Physician Communication and Patient Adherence to Treatment

A Meta-Analysis

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Background: Numerous empirical studies from various populations and settings link patient treatment adherence to physician-patient communication. Meta-analysis allows estimates of the overall effects both in correlational research and in experimental interventions involving the training of physicians' communication skills.

Objectives: Calculation and analysis of "*r* effect sizes" and moderators of the relationship between physician's communication and patient adherence, and the effects of communication training on adherence to treatment regimens for varying medical conditions.

Methods: Thorough search of published literature (1949–August 2008) producing separate effects from 106 correlational studies and 21 experimental interventions. Determination of random effects model statistics and the detailed examination of study variability using moderator analyses.

Results: Physician communication is significantly positively correlated with patient adherence; there is a 19% higher risk of nonadherence among patients whose physician communicates poorly than among patients whose physician communicates well. Training physicians in communication skills results in substantial and significant improvements in patient adherence such that with physician communication training, the odds of patient adherence are 1.62 times higher than when a physician receives no training.

Conclusion: Communication in medical care is highly correlated with better patient adherence, and training physicians to communicate better enhances their patients' adherence. Findings can contribute to medical education and to interventions to improve adherence, supporting arguments that communication is important and resources devoted to improving it are worth investing in. Communication is thus an important factor over which physicians have some control in helping their patients to adhere.

Key Words: physician-patient communication, patient adherence, communication training, communication skills, meta-analysis

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Over the past 3 decades, the biopsychosocial model of health has become increasingly important in the effective practice of medicine. Central to this model is an emphasis on treating the patient as a whole person, including the biological, psychological, behavioral, and social aspects of their health.[1,2] Essential elements of the physician-patient relationship include verbal and nonverbal communication, effective questioning and transmission of information (task-oriented behavior), expressions of empathy and concern (psychosocial behavior), and partnership and participatory decision-making.[3–5] In recent decades, teaching and evaluation of biopsychosocial care and communication skills have been incorporated into the medical training process. The United States Medical Licensing Examination includes assessment of communication skill, and the Accreditation Council for Graduate Medical Education and American Board of Internal Medicine require training and evaluation in communication skills for residents. Effective physician-patient communication is linked empirically to outcomes of care including patients' satisfaction, health status, recall of information, and adherence.[6–8]

Patient adherence—the degree to which patients follow the recommendations of their health professionals—is a salient outcome of the process of care. Across many disease conditions, nonadherence to prevention and disease management activities (eg, medications, appointments, screening, exercise, and diet) averages 25% of patients; for some medical conditions and in some settings, adherence can be as poor as 50% or less.[9] The World Health Organization proposes that adherence is affected by these factors: (1) health care system or provider-patient relationship, (2) disease, (3) treatment, (4) patient characteristics, and (5) socioeconomic factors.[10] The first, physician-patient communication and rela-

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tionship, is the focus of this meta-analysis that examines both task-oriented and psychosocial communication.

The link between patient adherence and physician-patient communication has been observed extensively in theoretical and review literatures which argue that physician-patient communication can enhance adherence through various mechanisms. Communication contributes to patients' understanding illness and the risks and benefits of treatment.[11] Support, empathy, and understanding,[12] collaborative partnerships,[13] and patient-centered interviewing,[14] require effective communication and enhance adherence.

Two decades ago, Hall et al[6] meta-analyzed various outcomes of physician communication and found adherence was predicted by greater physician information-giving and more positive discussion. Most reviews of the communication-adherence connection have heretofore been qualitative and selective, however.[11,15,16] The field needs an exhaustive review of the entire empirical literature and quantitative assessment of the strength (effect size) of the communication-adherence relationship, particularly in comparison to other major predictors of patient adherence including social support,[17] depression,[18] and illness severity[19] to name a few. Further, exploration of a possible causal connection between physician-patient communication and patient adherence is needed through synthesis of experimental studies. Can patient adherence be improved by training physicians to be better communicators? The present meta-analytic research addresses these important issues.

