8.2 ± 3.1 and 10.9 ± 2.8 mg/dL, respectively), which was reached at an earlier age (63.5 ± 34.8 and 82.2 ± 24.7 hours, respectively) as well as a lower closing PBC level (7.2 ± 2.9 and 9.6 ± 2.5 mg/dL, respectively) and an earlier age at closing (89.1 ± 35.6 and 110.8 ± 23.6 hours, respectively). Moreover, a PBC level of ≥8.0 mg/dL, a level at which jaundice is clearly visible, was not reached by 52% of the neonates in the preventive arm and 16% of the neonates in the therapeutic arm.

Conclusions. In G6PD-deficient neonates, a single dose of SnMP administered preventively or therapeutically entirely supplanted the need for PT to control hyperbilirubinemia. The preventive use of SnMP offers practical advantages in populations with a high enough prevalence of G6PD deficiency to justify cord blood screening. Pediatrics 1998;101(5). URL: http://www.pediatrics.org/cgi/content/full/101/5/e1; G6PD-deficiency, hyperbilirubinemia, heme oxygenase, Sn-mesoporphyrin, neonatal jaundice.

e2 ABSTRACT. Effects of Exposure to Alcohol in Mother’s Milk on Infant Sleep. Julie A. Mennella, PhD, and Carolyn J. Gerrish, PhD. Objective. To test the hypothesis that exposure to alcohol in breast milk affects infants’ sleep and activity levels in the short term.

Methods. Thirteen lactating women and their infants were tested on 2 days, separated by an interval of 1 week. On each testing day, the mother expressed 100 mL of milk, while a small, computerized movement detector called an actigraph was placed on the infant’s left leg to monitor sleep and activity patterning. After the actigraph had been in place for ∼15 minutes, the infants ingested their mother’s breast milk flavored with alcohol (32 mg) on one testing day and breast milk alone on the other. The infants’ behaviors were monitored for the next 3.5 hours.

Results. The infants spent significantly less time sleeping during the 3.5 hours after consuming the alcohol-flavored milk (78.2 minutes compared with 56.8 minutes after feeding alcohol in breast milk). This reduction was apparently attributable to a shortening in the longest sleeping bout (34.5 minutes for sleeping after breast milk alone) and the amount of time spent in active sleep (25.8 minutes compared with 44.2 minutes after breast milk alone); the decrease in active sleep was observed in all but 2 of the 13 infants tested.

Conclusions. Although the mechanisms underlying the reduction in sleep remain to be elucidated, this study shows that short-term exposure to small amounts of alcohol in breast milk produces distinctive changes in the infant’s sleep–wake patterning. Pediatrics 1998;101(5). URL: http://www.pediatrics.org/cgi/content/full/101/5/e2; alcohol, lactation, sleep, activity, development, infant behavior.

e3 ABSTRACT. Adverse Effects of High-dose Vitamin A Supplements in Children Hospitalized With Pneumonia. Charles B. Stephensen, PhD; Luis Miguel Franchi, MD; Herminio Hernandez, MD; Miguel Campos, MD, PhD; Robert H. Gilman, MD, DTMH; and Jose O. Alvarez, PhD. Objective. To test the hypothesis that high-dose vitamin A supplements will enhance recovery of children hospitalized for the treatment of community-acquired pneumonia.

Design. We conducted a randomized, double-blind, placebo-controlled clinical trial of high-dose vitamin A supplements among children 3 months to 10 years of age (N = 95) admitted to hospital with community-acquired pneumonia in Lima, Peru. Children ≤1 year of age received 100 000 IU of water-miscible vitamin A on admission to the hospital and an additional 50 000 IU the next day. Children >1 year of age received 200 000 IU on admission and 100 000 IU the next day.

