Predictors of Successful Telephone Follow-Up in a Multicenter Study of Infants With Severe Bronchiolitis

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Brief communication

Predictors of successful telephone follow-up in a multicenter study of infants with severe bronchiolitis

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ABSTRACT

Purpose: To identify the characteristics that predict successful telephone follow-up with parents of infants with severe bronchiolitis.
Methods: We analyzed data from a 17-center, prospective cohort study of infants (age <1 year) hospitalized with bronchiolitis during three consecutive fall/winter seasons. Participant contact information and clinical data were collected during the index hospitalization. Parents were called at 6-month intervals (based on the child's age) after discharge to assess respiratory problems. The primary outcome was age 12-month telephone interview status. Participants were classified as unreachable after 28 days of unsuccessful attempts.
Results: 798 of 916 children (87%) completed the age 12-month telephone interview. In unadjusted analyses, factors associated with successful follow-up included: private health insurance, annual household income $60,000 or more, and residing in the Northeast, Midwest, or West. Follow-up was less common among non-Hispanic blacks, Hispanics, and households with 3 or more children. In multivariable analyses, follow-up was more likely among parents of females, and, compared with the South, in the Northeast and Midwest (all $P < .05$). Compared with non-Hispanic whites, non-Hispanic blacks and Hispanics remained less likely to complete the interview as did households with 3 or more children (all $P < .05$).
Conclusion: Sociodemographic and geographic factors predict successful telephone follow-up, even among parents of infants with severe illness.

Introduction

The success of prospective cohort studies often lies in the recruitment of a robust sample size and the ability to obtain successful follow-up. Failure to recruit and retain study participants may jeopardize the ability to detect important associations and lead to inconclusive results [1–3]. In addition to improving the generalizability of findings, it is important to recruit and retain participants who are "members of racial and ethnic minority groups" as issued by the National Institutes of Health Revitalization Act [4]. Loss to follow-up often occurs because participants no longer wish to participate or the researchers have lost contact with the participants [5]. It is, therefore, imperative to identify the potential barriers to retaining participants so that targeted strategies can be implemented for subjects who tend to have higher rates of attrition.

The objective of our analysis was to identify the characteristics that predict a successful telephone follow-up with parents of children at age 12-month in a multicenter study of infants with severe bronchiolitis. We expected that by implementing consistent retentions strategies among all participants, there would be no significant differences in retention rates across demographic characteristics. A better understanding of the barriers to participant retention will assist researchers as they develop methods to recruit and retain specific populations, and help inform future retention strategies.

Methods

Study design

As part of the Multicenter Airway Research Collaboration (MARC), a program of the Emergency Medicine Network (EMNet;

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www.emnet-usa.org), we are conducting a multicenter, prospective cohort study that enrolled subjects at 17 geographically diverse sites during peak bronchiolitis season (November to April) for three consecutive years (2011–2014). Sites enrolled patients from both the inpatient wards and the intensive care unit, using a standardized protocol. Inclusion criteria for the study were an attending physician's diagnosis of bronchiolitis, less than 1 year of age, an English- or Spanish-speaking parent/guardian with the ability to give informed consent, and complete contact information (address, telephone number, email address, and alternate contact person) that was not expected to change for at least 12 months. Exclusion criteria for the study included transferring to a participating hospital more than 48 hours after original admission, more than 24 hours since transferring to a participating hospital, a parent/guardian refusing collection or future use of biospecimens, insurmountable language barrier, certain chronic conditions (e.g., known heart-lung disease, immunodeficiency), gestational age <32 weeks, or the patient had met the primary endpoint of the original U01 grant (recurrent wheezing by age 3 years) at the time of enrollment (i.e., two or more breathing problems treated with systemic corticosteroids within 6 months or four or more episodes of wheezing in 1 year). All participating hospitals obtained local Institutional Review Board approval.

