ENCOURAGING PHYSICIANS TO RESPOND TO SURVEYS THROUGH THE USE OF FAX TECHNOLOGY

SHELLY Y. LENSING
STEPHEN R. GILLASPY
PIPPA M. SIMPSON
STACIE M. JONES
JOHN M. JAMES
JUNEAL M. SMITH

University of Arkansas for Medical Sciences, Little Rock

High response rates to surveys of physicians are difficult to achieve. One possible strategy to improve physicians' survey participation is to offer the option of receiving and returning the survey by fax. This study describes the success of the option of fax communication in a survey of general practitioners, family physicians, and pediatricians in Arkansas with regard to pediatric asthma. Eligible physicians were given the choice of receiving the survey by telephone, mail, or fax. In this observational study, physicians' preferences, response rates, and biases for surveys administered by fax were compared with mail and telephone surveys. The overall survey response rate was 59%. For the 96 physicians completing an eligibility screener survey, the largest percentage requested to be surveyed by fax (47%) rather than by telephone (28%) or mail (25%). Faxing may be one strategy to add to the arsenal of tools to increase response rates in surveying physicians.

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Interest in studying physicians' practices has increased over the years as a consequence of increased focus on health care. Because physicians have demanding schedules and limited interest in survey topics, and because they are protected from outside nonclinical disruptions by office staff, it is difficult to obtain reliable data from them through the use of traditional survey methodology. In an assessment of response rates to mail surveys in studies appearing in the medical literature, physicians were the largest group targeted for survey, but they had the lowest average response rate (54%) compared with other groups of respondents, including nurses, patients, and administrators (Asch, Jedrziewski, & Christakis, 1997).

Physicians' poor responses to surveys threaten the reliability and validity of findings. Results of surveys with low response rates may not be generalizable or may be biased. Furthermore, smaller numbers result in lower statistical power for hypothesis testing or lower precision for estimates. Much research has been devoted to finding ways to improve response rates of physicians. These include examining the effects of (a) monetary incentives (Asch, Christakis, & Ubel, 1998; Everett, Price, Bedell, & Telljohann, 1997; Gunn & Rhodes, 1981; Tambor et al., 1993); (b) prepayment (Berry & Kanouse, 1987); (c) advance telephone contacts (Osborn, Ward, & Boyle, 1996; Tambor et al., 1993; Temple-Smith, Mulvey, & Doyle, 1998; Ward & Wain, 1994); (d) follow-up (Tambor et al., 1993); (e) rewards of continuing medical education credit (CME) (Temple-Smith et al., 1998); (f) professional society endorsements or institutional sponsorships (Gunn & Rhodes, 1981); and (g) peer recruitment (Heywood, Mudge, Ring, & Sanson-Fisher, 1995).

Other research has focused on the impact of nonresponse in surveys of physicians (Gough & Hall, 1977; Guadagnoli & Cunningham, 1989; Templeton, Deehan, Taylor, Drummond, & Strang, 1997). Response rates have been shown to vary by physician specialty, with pediatricians more likely to respond to surveys than other types of physicians, such as general practitioners and family medicine physicians (Gunn & Rhodes, 1981).

Most surveys of health care personnel are conducted by mail or telephone. Recently, technological advancements in fax quality and the prevalence of fax machines have made surveys by fax a viable option. Studies have found response rates to be higher for faxed surveys than for mailed surveys (Dickson & Maclachlan, 1996; Shannon & Arbet,

1998). However, no study to date has examined faxing as a survey tool with physicians.

In the summer of 1997, we conducted a survey on pediatric asthma with general practitioners, family practice physicians, and pediatricians. To facilitate survey participation, eligible physicians were given the option of receiving the survey by fax, telephone, or mail. This observational study was undertaken to investigate physicians' preferences for surveys administered by fax compared with traditional survey methods.