Results. Children receiving vitamin A (n = 48) had lower blood oxygen saturation (the mean difference on day 3 in hospital was 1.1%), higher prevalence rates of retractions (37% in the vitamin A group vs 15% in the placebo group on day 3), auscultatory evidence of consolidation (28% in the vitamin A group vs 17% in the placebo group on day 3), and were more likely to require supplemental oxygen (21% in the vitamin A group vs 8% in the placebo group on day 3) than children in the placebo group (n = 47). Adjustment for baseline severity of disease and nutritional status did not alter the association of vitamin A with increased clinical severity, although the difference in blood oxygen saturation was no longer statistically significant. No differences were seen in duration of hospitaliza-
e4 ABSTRACT. Attitudes of the Physician Membership of the Society for Adolescent Medicine Toward Medical Abortions for Adolescents. Nancy H. Miller, MD; David J. Miller, PhD; and Laura M. Pinkston Koenigs, MD. Objective. To document the practices and attitudes of the US physician members of the Society for Adolescent Medicine (SAM) regarding adolescent abortion and contraception, as well as physician willingness to prescribe medical abortion if approved by the Food and Drug Administration (FDA).

Design. Cross-sectional questionnaire survey.

Participants. The entire physician membership of SAM (N = 1001) was surveyed. A total of 713 physicians responded, with 668 usable surveys yielding an adjusted response rate of 70%.

Results. Of the respondents, 81% were trained as pediatricians; 58% had additional adolescent medicine training. Ninety-six percent prescribed contraception for their patients. Sixty-one percent of respondents identified abortion as an option for pregnant adolescents in all circumstances, whereas 4% believed abortion should never be an option. Eighty-nine percent referred their patients for abortions; 90% were aware of medications to induce abortions medically. If these medications (mifepristone [RU486] and misoprostol) were approved by the FDA, 42% would prescribe them for their patients; 34% were unsure. Fifty-four percent believed medical abortions were routinely available, they should be available from primary care physicians.

Physicians were significantly more likely to consider prescribing medical abortions if the physician were female, offered postcoital contraception, performed Norplant insertions, referred adolescents for abortions, or performed postabortion medical checkups. Physicians were no more likely to consider prescribing medical abortions according to physician age, specialty training, or date of residency training. Religious affiliation per se was not associated with likelihood of prescribing medical abortions, but Catholic physicians were significantly less likely to consider prescribing medical abortions.

Conclusions. Virtually all SAM physician respondents (96%) reported that abortion for pregnant adolescents should be available under some circumstances. Forty-two percent would prescribe medical abortion if the medications were FDA-approved, suggesting that medical abortion would potentially be available to adolescents from a larger group of physicians than is currently available. Pediatrics 1998;101(5). URL: http://www.pediatrics.org/cgi/content/full/101/5/e3; vitamin A, pneumonia, children, Peru, respiratory, lung, retinol.

e5 ABSTRACT. Do Missed Opportunities Stay Missed? A 6-Month Follow-up of Missed Vaccine Opportunities in Inner City Milwaukee Children. Swapna S. Sabnis, MD; Albert J. Pomeranz, MD; Patricia S. Lye, MD, MS; and Margaret M. Amatue, MD. Objectives. To determine 1) the frequency of missed vaccine opportunities (VOs) in inner city children ≤3 years of age; 2) whether the recommended vaccine(s) were given within 6 months of the missed opportunity (MO); 3) whether these vaccinations were age-appropriate according to the guidelines of the Advisory Committee on Immunization Practices; and 4) variables associated with MOs.

Design. Retrospective chart review with a nested retrospective cohort of children with MOs.

Setting. Two inner city practice settings in Milwaukee: a community health center and an academic continuity care practice.

Patients/Selection Procedure. A consecutive sample of 710 visits of inner city children ≤3 years of age with VOs, seen between January 1 and March 31, 1995. A VO was defined as any encounter when the child was vaccine-eligible according to Advisory Committee on Immunization Practices guidelines.

Results. MOs occurred in 47% (330/710) of the VOs. Only 40% of the children with MOs received age-appropriate immunizations within 6 months; 30% received the vaccinations beyond the age-appropriate time. The remaining 30% either did not return or were not vaccinated on return. The variables significantly associated with MOs were 1) age: children with MOs were older than those without, with a mean age of 15.5 months vs 10.9 months; 2) minor febrile illness; 3) moderate/severe illness; 4) acute illness encounters; and 5) patient’s being seen at the community health center. Only 15.3% of all MOs were justified by the presence of moderate/severe illness.