Meta-analysis

Meta-analytic techniques are applied here as a methodological approach to combining statistical findings from the entire body of individual research studies: (1) correlating physician communication with patient adherence to treatment, and (2) assessing the effects on patient adherence of training program interventions to improve physician communication skills. The present research involves assessment of all such studies published from 1949 (beginning of Medline) through 2008, determining the direction, size, and overall significance of both correlational and experimental effect sizes. Measurement and methodological strategies, including the quality of research method (eg, control groups, randomization), adherence and communication measurement, disease condition, and treatment regimen are analyzed as potential moderators of variability in these effects.

Several research questions guide this work. First, based on the patient-centered care model[7,20] is there a positive association between physician communication and patient adherence across studies? Second, does physician training have a positive effect on patient adherence? In tests of both hypotheses, effects of substantive and methodological moderators on the results are considered.

METHODS

Definitions and Search Strategies

For the purposes of this study, patient adherence was defined as following medical treatment or prevention recommendations prescribed by a physician and each article was coded for how adherence was measured (self-report or objective measure or measured by health professional), study design for adherence measurement and time if applicable (longitudinal, cross-sectional, retrospective), and regimen for which adherence is measured (medication, health behavior, appointment-keeping). Physician communication was defined as task-oriented (including verbal) or psychosocial (including nonverbal), rated (via patient questionnaire or observation) or coded (code of a patient's report of a doctor's behavior or observation), validated measure or created for current study purposes, patient assessed or assessed by health professional or researcher. Specific communication behaviors (eg, empathy, question asking, establishing rapport) were classified broadly as task versus psychosocial (or both). Correlational articles were coded for the following categories of variables: article characteristics, characteristics of physicians, physician communication type and measurement, characteristics of patients, adherence type, and measurement. Table 1 provides detail on the distribution of codes and the number of samples in the coded categories.

Several different search strategies were employed. First, a "bottom-up search" by the authors and a team of research assistants was done of 2 major literature databases (communication and adherence) in the authors' ongoing work. These databases include all English-language, empirical journal articles on physician–patient communication and on patient adherence catalogued and coded in Endnote. Information on these databases can be found in previous meta-analyses.[9,17–19,21] The second strategy was a "top down" approach, with searches of Medline and PsycInfo starting in 1949 and using key words physician-patient communication, communication intervention, physician education, communication skills training, and physician-patient communication skills training crossed with patient adherence and patient compliance. Third, the authors conducted reference searches of reviews of communication and of adherence as well as reference searches of included articles. Exact numbers of articles from each search can be found in Table 1.

Inclusion and Exclusion Criteria

Inclusion criteria were as follows. Studies were required to: (*a*) be published in a peer-reviewed, English-language journal from 1949 (when citations were first indexed in Medline) through August 31, 2008 (Thus, book chapters, dissertations, nonpeer-reviewed journal articles, prepublication drafts, and conference proceedings were not included.); (*b*) assess the communication of the physicians in the study (eg, with ratings by independent raters of audio or videotape recordings of the medical visit; by supervising physicians, peers, nurses, patients, or the physicians themselves of either task-oriented [including verbal] or psychosocial [including nonverbal] communication or both); (*c*) assess patient adherence; (*d*) assess the effect size of the relationship (correlation) between patient adherence and physician communication and/or assess the effect size of a training intervention to improve physician communication