Data collection

Site investigators completed a structured interview with parents/guardians to assess the patients' demographic characteristics, history (both medical and environmental), and the bronchiolitis episode for which the child was admitted. Site staff called the parents 1-week after discharge and the staff at the EMNet Coordinating Center called 3 weeks after admission; only subjects who were reached for both 1-week and 3-week follow-up calls remained in the longitudinal cohort ($n = 921$). Coordinating Center staff perform telephone interviews with subjects in the longitudinal cohort at 6-month intervals from age 6 months until age 6 years. If the subject was older than 6 months at enrollment, questions from the 6-month follow-up were integrated into the enrollment interview. Preference for time of day (including evenings) and telephone numbers for follow-up were recorded at enrollment and updated at the end of every telephone interview. Subjects were given the number of a dedicated, toll-free line with a working answering machine to facilitate communication with the Coordinating Center.

For each follow-up interview, parents were emailed 2 days before the beginning of the call window (the child's birthday or 6 months after birthday) to schedule a telephone interview. They were also mailed a birthday card with a reminder about the future interview. Parents who did not reply with an appointment time were called on the day their child's call window opened. If the parent was not reached at the first phone call, a voice message was left and a reminder email was sent. Call attempts occurred every 2 weekdays and reminder emails were sent after every 2 call attempts. Alternate contact numbers were called if the child's parent was unreachable after 14 days; during the last week of the call window, call attempts occurred daily. Follow-up was deemed unsuccessful if the child's parent was unreachable after 28 days of failed efforts (Fig. 1). Participants were paid $20 for their first completed 6-month follow-up interview and $30 for each subsequent interview. Lastly, parents were emailed quarterly newsletters which provided updates on the study and relevant pediatric research. All contact attempts and interview responses were documented using Research Electronic Data Capture (REDCap) [6].

Statistical analyses

Analyses were performed using Stata 13.1 (StataCorp, College Station, TX). Data are presented as proportions and medians with interquartile ranges. To examine potential factors associated with successful follow-up, we performed bivariate analyses using X^2, Fisher's exact test, and Wilcoxon Rank Sum test, as appropriate. For the variable pertaining to participants' region of residence at the time of enrollment, region was defined according to the U.S. Census Bureau's classification system [7].

Multivariable logistic regression was conducted to evaluate independent predictors of successful 12-month follow-up. Model covariates were selected *a priori* (e.g., age at enrollment, history of breathing problems) or considered for inclusion if they were associated with the outcome in unadjusted analyses ($P < .20$). The final regression model accounts for potential clustering by site, with results reported as odds ratios (ORs) with 95% confidence intervals (95% CIs). All *P*-values were two-tailed, with $P < .05$ considered statistically significant.

Results

Among the 921 children in the longitudinal cohort, 5 (0.5%) were never contacted for a 12-month interview because of withdrawal from the study ($n = 4$) and death ($n = 1$) due to causes unrelated to study procedures. Of the 916 children eligible for the 12-month call, 798 (87%) completed the age 12-month interview. Of these, 92% of the interviews were conducted with the children's mothers. Of the 118 infants who did not complete the call, 112 (95%) were unreachable, 1 (1%) refused, and 5 (4%) withdrew. Unadjusted associations between the children's characteristics and age 12-month follow-up completion are presented in Table 1. Age 12-month follow-up completion was more common among children with private health insurance, an annual household income of $60,000 or more who resided in the Northeast, Midwest, or West regions, and had older parents. By contrast, follow-up was less common among non-Hispanic black children, Hispanic children, and households with 3 or more children. Neither parental history of asthma nor a previous history of breathing problems was associated with follow-up completion.

In multivariable logistic regression analysis (Table 2), follow-up completion was more likely among parents of female children and, compared with the South, those residing in the Northeast and Midwest. In adjusted analyses, insurance status was not an independent predictor of successful follow-up ($P > .50$) and was not included in the final model. Compared with non-Hispanic white children, and controlling for multiple sociodemographic factors, non-Hispanic blacks and Hispanics remained less likely to complete the follow-up interview, as did households with 3 or more children.