Conclusions. VOs are frequently missed in inner city children. Most of the MOs were not justified by the valid contraindication of moderate/severe illness. Sixty percent of the children with MOs did not receive age-appropriate immunizations within 6 months. These children are vulnerable to vaccine-preventable diseases such as measles and pertussis. Pediatrics 1998;101(5). URL: http://www.pediatrics.org/cgi/content/full/101/5/e5; immunization, vaccination, missed opportunities, children, pre-school.

e6 ABSTRACT. Anabolic Steroid Use by Male and Female Middle School Students. Avery D. Faigenbaum, EdD; Leonard D. Zaichkowsky, PhD; Douglas E. Gardner, MA; and Lyle J. Micheli, MD. Background. The prevalence of anabolic steroid use by high school and college students has been reported in the literature. However, rumors persist regarding the use of steroids by younger populations.

Objective. To assess the extent of steroid use by male and female middle school students and to explore their attitudes and perceptions about these drugs.

Methods. A confidential self-report questionnaire was administered to 466 male and 499 female students between 9 and 13 years of age (mean ± SD, 11.4 ± 0.9 years) in 5th, 6th, and 7th grades from four public middle schools in Massachusetts. The number of students reporting steroid use and differences between users’ and nonusers’ underlying attitudes and perceptions about these drugs were evaluated.
ABSTRACT. Early Dexamethasone Therapy in Preterm Infants: A Follow-up Study. Tsu F. Yeh, MD; Chao C. Huang, MD; Yung J. Chen, MD; Yuh J. Lin, MD; Chao C. Huang, MD; Yung J. Chen, MD; Chyi H. Lin, MD; Hong C. Lin, MD; Wu S. Hsieh, MD; and Yu J. Lien, MA. Objectives. To study the outcome at 2-year corrected age of infants who participated in a double-blind controlled trial of early (≤12 hours) dexamethasone therapy for the prevention of chronic lung disease (CLD).

Methods and Materials. A total of 133 children (70 in the control group, 63 in the dexamethasone-treated group) who survived the initial study period and lived to 2 years of age were studied. All infants had birth weights of 500 to 1999 g and had severe respiratory distress syndrome requiring mechanical ventilation within 6 hours after birth. For infants in the treatment group, dexamethasone was started at a mean age of 8.1 hours and given 0.25 mg/kg every 12 hours for 1 week and then tapered off gradually over a 3-week period. The following variables were evaluated: interim medical history, socioeconomic background, physical growth, neurologic examinations, mental and psychomotor development index score (MDI and PDI), pulmonary function, electroencephalogram, and auditory and visual evoked potential.

Results. Infants in the control group tended to have a higher incidence of upper respiratory infection and rehospitalization than did the dexamethasone-treated group because of respiratory problems. Although there was no difference between the groups in somatic growth in girls, the dexamethasone-treated boys had significantly lower body weight and shorter height than the control boys (10.7 ± 3.0 vs 11.9 ± 2.0 kg; 84.9 ± 5.7 vs 87.5 ± 4.8 cm). The dexamethasone-treated group had a significantly higher incidence of neurologic dysfunction (25/63 vs 12/70) than did the control group. The dexamethasone-treated infants also had a lower PDI score (79 ± 26) than did the control group (87 ± 23), but the difference was not statistically significant. Both groups were comparable in MDI, incidence of vision impairment, and auditory and visual evoked potential. Significant handicap, defined as severe neurologic defect and/or intellectual defect (MDI and/or PDI ≤ 69), was seen in 22 children (31.4%) in the control group and 26 (41.2%) in the dexamethasone-treated group.