METHOD

STUDY POPULATION

General practitioners, family physicians, and pediatricians were identified from the Arkansas State Medical Board roster, which listed physicians' telephone numbers and addresses. A probability sample of 433, stratified by four groups based on type of provider and region of the state (see Table 1), was randomly drawn from this roster using a computerized random number generator. General practice physicians and family physicians were combined into one stratum. Eligibility criteria for physician participation included (a) currently residing in Arkansas and (b) currently treating pediatric asthma patients. For the evaluations of faxing versus telephone and mail survey methods, the sample was taken to be all of those meeting inclusion criteria after telephone screening.

The sample size calculations were conducted with the goal of achieving equal precision, or confidence intervals of equal width, for the four study groups for primary study end points. The width of confidence intervals for a given proportion will vary according to sample size, with larger sample sizes resulting in narrower confidence intervals. Because a higher response rate was anticipated for pediatricians, fewer pediatricians needed to be sampled (see Table 1). Further reductions in the widths of confidence intervals were obtained by the use of a finite population correction factor (Cochran, 1977), which reduces the variance of estimates when a larger proportion of the population is sampled. Because the population strata were of varying sizes, the number that was needed to achieve equal precision varied as well. The

TABLE 1
Sample According to Strata Based on Physician Specialty and Region of the State

Physician Group	*Region*	*Number Sampled*	*Number Screened for Eligibility (percentage of number sampled)*	*Number Determined to be Eligible (percentage of number screened)*	*Number Returning Surveys (percentage of number determined to be eligible)*
Pediatricians	Inside Central Arkansas	90	74 (82%)	42 (57%)	38 (90%)
	Outside Central Arkansas	79	60 (76%)	52 (87%)	48 (92%)
Family Medicine Physicians/ General Practitioners	Inside Central Arkansas	109	65 (60%)	21 (32%)	17 (81%)
	Outside Central Arkansas	155	94 (61%)	55 (59%)	44 (80%)
Total		433	293 (68%)	170 (58%)	147 (86%)

general rule of thumb is to use a finite population correction factor when > 5% to 10% of a population is sampled, and in this study at least 18% of the population for each stratum was sampled.

SURVEY DEVELOPMENT

A questionnaire on pediatric asthma was developed jointly by a pediatrician specializing in asthma and allergy from the Arkansas Children's Hospital Asthma Care Center (JMJ) and a health services researcher (JMS). Questions about physicians' demographics, asthma-specific practice characteristics, types of equipment available in the treatment of asthma, barriers to referring patients, and management of children presenting in three case scenarios of potential asthma were evaluated. The survey required 7 to 10 minutes to complete. A brief screener questionnaire was developed to collect basic demographics and to determine eligibility.

Feedback solicited from pediatricians and health service researchers and the results from a pilot study involving 6 pediatricians were used to improve the instrument before survey implementation. Major obstacles to a high response rate identified through this survey development process were physicians' time constraints and their frustration with receiving so many surveys. Therefore, physicians were given the choice of receiving the survey by fax, by telephone, or by mail in conjunction with other procedures shown to improve survey response rates.

SURVEY IMPLEMENTATION

An introductory letter on university letterhead describing the study and assuring confidentiality was mailed to potential respondents approximately 2 weeks prior to their being contacted. An initial screening contact was made by telephone to determine eligibility (i.e., physicians residing in Arkansas and currently treating pediatric patients). Once determined to be eligible, the physician was asked if he or she preferred to be surveyed at that time or at a scheduled time by telephone, by mail, or by fax. Those choosing to receive the survey by mail or fax were told that completed surveys could be returned either by mail or by fax. To avoid alienating the staff, calls to make initial contact with a physician were limited to five, and reminder calls were

limited to three. When contact could not be made with a physician, we attempted to obtain a fax number from a nurse or receptionist to fax the screener and survey. Also, in a few instances, a correct telephone number could not be found for the physician, so the screener and survey were both mailed. For sample physicians located at our institution, the survey was sent via interoffice mail. Figure 1 gives an overview of the survey process and the methods of survey administration for the eligibility screener survey and the study survey.