TABLE 1. Moderator Variables Coded in 106 Correlational and 21 Training Studies

Moderator Variables Coded in 106 Correlation Studies	Distribution of Codes Analyzed; No. Samples in Coded Categories
Articles	
Source of articles (search strategy)	50 (of 2319 total) from Adherence database; 39 (of 3166 total hits) from Top-down search, 17 from Reference Searches. Yr of publication:1968–2008
Location of study	43 studies in University settings; 49 in Community Practices; 10 in the VA Medical System, 3 in staff model HMO's
Population survey	16 studies involved Population based surveys
Physicians	
Physician level of experience	93 studies included practicing physicians/attendings; 23 included residents, 1 included fellows, 2 included medical students, 12 included other health professionals in addition to physicians
Physician specialty	40 studies of physician in primary care; 23 in general or family practice, 13 in pediatrics, 14 in internal medicine, 36 in specialty practice
No. physicians in the studies (reported in 50 studies)	Mean: 96 (s.d.: 352). range = 1–2,499, median = 25.50
Physician communication	
Measurement of physician communication	41 studies measured Verbal/task-oriented communication; 10 measured Nonverbal/psychosocial communication; 55 measured both. 10 studies, communication was measured as patient "trust"
Rating vs. coding of communication	79 studies communication rated (questionnaire or observation involving a Likert-type scale)
	27 studies communication coded (assigning a behavioral code to either a patient's report of a doctor's behavior or analysis of observed behavior)
Validity of communication measure	21 studies used a validated, published measure of communication; 85 studies used a measure developed by the authors
Objectivity/subjectivity of communication assessment	31 studies used an objective test of physician communication; 75 studies used subjective assessment
Who assessed physician communication skill?	79 studies-patient assessed
	5 studies-assessed by health professional
Patients	
Seriousness of patient illness in the study sample. Measured with SIRS-r[22]	56 studies, Mean SIRS-r score 110.27, s.d. 22.08, range: 41–137. (no score if study of many different patients in primary care practice, or of adherence to screening/prevention)
Age group of patients	89 studies of adult patients (18 and older); 14 studies of pediatric patients (under 18); 3 studies with both age groups
Patient adherence	
Measurement of patient adherence	21 studies used established scale for adherence measure
	83 studies included self-reported patient adherence
	30 studies included pill count, electronic, or pharmacy data
	7 studies-health professional assessed adherence
	10 studies-adherence measure was average of 2 or more adherence assessments
Study design for adherence measurement	53 studies longitudinal (adherence assessed after physician communication)
	48 studies cross-sectional (adherence assessed at same time as physician communication)
	5 studies were retrospective (adherence assessed from past period before assessing physician communication)
	2 studies measured patient "intent to adhere"
Time to adherence measurement in weeks (longitudinal studies only)	M = 30.25 (SD = 68.93; range: = 0.5–416 wk)
Regimen (adherence to which is measured)	87 studies included adherence to medication
	45 studies included behavioral regimen/health behavior
	17 studies included appointment-keeping adherence
	32 studies averaged adherence to 2 or more regimens
Moderator variables coded in 21 experimental studies	Distribution of Codes analyzed; Number of samples in coded categories.
Articles and design	
Source of articles (search strategy)	1 from Adherence database; 8 from Top-down search, 12 from Reference Searches. Year of publication:1976–2007
Location of study	10 studies in University settings; 11 in Community Practices
Experimental designs	16 Randomized experiments; 5 studies not randomized; In 3 studies, analyses done at physician level (n based on number of physicians); in 18 studies analyses done at patient level (n based on number of patients)

(*Continued*)

TABLE 1. (*Continued*)

Physicians	
Physician level of experience	11 studies included practicing physicians/attendings only; 6 included residents/trainees only, 4 studies contained both
Physician specialty	19 studies of physicians in adult primary care, family practice, internal medicine; 2 included pediatricians, none in specialty practice
No. physicians in the studies	Mean 60.95 (SD = 57.32); range = 8–234, median = 42
Physician communication training	
Training program	14 studies-communication training focused on adherence; 9 studies-communication training focused on specific disease; 15 studies included general communication training
	5 studies included audiovisual training, 9 studies involved experiential training; 2 studies involved simulated patients
Patients	
Seriousness of patient illness in the study sample. Measured with SIRS-r[22]	10 studies, Mean SIRS-r score 92.80, SD 23.95, range: 41–113 (no score if study of many different patients in primary care practice, or of adherence to screening/prevention)
Age group of patients	19 studies of adult patients (18 and older); 2 studies of pediatric patients (under 18)
Patient adherence	
Measurement of patient adherence	14 studies patient adherence measure included self-reported
	12 studies measure included pill count, electronic, pharmacy data
	5 studies-adherence measure was average of 2 or more adherence assessments
Time to adherence measurement in weeks (all longitudinal studies)	Mean 25.58 (SD = 17.77) range = 1–52 wk
Regimen (adherence to which is measured)	14 studies included adherence to medication
	13 studies included behavioral regimen/health behavior
	3 studies included appointment-keeping adherence
	7 studies averaged adherence to 2 or more regimens

skill on the measure of patient adherence (or statistics allowing the effect size to be calculated). Studies of psychiatric care or treatments for substance abuse were excluded. There were 106 studies correlating physician communication with patient adherence, and 21 studies examining the effect of physician communication skill training on patient adherence.