Conclusions. Although early postnatal dexamethasone therapy for 4 weeks significantly reduces the incidence of CLD, this therapeutic regimen cannot be recommended at present because of its adverse effects on neuromotor function and somatic growth in male infants, detected at 2 years of age. A longer follow-up is needed. If early dexamethasone therapy is to be used for the prevention of CLD, the therapeutic regimen should be modified. The proper route of administration, the critical time to initiate the therapy, and the dosage and duration of therapy remain to be defined further. Pediatrics 1998; 101(5). URL: http://www.pediatrics.org/cgi/content/full/101/5/e6; preterm infant, early dexamethasone therapy, follow-up study.

e8 ABSTRACT. Self-reported Adherence, Management Behavior, and Barriers to Care After an Emergency Department Visit by Inner City Children With Asthma. Frederick E. Leickly, MD; Shari L. Wade, PhD; Ellen Crain, MD, PhD; Deanna Kruzson-Moran, MS; Elizabeth C. Wright, PhD; and Richard Evans III, MD, MPH. Objective. The inability to adhere to a prescribed therapeutic program for the treatment of a chronic disease may be responsible in part for continued disease activity. This problem may be more of an issue in the treatment of asthma, a common, potentially lethal chronic condition in which the lack of symptoms may be interpreted as remission. Adherence was one of the key areas of interest for the National Cooperative Inner-City Asthma Study. The focus of this study was to identify those issues reported by families that could adversely affect their adherence to an asthma care program. The identification of barriers to adherence could then form the basis of a successful intervention program. This study describes barriers to adherence, asthma management behavior, and self-reported adherence.

Methods. Patients presenting during an acute attack of asthma at an emergency department (ED) were recruited for this study. The medical record of the ED encounter was abstracted and compared with information that was obtained during a baseline interview 3 to 5 weeks later. During the baseline interview, parents were asked about health care behaviors related to adherence.

Results. There were 344 children 4 to 9 years of age living in inner city census tracts in the study. Four areas of adherence (medicine use, appointment-keeping, emergency actions, and asthma attack prevention) were investigated. The parental report of medications prescribed at the ED and the information on the abstracted ED report agreed 94.9% of the time for the β-agonists, 86.8% for steroids, and 69.4% for cromolyn. Among respondents, 85.4% of parents reported that they are able to follow the ED recommendations almost all of the time; side effects of medicines were a concern for 81.1% of caretakers who were adherent and for 89.5% of caretakers who were nonadherent. Doubts regarding the uselessness of medications occurred in 34.4% of those considered adherent and 54.2% who admitted nonadherence. Medications
were forgotten some of the time by 45.2% of the children, and 52.8% tried to get out of taking medicine. Appointments for follow-up care were kept by 69% of those given an appointment in the ED, by an estimated 60.0% of those who were told specifically to call for an appointment, and by an estimated 25.2% of those who were neither given an appointment nor told specifically to make one. Only one third of parents report that they were able to keep the child away from known asthma triggers nearly all of the time. Approximately half avoided allergens; however, only 37.5% reported avoidance of cigarette smoke. The use of preventive medicines occurred in 23.5%. Using a medicine and taking the child to a physician were reported as the first or second action during an acute attack of asthma by 72.1% of respondents.

Conclusions. Adherence to an asthma-management program involves a number of areas: medication, appointment-keeping, prevention, and applying an emergency plan of action. Barriers to adherence may exist in one or all four of these areas, leading to ineffective control of asthma. Recommendations are made for improving the patient-physician partnership to improve adherence. Pediatrics 1998;101(5). URL: http://www.pediatrics.org/cgi/content/full/101/5/e9; carnitine, valproate, valproic acid, epilepsy, liver dysfunction, hyperammonemia, lipid metabolism, Reye’s syndrome, handicap, malnutrition.

e9 ABSTRACT. Valproate Therapy Does Not Deplete Carnitine Levels in Otherwise Healthy Children. Shinichiro Hirose, MD; Akihisa Mitsuomde, MD; Sawa Yasumoto, MD; Atsushi Ogawa, MD; Yukiko Muta, BS; and Yasuko Tomoda, MD. Objective. To determine whether children with epilepsy undergoing valproate (VPA) antiepileptic therapy and who are otherwise healthy have a lower serum level of carnitine (CAR) and a higher plasma level of plasma ammonia than do normal children.