ANALYTICAL METHOD

The primary end points of this study are the preference and response rates for each survey method, the ease by which each response rate was obtained, and methodological bias. A record was kept of the status of all contacts (e.g., screened by telephone and administered survey by fax), which was maintained until a physician had been determined to be ineligible. The number of contacts required to initially reach the physician and the number of reminder calls for follow-up were also maintained.

A preliminary investigation of differences in demographic and practice characteristics according to survey method was performed using Fisher's exact test for categorical responses and the Mantel-Haenszel test for ordinal responses. The Mann-Whitney nonparametric test was used to compare the number of reminder calls according to survey method. Stratification and sampling weights were ignored because we wanted every response to contribute equally in this investigation of response rates. *P* values were all two sided, and values $< .05$ were considered statistically significant.

RESULTS

A description of the four targeted groups in terms of sample sizes, screening rates, and return rates is given in Table 1. Pediatricians were more likely to be eligible to participate and, once determined to be eligible, were more likely to respond.

Because there were two surveys—a screener survey to determine eligibility and the study survey—there is more than one response rate to compute (see Figure 1). Of the 433 physicians sampled from the medical board roster, 293 completed screener surveys. Of these, 170

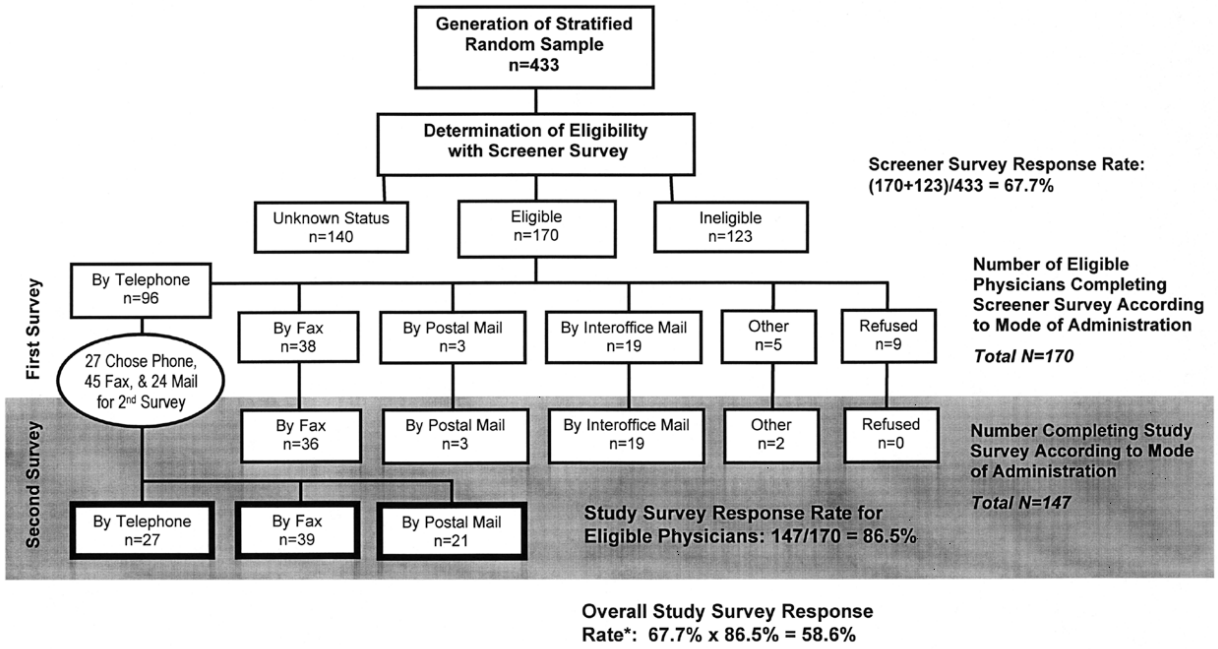

Figure 1: Study Description and Response Rates.
Boxes with bold lines indicate sample used for investigating survey method bias.