Discussion

In this large, multicenter, prospective study of children hospitalized with bronchiolitis, the telephone follow-up rate at 12-month with a study population with more than 50% minority representation was 87%. This is comparable with the retention rates reported in other pediatric asthma studies (71%–89%) [8, 9, 10, 11]. We found several factors independently associated with successful age 12-month telephone follow-up: female sex, non-Hispanic white race/ethnicity, residing in the Northeast or Midwest, and fewer children in the household.

Telephone follow-up interviews can serve as a simple, low-cost approach to collect research data. While mailed surveys and in-person interviews are often used to enhance response rates, their efficacy may be limited by the potential number of attempts compared with conducting phone calls. Indeed, a study by Nota

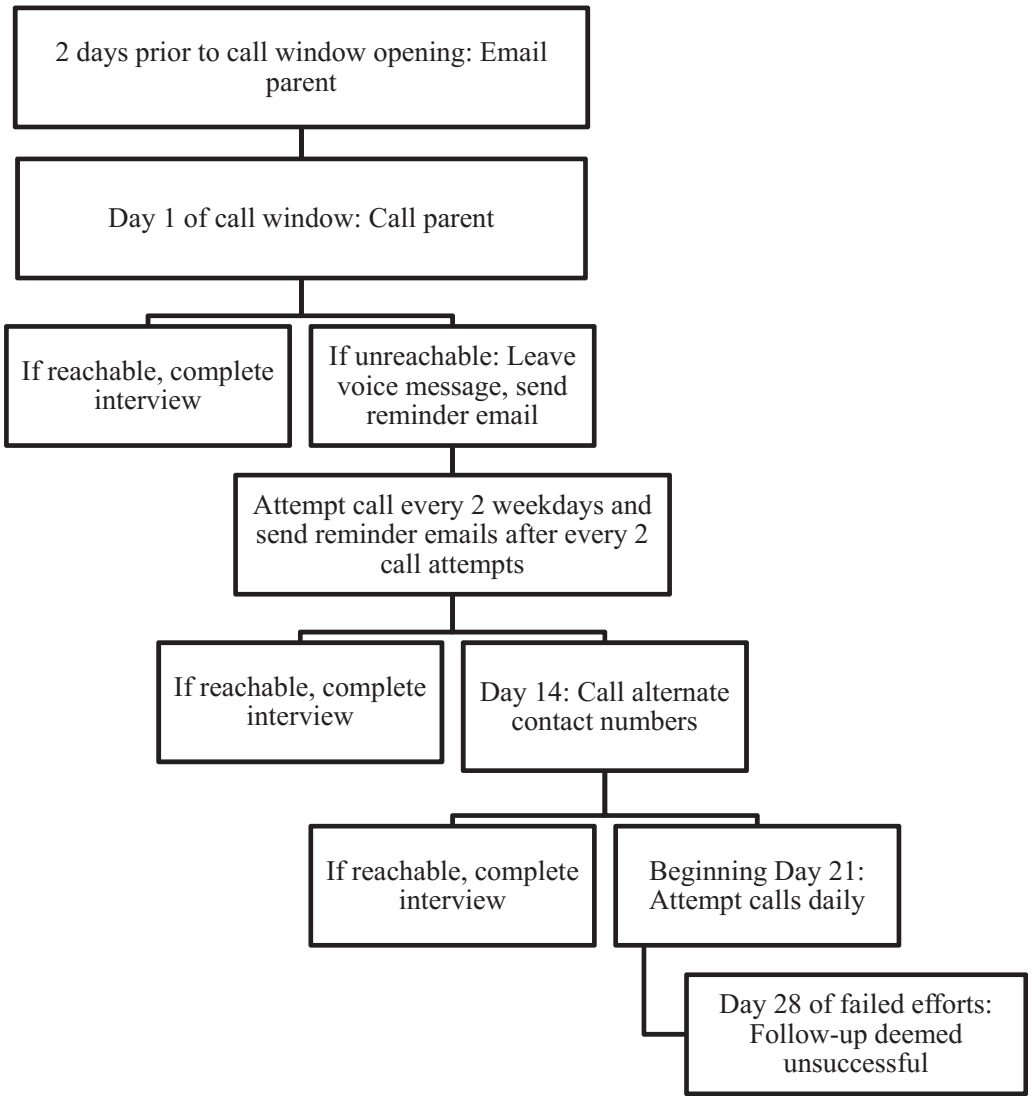

Fig. 1. Calling protocol for every follow-up interview conducted in 6-month intervals from age 6 months onwards.