Methodology. A total of 45 children with epilepsy, 6.3 to 21.7 years of age, who were treated solely with VPA and were free of abnormal neurologic findings or nutritional problems were randomly selected (VPA-treated group). An age-matched control group (n = 45) was selected from subjects without epilepsy (control group). Total (T) and free (F) serum CAR, serum VPA concentration, and the plasma ammonia level were measured and analyzed.

Results. Serum VPA concentration exhibited a weak negative correlation with both T- (r = −0.34) and F-CAR (r = −0.41). The T-CAR levels were 55.7 ± 12.4 and 57.6 ± 12.1 mM, and the F-CAR levels 42.7 ± 9.9 and 44.4 ± 9.9 mM in the VPA-treated and control groups, respectively. Thus, there was no significant difference in T- or F-CAR levels between the VPA-treated and control groups. Plasma ammonia levels were the same in the two groups: 9.2 ± 6.2 and 9.4 ± 11.8 mM in the VPA-treated and control groups, respectively. There was no significant correlation between blood ammonia and either T- (r = +0.024) or F-CAR (r = −0.026).

Conclusion. Children on a regular diet ingest a sufficient amount of CAR that more than meets their daily CAR requirement. The level of neither T- nor F-CAR in patients with epilepsy and without severe neurologic or nutritional problems being treated with VPA appeared to be affected by VPA therapy. Because the blood CAR level depends on nutritional condition rather than on blood VPA concentration, CAR deficiency caused by VPA is not likely to occur in this population. The usefulness of supplementation of CAR for this type of patient with epilepsy, therefore, must be reevaluated carefully. Pediatrics 1998;101(5). URL: http://www.pediatrics.org/cgi/content/full/101/5/e9; carnitine, valproate, valproic acid, epilepsy, liver dysfunction, hyperammonemia, lipid metabolism, Reye’s syndrome, handicap, malnutrition.

e10 ABSTRACT. Symptomatic Splenic Hamartoma: Case Report and Literature Review. Teresa C. Hayes, MD; Howard A. Britton, MD; E. Bruce Mewborn, MD; Dean A. Troyer, MD; Victor A. Saldivar, MD; and Irving A. Ratner, MD. An 11-year-old girl with low-grade fever, night sweats, thrombocytopenia, and an 8-year history of progressive splenomegaly underwent an elective splenectomy. Pathologic diagnosis was multiple splenic hamartoma. The patient’s symptoms resolved after the splenectomy. Since first described by Rokitansky in 1861, ~140 cases of splenic hamartoma have been described in the literature. Most of the splenic hamartomas were discovered incidentally. A minority of these lesions were associated with hematologic symptoms such as pancytopenia, anemia, and thrombocytopenia. Only 20 of the reported cases of splenic hamartoma occurred in pediatric patients. However, compared with the adult patients, nearly half of these cases in pediatric patients was associated with symptoms. Splenectomy and partial splenectomy have relieved these symptoms. With advances in imaging, splenic hamartomas are being discovered with increasing frequency. A multimodal radiologic work-up has enabled some cases of splenic hamartoma to be diagnosed preoperatively. Inclusion of this benign entity in the differential diagnoses of symptomatic splenomegaly in a pediatric patient is important in the preoperative management and counseling of the patient and family. In patients who have discrete lesions, consideration of this entity preoperatively may avoid total splenectomy. Pediatrics 1998;101(5). URL: http://www.pediatrics.org/cgi/content/full/101/5/e10; splenic hamartoma, pancytopenia, hypersplenism, splenomegaly, hemangiomas.

e11 ABSTRACT. School-age Follow-up of Prophylactic Versus Rescue Surfactant Trial: Pulmonary, Neurodevelopmental, and Educational Outcomes. Robert A. Sinkin, MD; Bonnie M. Kramer, PhD; Joan L. Merzbach, MSW; Gary J. Myers, MD; John G. Brooks, MD; Donna R. Palumbo, PhD; Christopher Cox, PhD; James W. Kendig, MD; Charles E. Mercier, MD; and Dale L. Phelps, MD. Background. Exogenous surfactant replacement has improved survival and reduced pulmonary complications of prematurity. Improved early outcomes for infants of <30 weeks’ gestation treated with a strategy of prophylactic versus rescue surfactant, if needed, were demonstrated in a multicenter randomized trial conducted between 1985 and 1988. We reevaluated a subset of survivors from this trial to determine the pulmonary and neurodevelopmental outcomes at school age.