Article Coding and Effect Size Extraction

For each article, extensive information was coded for the purpose of moderator analysis, and Table 1 describes each variable coded and the frequencies of the categories of that variable.

In addition, for each article, the "effect size *r*" (the correlation between communication and adherence, or the effect size of communication skills training on patient adherence), was extracted. If the effect size *r* (in the form of Pearson, point-biserial, or ϕ coefficient) was not presented in the study, data were extracted to calculate an *r* (from *F* [1 degree of freedom in the numerator], *t*, χ^2, means and standard deviations, tables of counts, or exact *P* values (and using the *Z* associated with the exact *P*, divided by the square root of n, to equal ϕ).[23] The following one-tailed *Z* values were used when the range of probability was provided: ($P < 0.05$: $z = 1.645$; $P < 0.01$: $z = 2.326$; $P < 0.001$: $z = 3.09$). When results were described in text simply as "nonsignificant," the *r* value was designated as 0. In situations where there were multiple effects from an individual study (eg, several measures of patient adherence correlated with communication), effects were averaged for an overall effect size for each study. Appendix A, http://links.lww.com/A1413, presents the full references for the 106 journal articles reporting studies correlating physician communication with patient adherence and coding details (first author and year, type of doctor, setting of study, medical specialty, number of doctors, disease, details of communication and adherence measures, time period to assess adherence, number of patients) for each study. Appendix B, http://links.lww.com/A1413, presents references for the 21 studies that involved physician communication training effects on patient adherence with coding details (first author and year, disease, physician sample, details of the communication training, intervention design, adherence measure, and number of patients) for each study. In addition, whether the analysis was done using physicians or patients as unit of analysis is indicated. Both Appendices are available from the authors (or presented online as Supplemental Digital Content 1: Appendix A, http://links.lww.com/A1413, and 2: Appendix B, http://links.lww.com/A1413).

Statistical Analyses

A random-effects model using the unweighted mean *r*, which is based on *k* (the total number of studies), is used in this meta-analysis.[23,24] This model is ideally used in meta-analysis because it allows generalization of the findings to the population of studies not included in this analysis. For convention, the fixed-effects model using the weighted mean *r* is also calculated and presented (with each study weighted by sample size and with analyses based on the total N across all studies). Although fixed-effects results are not as robust and generalizable as the more stringent random-effects test, the large total number of subjects increases the likelihood of significant results.[25] The effect size "*r*" is used here because it represents both the strength and direction of association.[25]

Throughout, a positive *r* indicates that better communication is associated with better patient adherence, and that communication training has resulted in improvements in patient adherence. A negative *r* indicates that better communication is associated with worse patient adherence and that physician communication training has decreased patient adherence. All calculations involving *r* were performed by first transforming *r* to the Fisher's *z* transformation of *r*, and then returning results to the *r* metric. The unweighted mean *r* (equivalent to the risk difference) and the weighted mean *r* (weighting by n − 3) were calculated, as was the fail-safe n (the number of new, not published, or not retrieved studies with no effect that would need to be found for significant results to be declared nonsignificant at $P < 0.05$).[23] The standardized odds ratio and standardized relative risk were calculated from the unweighted mean *r* using the binomial effect size display.[25] In the calculation of preliminary meta-analytic components (medians, means, standard deviations, correlations, and *t* tests), SPSS 12.0 was used, but otherwise all meta-analytic work was hand-calculated with a 5-function TI-503 calculator following recommended methods.[25] Variability in effect sizes as a function of the various coded characteristics of the studies (all variables in Table 1) is explored with moderator analyses employing random-effects model *t* tests.