physicians were eligible and 123 were ineligible. Therefore, the response rate for the screener survey was (170+123)/433, or 67.7%, and 32.3% were nonrespondents. The response rate for the study survey for eligible physicians was 147/170 = 86.5%, because 147 of the eligible physicians completed study surveys. To complete the study survey, a physician also had to complete the screener survey. Therefore, the overall survey response rate equaled the probability of completing the screener survey times the probability of completing the study survey, or 67.7% 86.5% = 58.6%. Another way of conceptualizing this is to realize that some of the physicians with unknown eligibility status would have been eligible to complete the study survey (Asch, et al.). It would not be a fair estimate of the response rate to ignore this fact and just report the response rate for known eligible physicians, because the generalizability of a study's findings would be inflated. One method to estimate the proportion that would have been eligible is to assume that the eligibility rate for those with unknown status is the same as those with known status (170/(170+123), or 58%). Under these assumptions, 81 of those with unknown status would have been eligible to participate. Therefore, the study survey response rate is 147/(81+23+147) = 58.6%. The response rate is the same as the previous because this is just another perspective to an identical calculation.

Of the 123 ineligible physicians, 66% reported not treating pediatric asthma patients, 17% were retired, 3% were deceased, and 14% had moved out of state. For the 140 physicians with unknown eligibility status, 44% had been contacted but refused to complete the screener survey, and 15% were unable to be contacted amid our inability to find a correct telephone number or address. The remaining 41% were mailed or faxed a screener and survey but did not return them.

Of the 96 eligible physicians who were screened by telephone (see Figure 1), more requested to be surveyed by fax (47%) than by telephone (28%) or by mail (25%). For these physicians, surveys were returned by 87% of physicians administered study surveys by fax, 100% by telephone, and 88% by mail. Although the return rate was higher for telephone surveys because all chose to be surveyed immediately after screening, only 27 physicians chose this method. Furthermore, faxing allowed even more physicians to be screened for eligibility because those who could not be screened by telephone were faxed a survey when a fax number was available. A large proportion (22%) of

all eligible physicians had been screened by fax, and the majority of all returned study surveys were administered by fax (75/147, or 51%).

For those screened by telephone, fewer reminder phone calls were required for those faxed study surveys compared with those mailed surveys. In fact, 44% of those faxed surveys did not require a follow-up call compared with 13% of those mailed surveys ($p = .001$). There was no significant difference among the three methods in the number of calls required to initially screen physicians (median value of 2, $p = .39$).

Among physicians screened by telephone and given the option of survey by phone, mail, or fax, there were no significant differences detected in demographics according to chosen survey method (see Table 2). Those choosing a survey by mail tended to be younger than those choosing a survey by telephone or fax ($p = .08$). In terms of practice characteristics, the only significant difference among survey method choices was for the size of the practice. Practice size, as indicated by an estimate of the number of active charts, was the smallest for those who were mailed surveys and the largest for those who were surveyed by telephone or fax ($p = .03$). The small sample sizes should be kept in mind when interpreting these comparisons, because a nonsignificant finding may be attributed to a lack of power to detect a meaningful difference.

DISCUSSION

There are several studies on methodologies to improve response rates among physicians, but no studies of which we are aware have described the utility of faxing as a method of administering surveys in this difficult population. Nearly twice as many eligible physicians requested to be surveyed by fax compared with traditional methods, and the overall response rate was higher than the average reported in the literature. Furthermore, physicians who were faxed surveys required fewer follow-up calls. Potential methodological biases were introduced, as indicated by significant or near-significant differences in practice size and physician age.