Methods. At 4.5 to 8 years of age, all survivors from one of the three centers were located, and 96% were evaluated. The original randomization included stratification by center and followed an intention-to-treat methodology in assessing the efficacy of prophylactic versus rescue treatment with surfactant. The follow-up test battery included a health-assessment questionnaire, spirometry, 88% saturation test, neurologic examination, and the McCarthy Scales of Children’s Abilities (MSCA) and the
Conners’ Parent Rating Scale–48. Educational achievement was determined by school class placement and teachers’ reports of achievement.

Results. Of the 192 children originally enrolled, 154 survived. Evaluations were performed on 148 of these infants. An abnormal pulmonary history was found in 45 (30%) of the children: 16 (22%) in the prophylactic group and 29 (39%) in the rescue group. Formal pulmonary function was evaluated in 81 children; 29 (78%) in the prophylactic group and 33 (75%) in the rescue group were considered abnormal. No significant differences were found between the two groups on either cognitive or motor subscales of the MSCA, the Conners’ Parent Rating Scale–48, the neurologic examination, the education services received in school, or the teacher ratings of below-average academic performance. Intelligence scores measured on the MSCA were low–normal for both groups. Some level of educational assistance was being provided to 72 (49%) of the cohort studied, and both groups had below average educational performance and increased needs for educational assistance.

Conclusions. Prophylactic surfactant administration to infants of <30 weeks’ gestation was associated with fewer long-term clinical pulmonary complications than assignment to rescue administration. Formal pulmonary testing at school age did not reveal significant differences between treatment groups in those infants who could be tested. There also were no group differences found on neurologic, cognitive, behavioral, or educational assessments at school age. Pediatrics 1998; 101(5). URL: http://www.pediatrics.org/cgi/content/full/101/5/e12; follow-up, newborn, premature, surfactant.

e12 ABSTRACT. Predictors of Mortality From Fires in Young Children. Seth J. Scholer, MD, MPH; Gerald B. Hickson, MD; Edward F. Mitchel, Jr, MS; and Wayne A. Ray, PhD. Background. In the United States in 1994, fires claimed 3.75 lives per 100,000 child years and accounted for 17.3% of all injury deaths in children <5 years of age.

Objectives. To conduct a historical cohort study that uses maternal demographic characteristics to identify young children at high risk of fire-related deaths, thus defining appropriate targets for prevention programs.

Methods. The cohort consisted of children born to mothers who resided in the state of Tennessee between 1980 and 1995. Information was obtained by linking birth certificates, 1990 census data, and death certificates. Children were eligible for the study if they were <5 years of age at any time within the study period and if key study variables were present (99.2% of births).

Birth certificates provided information on maternal characteristics including age, race, education, previous live births, use of prenatal care, and residence (in standard metropolitan statistical area). Child characteristics included gender, gestational age, and birth type (singleton/multiple gestation). Neighborhood income was estimated by linking the mother’s address at the time of birth to the 1990 census (block group mean per capita income).

The study outcome was a fire resulting in at least one fatality (fatal fire event) during the study period, identified from death certificates (coded E880 through E889 in the International Classification of Diseases, 9th rev). We calculated the fatal fire event rate corresponding to each stratum of maternal/child characteristics. We assessed the independent association between each characteristic and the risk of a fatal fire event from a Poisson regression multivariate analysis.