RESULTS

Meta-analysis results are summarized in Table 2, where summary statistics are first presented for the 106 studies providing correlations between physician communication and patient adherence, and then for the 21 studies providing effect sizes of the effect of physician communication training on the outcome of patient adherence. The following statistics are presented for both: the number of independent samples (*k*); the total number of subjects across all of the samples (N); minimum, maximum, and median *r*; fixed-effects–weighted (by n) mean *r* (95% CI); random-effects model unweighted mean *r* (95% CI); Cohen's *d*[23] an effect size of standard deviation difference; fail-safe n, standardized odds ratio (95% CI), and standardized relative risk.

Patient Adherence and Communication

Across 106 studies (where, as shown in Appendix A, http://links.lww.com/A1413, all except 2 effects are positive), the relationship between respondents' adherence and their physicians' communication is strongly positive and significant ($P < 0.001$) with both fixed and random-effects tests (weighted mean and unweighted mean, respectively). Based on the random-effects model unweighted mean *r*, there is a 19% higher risk of nonadherence ($r = 0.19$, 95% CI = 0.16, 0.21) among patients whose physician has poor communication than among patients whose physician communicates well. The fail-safe n is well above the "tolerance level" of 540[23] and indicates that over 28,563 studies with null effects would need to exist, and have been missed by our search strategies, to render this finding nonsignificant. Nonadherence is more than 1.47 times greater (standardized relative risk) among individuals whose physician is a poor communicator, and the odds of a patient adhering are 2.16 times better (standardized odds ratio) if his or her physician is a good communicator.

Moderators of Patient Adherence and Communication

Careful analysis of the variation in these effects, and testing of all moderators with random-effects model *t* tests, produced 6 significant moderator variables: sample size, adherence measure (self-report vs. objective), physician type (pediatrician or not), number of physicians (above/below median), physician experience (practicing vs. resident), and

TABLE 2. Summary of Meta-analysis Results

Category	*k**	Total N of *Ss*†	Median *r* (Range)	Weighted Mean *r* (95% CI)‡	Unweighted Mean *r* (95% CI)§	Effect Size d¶	Fail-Safe n‖	Standardized Odds Ratio (95% CI)**	Standardized Relative Risk**
Patient adherence correlated with communication skill of physician ††	106	45,093	0.16 (−0.16, 0.57)	0.15 (0.14, 0.16)‡‡	0.19 (0.16, 0.21)‡‡	0.39	28,563 (tolerance level = 540)	2.16 (1,91, 2.35)‡‡	1.47
Training physician in communication skill: patient adherence as outcome§§	21	1280 phys.; 10,190 pts.	0.09 (0.00, 0.33)	0.09 (0.07, 0.11)‡‡	0.12 (0.08, 0.16)‡‡	0.24	550 (tolerance level = 115)	1.62 (1.38, 1.91)‡‡	1.27

*Number of independent samples/studies.
†Total N across all samples/studies (*Ss*).
‡This mean *r* is weighted by n − 3 and represents a fixed effects analysis.
§For each sample, a positive *r* demonstrates that better adherence is associated with better physician communication skills. The unweighted mean *r*, as a percent, also represents the standardized risk difference.
¶The effect size *d* is calculated by converting *r* to *d* with the following formula: $d = 2r/\sqrt{(1 - r^2)}$.[23]
‖The fail-safe n surpasses the tolerance level so the "file drawer problem" is unlikely to bias the results.[23]
**Standardized odds ratio and standardized relative risk are based on the binomial effect size display calculated from the unweighted mean effects in the random effects model.
††A test of the significance of the difference (from 0) of the mean of the 106 correlational studies: $t(105) = 14.590$, $P < 0.001$. Correlational studies homogeneity test: $\chi^2(105) = 783.11$, $P < 0.001$. This is a fixed effects test dependent upon individual study sample size; it suggests analysis of moderators is necessary.
‡‡$P < 0.001$.
§§A test of the significance of the difference (from 0) of the mean of the 21 experimental studies: $t(20) = 6.334$, $P < 0.001$. Experimental studies homogeneity test: $\chi^2(20) = 43.22$, $P < 0.01$. This is a fixed effects test dependent upon individual study sample size; it suggests analysis of moderators is necessary.

communication measure (assessed by patient or not). Four moderators were of borderline significance: Comprehensiveness of measure of communication (both task and psychosocial vs. not both), year of study (median split), seriousness of patients' disease (SIRS-r^{22}), and age group of patients (adult vs. pediatric).We tested (using 1 sample *t*, which is the random-effects unweighted mean test) the significance of each *z* sub *r* mean from 0. Most were highly significantly different from zero (ie, a null effect). All *t* tests and accompanying means and standard deviations are presented in Table 3.

