Efficacy of communication-based interventions on physicians and patients’ outcome: A meta-analysis of randomised controlled trials

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Abstract
Communication-based intervention on physicians are strongly linked to patient health improvement. We proceeded examine the efficiency of these programs interventions for relevant outcomes in patients life, along with study quality, publication bias and potential moderators.

For this meta-analysis, we searched 2 databases, including: Web of Science and PubMed, using a comprehensive search strategy to identify the efficacy of the physician interventions on patient’s outcome studies in the literature, published from inception of 1965. Studies reporting means of health-related outcome in patients were included in the analyses. Studies quality was assessed with risk of bias tool. Meta-regression was used to explore heterogeneity of the year of published studies moderator and subgroup analysis was used to explore the medical specialty moderator.

Of the 3,470 studies initially identified, 14 were eligible for inclusion. These studies had a large diversity of program interventions. The mean effect size representing the impact of communication intervention on patients physical and psychological health was not significant. The only significant mean effect was represented by psychological outcome. Significant associations were found between year of studies and general medicine specialization.

In conclusion the impact of physicians’ intervention in not efficient on patients’ communication and medical outcome but it improves psychological health.

Keywords: communication-based intervention, physician-patient relationship, patient outcome, patient health

Introduction
The relationship between a doctor and patient is considered to be one of the most significant aspects of a good medical care. Within interactions in the mentioned dyad information is easily shared, choices more comfortable to be taken and reassurances are provided. In the medical relationship, trust is an essential emotional and behavioral element of effective treatment and is conceptually distinct from satisfaction with treatment (1) and physician–patient working alliance might be related to patients’ beliefs about the usefulness of treatment. The patient satisfaction as an outcome of multiple factors, such number of patients a doctor sees within a day, accessibility to doctors, patients’ use of alcohol and drugs, friendliness, and patient level of education (2) and it is also been linked with adherence to therapy, patients changing doctors, and outcome (3).

The increased interest in communication between physicians and patients is motivated by the aim to provide the best possible health care for patients and their
families. In addition, studies indicate that effective and empathic communication skills may decrease the probability of patients filing malpractice claims against their physicians (4). Patients feeling rushed and ignored by physicians providing inadequate explanations and advice proved to be the most significant predictors of dissatisfaction and low outcomes in healthcare. The ability to communicate honestly and empathically with patients has a powerful effect on the success of a medical practice (5,6).

**AIM**

The aim of the present meta-analysis is to examine whether there is robust empirical evidence for the efficacy of communication skills program interventions for physicians in the patients’ health status.

**METHOD**

**Search strategy**

Studies were collected through searches of electronic databases Web of Science and PubMed, from the inception of 1965 to May 2020. A search strategy was developed for each database with a combination of free text and MeSH terms for controlling vocabulary. The following comprehensive search string was entered into the databases: “doctor psychological training” or “physician psychological training” or “doctor psychological intervention” or “physician psychological intervention” and “doctor-patient relationship” or “physician-patient relationship”. Also, it was manually searching for citations in reference lists of the relevant articles and additional web-based search on Google Scholar for grey literature. The search was limited to those published in English language and human science, and each study from the final results was screened by title and abstract.

**Selection and eligibility criteria**

The selected studies were screened in two stages: screening of titles and abstracts followed by the retrieval and screening of full-text articles using the eligibility criteria recommended by the preferred reporting items for systematic reviews and meta-analyses (PRISMA) (7) in Figure 1.

Studies were included if they were applying the following conditions: the studies had a randomized controlled trial (RCT) design; studies that clearly delimited the population if interest from others (i.e. nurses or auxiliary personnel); an existing outcome from patients; patients evaluated the physicians (peer-report); an existing control group for both physicians and patients.

**Risk of bias**

The methodological quality of the included studies was assessed with risk of bias assessment tool, developed by the Cochrane Collaboration (8). The five criteria of sources of bias in RCTs assessment are: (a) adequate generation of allocation sequence; (b) concealment of allocation to conditions; (c) prevention of knowledge of the allocated intervention to assessors of outcome; (d) prevention of knowledge of the allocated intervention to participants and (e) dealing with incomplete data.

**Moderator variables**

We conducted categorical moderator analyses testing the one variable, the medical specialization of the physicians: general medicine, including specialties as: family medicine, surgery, military medicine; respectively oncology specialization, including any domain of the specialization. A second moderator, represent the year of studies publication, used as continuous moderator variable.

**Meta-analytic procedures**

We conducted a random effects meta-analysis with comprehensive meta-analysis software (CMA) version 3. The meta-analysis was conducted in the following sequence: First, we calculated the comparison between physician intervention group and a comparison group, the effect size, indicating the differences between the two groups at post-test. It was calculated using variance for Hedges’g. The effect size was calculated by means, standard deviation and number of participants (patients), at post-test with a control group. Outcome is the standardized mean difference for the patients from the trained physicians’ group vs. the control group. Each study reports three outcomes at once or separately: medical, communication and/or psychological. Next, we conducted subgroup analyses for patient’s outcome across all the studies included. In the subgroup analysis we consider each outcome as an independent study and a meta-regression analysis for publication year.