Results. During the study period, 1,428,694 children contributed 5,415,213 child years to the cohort; there were 270 deaths from fire (4.99 deaths per 100,000 child years) and 231 fatal fire events. In the multivariate analysis, factors associated with greater than a threefold increase in fatal fire events included maternal education, age, and number of other children. Compared with children whose mothers had a college education, children whose mothers had less than a high school education had 19.4 times (95% confidence interval [CI], 2.6–142.4) an increased risk of a fatal fire event. Children whose mothers had more than two other children had 6.1 times (95% CI, 3.8–9.8) an increased risk of a fatal fire event compared with children whose mothers had no other children. Children of mothers <20 years of age had 3.9 times (95% CI, 2.2–7.1) an increased risk of a fatal fire event compared with children whose mothers were ≥30 years old. Although both maternal neighborhood income and race were associated strongly with increased rates of fatal fire events in the univariate analysis, this association did not persist in the multivariate analysis. Other factors that were associated with increased risk of fatal fire events in the multivariate analysis were male gender and having a mother who was unmarried or who had delayed prenatal care.

The three factors associated most strongly with fire mortality were combined to create a risk score based on maternal education (≥16 years, 0 points; 13 to 15 years, 1 point; 12 years, 2 points; <12 years, 3 points); age (≥30 years, 0 points; 25 to 29 years, 1 point; 20 to 24 years, 2 points; <20 years, 3 points); and number of other children (none, 0 points; one, 1 point; two, 2 points; three or more, 3 points). The lowest-risk group (score <3) included 19% of the population and had 0.19 fatal fire events per 100,000 child years. In contrast, highest-risk children (score >7) comprised 1.5% of the population and had 28.6 fatal fire events per 100,000 child years, 150 times higher than low-risk children. Children with risk scores >5 contributed 26% of child years but experienced 68% of all fatal fire events. If the fatal fire event rate for all children had been equal to that of the low-risk group (risk score <3), then 95% of deaths from fires would not have occurred.

Discussion. Maternal education, age, and number of other children had strong and independent associations with fire-related deaths among young children. Taken together, these factors defined a steep risk gradient, where children in the highest-risk group had a fire-related mortality rate that was 150 times that of the lowest-risk group. From a public health perspective, maternal factors clearly define children who would be good candidates for prevention programs. There is an urgent need to develop prevention programs that can be shown to reduce fire-related injury in high-risk children. Pediatrics 1998;101(5). URL: http://www.pediatrics.org/cgi/content/full/101/5/e12; wounds and injuries, fires, socioeconomic factors, risk factors.

e13 ABSTRACT. Cat Scratch Disease Presenting With Peripheral Facial Nerve Paralysis. Robert S. Walter, MD, and Stephen C. Eppes, MD. Acquired peripheral facial nerve paralysis is a relatively common disorder that af-
ffects both children and adults. The most frequent non-
trauma-related etiologies in otherwise neurologically in-
tact patients are idiopathic (Bell’s palsy) and infectious,
which includes otitis media, herpes zoster, Lyme disease,
herpes simplex virus, Epstein–Barr virus, and Myco-
plasma pneumoniae.¹⁻⁵

Cat scratch disease (CSD) is typically a subacute, re-
gional lymphadenitis caused by Bartonella henselae that
is seen in children and young adults. CSD most often has
a benign, self-limited course. However, 11% of CSD
patients may present atypically, most commonly with
Perinaud’s oculoglandular syndrome or acute encepha-
lopathy.⁶⁻¹¹

We present a child with the first reported case of acute
facial nerve paralysis in serologically proven CSD with
typical lymphadenitis.

**ADDITION**

A sentence has been added to the American Academy of Pediatrics statement from the Committee on
pages, as article e13. The following should be added under the heading, “Propranolol,” after the dosage but
before the note that was initially published:

*Note: Some practitioners have used up to 0.15 to 0.25 mg/kg for the treatment of refractory infundibular spasm.*

The electronic version of this article will include links indicating this addition.
Comparison of Length of Stay for Asthma by Hospital Type
Barbara N. Samuels, Alvin H. Novack, Diane P. Martin and Frederick A. Connell

*Pediatrics* 1998;101:e13
DOI: 10.1542/peds.101.4.e13

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://pediatrics.aappublications.org/content/101/4/e13

An erratum has been published regarding this article. Please see the attached page for:
http://pediatrics.aappublications.org/content/101/5/914.full.pdf