The correlation between physician communication and patient adherence was significantly higher when the patient sample was smaller, when adherence was measured with objective measures rather than subjective, when the physician was a pediatrician, when there were fewer physicians in the study, when the participating physicians were residents or trainees, and when communication was not assessed by the patient. The correlation between physicians' communication and patient adherence was borderline significantly higher when the measure of communication was not comprehensive (targeted to task or to psychosocial communication), the study was older (before 1998), the patients' disease was less serious, and the studies involved pediatric samples. No other potential moderators approached even borderline significance.

TABLE 3. Significant Moderators in Correlational and Experimental Studies

Moderating Variable	Categories	No. Studies in Each Group	Group Means (SDs)	T Significance Test (Random Effects Model: t, df, *P*, r Effect Size)*
Correlation studies				
Sample size (median split on size of patient sample)	≤182	53	0.24† (0.12)	$T(104) = 4.34$, $P = 0.00$, $r = .39$
	≥183	53	0.13† (0.13)	
Adherence measure is self report (or not/objective)	Objective	23	0.25† (0.13)	$T(104) = 3.11$, $P = 0.002$, $r = 0.29$
	Self-report	83	0.17† (0.12)	
Physician is a pediatrician	Pediatrician	13	0.25† (0.15)	$T(104) = -2.33$, $P = 0.022$, $r = 0.22$
	Not	93	0.18† (0.13)	
Number of Physicians (above/below median)	1–25 docs	25	0.21† (0.13)	$T(48) = 2.34$, $P = 0.023$, $r = 0.32$
	>26 docs	25	0.14† (0.10)	
Physician Experience (not including samples where there are both)	Resident, fellow, and/or med student but not practicing	10	0.26† (0.09)	$T(88) = 2.17$, $P = 0.032$, $r = 0.23$
	Practicing doctor	80	0.18† (0.12)	
Communication measure is assessed by the patient or not	Not	27	0.23† (0.13)	$T(104) = 2.08$, $P = 0.040$, $r = 0.20$
	Assessed by patient	79	0.17† (0.13)	
Measure of communication is comprehensive—includes 2 types	Not both/targeted	51	0.21† (0.12)	$T(104) = 1.93$, $P = 0.056$, $r = 0.19$
	Both task and psychosocial	55	0.16† (0.12)	
Year of study (median split)	1968–1998	54	0.21† (0.14)	$T(104) = 1.88$, $P = 0.063$, $r = 0.18$
	1999–2008	52	0.16† (0.12)	
Seriousness of patients' disease (median split)	≤112	60	0.21† (0.15)	$T(93) = 1.90$, $P = 0.06$, $r = 0.19$
	≥113	35	0.16† (0.10)	
Adult vs. pediatric	Pediatric	14	0.24† (0.14)	$T(101) = 1.75$, $P = 0.08$, $r = 0.17$
	Adult	89	0.18† (0.13)	
Experimental studies				
SIRS-R¶	41–85	3	0.24‡ (0.08)	$T(8) = 3.52$, $P = 0.008$, $r = .78$
	95–113	7	0.10‡ (0.05)	
Physician is a pediatrician	Pediatrician	2	0.27 ns (0.08)	$T(19) = 3.42$, $P = 0.003$, $r = 0.62$
	Not	19	0.10† (0.07)	
Communication training involves specific training of doctor in achieving adherence	Communication training not specifically to achieve adherence	7	0.07§ (0.07)	$T(19) = -1.81$, $P = 0.086$, $r = 0.38$
	Adherence communication training	14	0.14† (0.09)	

Significance of difference of each subgroup r from 0.
*$\sqrt{t^2/t^2 + df}$.[23]
†$P < 0.001$.
‡$P < 0.01$.
§$P < 0.05$.
¶Sirs-R median is 95 in sample of 10 experiments. Median splits are supposed to result in equal groups but sometimes cannot depending on where the median falls. In that case, the group split is guided by the median and by the distribution.