et al. concluded that the response rate to a questionnaire administered by phone 3 months after initial enrollment was significantly higher than by mail or email [12]. For participants who are difficult to reach, oftentimes the most successful means to regain contact is through a family member or an alternate contact [13,14]. We attempted to address the challenge of frequent primary phone number changes by collecting contact information for an alternate contact at the time of enrollment and updating this backup information at the end of every successful call.

Consistent with other studies analyzing recruitment and retention, male sex, non-white race, and households with more children were predictors of low participant retention [11,14–19]. A study by Nicholson et al. implemented retention strategies in a longitudinal study among low-income, ethnically/racially diverse families (with a large proportion of African-Americans); at 12-months, they did not find any difference in retention rates by race [20]. Despite using similar retentions strategies (including consistent and repeated attempts to reach participants, financial incentives, continuous monitoring, and a dedicated phone line), our study found that follow-up completion remained less likely among non-Hispanic black children and Hispanic children, as well as households with 3 or more children.

Given that as of 2012, 85% of U.S. adults owned a cell phone and 80% of cell phone users say they use text messaging [21], short messaging service (SMS) or utilizing social media could potentially serve as a powerful tool to improve follow-up rates across all income and races [22,23]. We could adopt this approach in future follow-up calls and use SMS to send reminders the day before the scheduled telephone follow-up; participants could respond back via SMS with their most convenient times. This strategy was not previously implemented since many of our participants provided landline phone numbers. While there may be a challenge with text messaging fees and determining the optimal frequency of texts, implementing this strategy could enable respondents with lower annual household incomes who may have multiple jobs to schedule interviews around their busy schedules.

Motivation for continued participation in longitudinal studies often declines over time [20,24]. Compared with clinical follow-up, in which patients are motivated to follow treatment to improve their health, there are fewer perceived benefits in observational studies and greater effort is needed to maintain retention rates. Small financial compensation has been shown to motivate participants to complete follow-up [25]; in the present study, financial incentives may have contributed to the high rate of completion.

Table 1
Demographic characteristics and medical history of children admitted with bronchiolitis by age 12-month interview status

Characteristics	All children ($n = 916$)	Without age 12-month follow-up ($n = 118$)	With age 12-month follow-up ($n = 798$)	*P*-value
	n	%		
Age at enrollment, months, median (IQR)	916	3 (2–5)	3 (2–6)	.25
Age at enrollment, months				.51
<1.0	106	14	86	
1.0–2.9	324	15	85	
3.0–5.9	259	12	88	
≥6.0	227	11	89	
Sex				.06
Male	549	15	85	
Female	367	10	90	
Race/ethnicity				**.001**
Non-Hispanic white	399	8	92	
Non-Hispanic black	209	19	81	
Hispanic	273	15	85	
Other	35	17	83	
Insurance				**<.001**
Private	371	8	92	
Public	530	17	83	
None	13	15	85	
Annual household income				**.001**
< $60,000	371	15	85	
≥$60,000	282	7	93	
Refused/unknown	263	16	84	
Region of residence at enrollment				**.003**
Northeast	240	8	93	
Midwest	80	8	93	
South	408	17	83	
West	188	13	87	
Total number of children in home				**.001**
1–2	543	10	90	
≥3	373	17	83	
Mother's age, years, median (IQR)	914	26 (22–31)	29 (24–33)	**<.001**
Father's age, years, median (IQR)	895	28 (24–32)	31 (26–36)	**<.001**
Parental history of asthma	302	13	87	1.00
Premature birth (≤37 weeks)	171	11	89	.31
Smoke exposure in the home	27	26	74	.07
History of breathing problems	185	13	87	.97
ICU admission	138	15	85	.37
Hospital LOS, days	916	2 (1–3)	2 (1–3)	.10
LOS ≥3 days	365	11	89	.23
Had 6-month follow-up	651	9	91	**<.001**

ICU = intensive care unit; IQR = interquartile range; LOS = length of stay.
P-values <.05 are in bold.