Although survey methodology was not the subject of interest, the use of fax technology has been reported in at least one survey of physicians. Among cardiologists administered surveys by fax, 86%

TABLE 2
Demographic and Practice Characteristics According to Survey Method for Physicians Completing Both Screener and Study Surveys

Variables	*Surveyed by Telephone (n = 27)*	*Surveyed by Fax (n = 39)*	*Surveyed by Mail (n = 21)*	*P*
Demographics				
Pediatricians (%)	51.9	52.3	57.1	.93
Reside in Central Arkansas (%)	33.3	23.1	28.6	.65
Male (%)	74.0	74.4	70.0	.95
Age in years (median)	41	39	36.5	.08
Years treating children with asthma (median)	13	11	8	.11
Practice Characteristics				
Setting of Most Clinical Activity				
Solo (%)	7.4	26.3	14.3	.13
Group/academic/other (%)	92.6	73.7	85.7	
Payment Method				
Salary (%)	44.4	36.9	57.2	.22
Fee for service (%)	44.4	60.5	33.3	
Other (%)	11.2	2.6	9.5	
Number of Active Charts				
<2000 (%)	19.2	13.5	52.6	.04
2000-4999 (%)	38.5	48.7	26.3	
5000+ (%)	42.3	37.8	21.1	
Number of children with asthma per week seen				
0-4 children/week (%)	51.9	51.3	47.6	.97
5-9 children/week (%)	25.9	30.8	33.3	
10-19 children/week (%)	18.5	12.8	19.1	
20+ children/week (%)	3.7	5.1	0	

Overall study survey response rate: 67.7% 86.5% = 58.6%. To complete the study survey, the participant had to complete the screener survey. Therefore, the overall response rate is the probability of completing the screener survey the probability of completing the study survey.

returned completed surveys (Ray & Turpie, 1997). Faxing has also been shown to be a cost-effective method of surveying professionals (Dickson & Maclachlan, 1996; Shannon & Arbet, 1998). Other benefits of faxing include freedom from postage costs, the speed with which surveys can be quickly received and returned, the speed at which surveys can be quickly prepared because no addressing and stuffing of envelopes are required, and the uniqueness of faxed surveys compared with mail surveys, which are often ignored. Drawbacks to faxed surveys include the difficulty of obtaining fax numbers;

loss of anonymity; loss of graphic quality; contact difficulties (i.e., busy signals and inoperable fax machines); difficulty in sending several surveys with a limited number of fax machines; phone costs that vary by time of day, duration, and distance; and inability to accompany a fax survey with an incentive or a return envelope (Dickson & Maclachlan, 1996).

A limitation of this study is that physicians were self-selected into the method of survey and not randomly assigned. Also, administering a survey solely by fax without an advance call to encourage participation may not be as effective (Osborn et al., 1996; Ward & Wain, 1994). Finally, group sample sizes were small for some comparisons, thus resulting in reduced power to detect meaningful differences.

In a previous study of physician nonrespondents, 66% reported the large volume of unsolicited questionnaires as the greatest reason for not participating in surveys (MacPherson & Bisset, 1995). Researchers must successfully communicate to physicians that their involvement is important. Use of the fax may be one way to distinguish surveys from the multiple requests for information physicians receive by mail.

Additional research is needed in the use of fax technology to survey physicians. These results point to some interesting findings, but a more formal study would be desirable. An evaluation of faxing as a survey methodology could be executed as a substudy within a large study of physicians. To make unbiased inferences, physicians should be randomized to method of survey. Sample sizes should be computed not only to meet the goals of the larger study but also with regard to the a priori hypotheses involving survey methods. Previous research comparing survey methods could be replicated to evaluate the use of fax technology. Also, it would be of interest to determine if the process of giving a choice of survey methods results in a better response rate compared with requiring that physicians be administered their survey by fax. Some studies may not require a screener call such as this survey, so it would be beneficial to determine if the response rates for faxed surveys without an advance call are just as effective as those with one. Furthermore, it would be interesting to determine, after the novelty of receiving surveys by fax wears off, whether physician response rates decrease over time.

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