Patient Adherence and Physician Training in Communication Skills

The second part of Table 2 presents the summary results of 21 studies reporting patient adherence as an outcome of an intervention to train physicians in communication skills. Across 21 studies, all effects are positive (one is 0.00) and the effect of physician training on their patients' adherence is positive and significant ($P < 0.001$) using both fixed and random-effects models. Based on the random-effects model unweighted mean, there is a 12% higher risk of nonadherence ($r = 0.12$, 95% CI = 0.08, 0.16) among patients whose physicians have not been trained in communication skills than among patients whose physicians have been trained. The fail-safe n is greater than the tolerance level of 115 and indicates that over 550 studies with no effects would need to be found to render this finding nonsignificant. The risk of nonadherence is more than 1.27 times greater among patients of untrained physicians, and the odds of a patient adhering are 1.62 times better if his or her physician has been trained in communication skills.

Moderators of Patient Adherence and Physician Training in Communication Skills

The 21 studies (2 of pediatric samples and 19 of adults) were diverse in terms of their samples, methodologies, and study designs. Analysis of the variability in these effects, and testing of all moderators with random-effects model tests, produced 3 moderators of note: SIRS-*r*, doctor is pediatrician, and communication training involves specific training of doctor in achieving adherence. Physician communication skills training has less effect on adherence the more serious a patient's disease and more effect if the physicians trained were pediatricians. When communication training involves specific training in achieving adherence, there is a marginally significant effect of communication training on patient adherence. See Table 3 for detail on the findings. There is no consistent variation due to any other assessed moderators.

DISCUSSION

Two of the earliest studies of patient adherence and physician-patient communication involved ratings of audiotaped visits; physician communication was positively related to adherence to several different regimens.[26,27] Since that time, the study of medical communication and its outcomes has flourished. Communication is an essential component of the medical care process,[8,28] and through the therapeutic physician-patient relationship, patients are informed about their regimens, encouraged and supported in their motivation, and offered assistance in gathering and using needed resources to adhere.[29] Patient nonadherence continues to be a challenge for medical professionals, patients, and researchers, however, with review evidence indicating that 25% to 50% of patients are nonadherent.[9,16] A lack of consensus remains about the most important barriers to and strategies for achieving adherence; the present meta-analytic study makes a compelling argument for the importance of improving physician-patient communication.

Summarizing a total of 127 studies, this meta-analysis supports the prediction that patient adherence is significantly related to the communication of physicians, and that adherence can be improved when physicians are trained to be better communicators. Physician skill at communicating in the medical visit may be a central factor in achieving patient adherence because it improves the transmission and retrieval of important clinical and psychosocial information,[30,31] facilitates patient involvement in decision making,[32–34] allows open discussion of benefits, risks, and barriers to adherence,[13,35,36] builds rapport and trust[37] and offers patients verbal and nonverbal support and encouragement.[38] This meta-analysis summarizes the entire literature with robust, random-effects model tests across a broad range of samples, varying measures, and a broad range of treatment regimens. Patients of physicians who communicate well have 19% higher adherence, and training physicians in communication skills improves patient adherence by 12%. While these effect sizes may initially appear to be modest, when compared with many standard medical interventions (eg, Tamoxifen as prevention for breast cancer [0.04], Plavix and reduced risk of serious cardiac events [0.04], and low dose Warfarin and prevention of blood clots [0.15]), they are actually quite impressive.[19,39]

Substantive moderators of the effects are of particular interest here; they include pediatric (vs. adult) care, and physician status as a resident. These findings suggest first that effective communication might be even more important in achieving adherence in pediatric care than in adult care, perhaps because pediatricians must communicate at the level of both child and parent, and must present information about recommended regimens to ensure that both children and parents understand. The greater effect of communication on patient adherence among residents may suggest that with lower levels of experience in patient and disease management, residents may need the extra interpersonal skills of effective communication to achieve better adherence and better patient health care outcomes.