Table 2
Multivariable logistic regression predicting age 12-month follow-up among children admitted with bronchiolitis, clustered by site

Characteristics	Odds ratio (95% CI)	*P* value
Age at enrollment, months	1.06 (0.99–1.14)	.11
Sex		
Male	1.00 (Reference)	
Female	1.45 (1.00–2.09)	**.049**
Race/ethnicity		
Non-Hispanic white	1.00 (Reference)	
Non-Hispanic black	0.55 (0.36–0.84)	**.005**
Hispanic	0.68 (0.47–0.98)	**.04**
Other	0.47 (0.16–1.43)	.18
Annual household income		
<$60,000	1.00 (Reference)	
≥$60,000	1.57 (0.96–2.55)	.08
Refused/unknown	0.97 (0.68–1.39)	.87
Region of residence at enrollment		
Northeast	1.89 (1.19–3.00)	**.007**
Midwest	2.00 (1.30–3.07)	**.002**
South	1.00 (Reference)	
West	1.58 (0.99–2.53)	.06
Mother's age, years	1.03 (0.99–1.07)	.10
Parental history of asthma	1.09 (0.74–1.62)	.66
Total number of children in home		
1–2	1.00 (Reference)	
≥3	0.60 (0.44–0.81)	**.001**
History of breathing problems	0.84 (0.57–1.22)	.36
Hospital LOS ≥3 days	1.31 (0.85–2.00)	.22

CI = confidence interval; LOS = length of stay.
P-values <.05 are in bold.

However, Gross et al. and Green et al. assert that although financial incentives may serve as the initial motivator for participation, sustained engagement is related to subjects' interest, trust, and perceived benefit to the community [26, 27]. We therefore expected (1) parental history of asthma and (2) experiencing previous breathing problems before study participation would be predictors of successful follow-up. However, neither factor was associated with follow-up completion.

The major strengths of our analysis were the large cohort size, recruitment from 17 geographically diverse sites, and the racial/ethnic diversity of the families and infants. This cohort consists of hospitalized infants with severe illness, which presents a greater challenge to follow than a healthy cohort. We also made multiple follow-up attempts so we can be more confident that the follow-up failure was not due to insufficient effort. We attempted to boost parent interest through birthday cards and newsletters. One of the limitations is not having data on the mother and father's highest educational attainment—having a high education level may be a marker of better participation in the cohort study. We do not know the extent to which retention methods may have differentially affected participants from families with low-educational attainment; however, Nicholson et al. suggests that the mother's education may not statistically contribute to retention rates at 6 or 12 months [20]. In addition, only the children for whom follow-up at 1 and 3 weeks were completed were part of the longitudinal cohort and were eligible to complete a follow-up interview. To participate in the study, multiple types of contact information were required. These specific enrollment criteria may limit the external validity to only those families who can complete the initial follow-up and have a relatively stable family environment. In addition, our multivariable regression model was limited by the smaller number of nonevents ($n = 118$ participants who did not complete the interview); therefore, we restricted the number of covariates to prevent possible overfitting of the model.

Conclusions

In summary, female sex, white race, residing in the Northeast or Midwest, and fewer children in the household positively predicted the successful age 12-month follow-up. These findings suggest the importance of developing and implementing follow-up methods (such as SMS and social media) to improve retention rates among families of participants who are male, from a racial/ethnic minority, or from the South. Improved retention will require targeting these higher attrition groups with novel methods that have been shown to be effective in these same groups.

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Appendix

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