A number of methodological, design, and measurement moderators were significant, supporting past research on the importance of these factors in studies of adherence.[9] These included physician communication assessment by others (not the patient), objective measurement of patient adherence, smaller patient sample size, and fewer physicians in the study. Objective communication assessment (independent of patients) appears to be a stronger predictor of adherence than patient-assessed communication; this argues for the importance of observational studies with assessment of communication by neutral observers. It is possible that objective measures may have less measurement error and greater validity than self-report measures, although this issue continues to be debated. It may also be helpful for researchers to consider designing studies with larger numbers of patients and physicians, to increase the power available, particularly in intervention research. Overall, these measurement and design moderators suggest that the outcomes of studies on adherence are affected by the methodological choices made; such variation should continue to be examined.

There was also a significant effect of physician communication skill training on the outcome of patient adherence. Several moderators increased the effect of communication training on patient adherence. When patients' illness was less severe, physician communication training had a greater effect on increasing their adherence. This finding is of interest considering past research showing that patients who are more severely ill with more serious diseases are less adherent.[19] The message is clear that training physicians to be better communicators improves their patients' adherence, although more studies are needed to make stronger causal claims. Studies suggest that communication skills training is effective at changing communicative behavior[40,41] but this is the first analysis to compile all published evidence that the achievement of adherence is one benchmark of success of communication skills training programs for physicians.

Strengths, Limitations, and Research Recommendations

Although several search strategies were employed in this meta-analysis, it is possible that some studies were missed. While studies with statistically significant findings may have been more likely to be published, large fail-safe ns make it unlikely that the present results were affected. Only studies of physicians' communication were included here; communication of nurses and other health care professionals, and the effect on patient adherence of interventions to improve patients' communication skills should be the subject of future meta-analytic work.[42–44] Finally, because no studies have compared various approaches to reliable and valid measurement of adherence and communication, and various experimental designs, it was not possible here to pinpoint how the findings might be influenced by methodological choices.

Future research should focus on training both physicians and patients in the same intervention, assessing which aspects of communication are most crucial for patient outcomes, incorporate multiple time points of follow-up, elucidate whether certain groups of physicians may benefit more from communication skills training, and attend to issues of adherence and communication unique to both primary and specialty care.

Clinical Implications

The results of this meta-analysis indicate that the odds of patient adherence are 2.16 times higher if a physician communicates effectively. This odds ratio is comparable with that of other important predictors in meta-analytic work (practical social support [3.6] and emotional support [1.83],[17] depression [3.03],[18] and perceptions of disease severity [2.5]).[19] The present meta-analysis goes beyond correlational connections to adherence, by demonstrating the overall significant effect of training communication to influence adherence. There are also broader economic and health care policy implications of this finding. The National Ambulatory Medical Care Survey reported that 963.6 million medical visits were made over the course of 2005.[45] Employing the percentage difference in adherence for patients whose physician communicated well versus patients whose physician did not (19%), we calculate that over 183 million visits that resulted in patient nonadherence would have resulted in better patient adherence if the physician had strong interpersonal communication. These estimates are only suggestive, of course, but point to the potential importance of communication in reducing wasted health care resources that result from nonadherence. It is, of course, essential to note that adherence contributes to better outcomes only when diagnosis and treatment are correct and appropriate, underscoring the centrality of promoting adherence to evidence-based care that is targeted to the benefit of the individual patient.[46]

Training in communication is an essential and effective component of medical education and may be even more important in residency training for physicians.[47] Interventions should be broad-based, focusing on verbal and nonverbal communication,[48] affective/psychosocial and instrumental/task-oriented behavior,[49] and creation of opportunities for active patient involvement.[43] Interventions should evaluate effects on multiple patient outcomes in addition to improvement in communication skills.[42] These findings also have implications for designing interventions to enhance adherence which should address multiple risk factors of nonadherence.[49] Interventions might best be developed to be personalized, identifying the factor(s) most relevant for a particular patient and tailoring the intervention accordingly.[50] For many patients, being able to communicate openly and honestly with their physician about their own challenges with a regimen, obtaining all of the information they need, feeling supported and encouraged, and feeling involved in making decisions about their care may be of great benefit to their achievement of adherence. Such effective communication may help to reduce barriers that stand in the way of optimal health outcomes.

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