If means and standard deviations were not reported for the symptom outcomes in a study, we calculate the standardized mean difference from dichotomous data or from other statistics such as t-values or p-values. If the effect size could possible to be calculated, the study was excluded. For the studies that had more than one intervention group or control group it was used the most relevant intervention group and only one control group, the less biased of intervention, to calculate effect size. From one study (9) was included with three point times outcomes (after intervention and follow up at 3 and 6 months). At the follow up the
study has an additional outcome (medical outcome) for patients and different size of sample. For the rest of the studies we reported effect sizes for the time point available (e.g. post-test after intervention, 4 weeks later, 6 months or 12 months).

RESULTS

Characteristics of the included studies

Of the 3,470 studies, 2,510 potentially relevant full-text articles were screened by title and abstract. From these, we identified 144 that have had the potential to provide data on interventions on physicians and patients outcome were full text assessed. Among these, 26 examined intervention on physician in correlation with other variables, 14 provided communication intervention on nurses or patients, 26 had a different outcome (e.g. physician productivity or efficacy, physician wellbeing or mental health), 12 studies had lack outcome data, other than mean and standard deviation (e.g. odd ratio or median) and could not be calculated by the author from the available data, in one study has not reported the patient outcome, five studies had the intervention on both physicians and nurses or other auxiliary personnel, two studies had no control group and other 4 had no intervention program. In 9 studies was no intervention and finally, 31 studies were qualitative studies, explaining a series of interventions by methodological and applying procedure. After excluding ineligible studies, 14 studies that provided the inclusion criteria data were included in the qualitative and quantitative processes as shows Figure 1.

Risk of bias of the included studies

Overall, the quality of the included RCTs was not optimal. Four studies met two high risk criteria out of the five considered. The highest risk of bias is targeting the random selection bias, followed allocation bias four studies out of 14 as seen in Figure 3. The percentage of

FIGURE 1. Flow chart of selection and inclusion process
Efficacy of communication-based interventions

The main meta-analytical results are displayed in Figure 4, the forest plot of the standardized effect sizes of communication interventions.

The mean effect size representing the impact of communication intervention on patients physical and psychological health is $g = 0.113$ (95% CI -0.070; 0.098) for all 14 RCTs, ($p > 0.05$). Heterogeneity was moderate ($I^2 = 32.11$) (Table 2). The results show that the efficacy of the interventions is not significant. Next, we calculated the effect sizes for each outcome Figure 5. The statistical analysis for communication outcome ($N = 6$, $g = 0.169, 95\% CI = -0.160; 0.497, I^2 = 21.79; p > 0.05$), is not significant. The results point out that intervention
| Study                          | Intervention Method                  | Intervention duration / n sessions | Doctor Speciality | Measurements | Intervention group | Control group | Physicians group | Outcome          |
|-------------------------------|-------------------------------------|-----------------------------------|-------------------|--------------|-------------------|---------------|------------------|------------------|
| Scott et al., 1999 (10)       | PBI (problem-based interviewing)    | 12 months training               | General medicine  | MISS         | 144 (11.1) 38.4 (5.4) | 136 (11.2) 37.4 (5.3) | 10 | 10 | Communication Psychological |
| Jenkins, 1998 (11)            | Communication skills course         | 3-day residential course         | Oncology          | PSB          | 186 (10.5) 75.4 (5.4) | 186 (8.73) | 48 | 45 | Communication Psychological |
| Douglas et al., 2016 (12)     | Learning strategies for quality communication training | Half-day workshop                | General medicine  | CAT; PHDRA   | 719 (3.5) 6.3 (2.3) | 681 (0.9) 3.4 (0.5) 5.8 (2.6) | 23 | 28 | Communication Psychological |
| Epstein et al., 2017 (13)     | Patient-Centered Communication Intervention | 2-session in-office physician training (1.7 hours) 1-hour patient and caregiver coaching session, and 3 follow-up phone calls | Oncology          | APPC; Verona VR-CoDES; PTCC | 130 (0.81) | 135 (0.19) 0.01 (0.66) | 19 | 9 | Communication Psychological |
| Jerant et al., 2016 (14)      | SEE IT training                     | >3 sessions of 20-min audio-recorded visits | General medicine  | HBCM         | 66 (0.96) | 65 (1.01) 0.6 (1.0) | 27 | 23 | Psychological |
| King et al., 2002 (15)        | Acquisition of skills in the application of brief cognitive behaviour therapy | Four half day workshops at one week intervals | General medicine  | BDI; STAI    | 137 (9.6) 48.6 (13.8) | 135 (11.5) 48.2 (14.8) | 42 | 42 | Medical Psychological |
| Merckaert et al., 2008 (16)   | BT (Communication skills basic training) | Two 8h day sessions and one 3h evening session; a 2h plenary session; 17h of small group role-playing sessions | General medicine  | HADS         | 27 (22.3) | 29 (2.14) 2.4 (2.4) | 27 | 29 | Psychological |
| Mjaaland & Finset, 2009 (17)  | GRIP (Communication skills training programme) | Forty hours (three full days and five half days) over an 8-week period | General medicine  | PEQ          | 62 (9.8) | 59 (5.5) 56.0 (5.0) | 15 | 10 | Communication Psychological |
| Morasso et al., 2015 (18)    | Communication skills training program | Three weekly 3h sessions (9 hours in total) with didactic and experiential learning methodologies | Oncology          | PDI; SIT     | 174 (11.81) 27.67 (9.13) | 165 (10.74) 28.61 (8.91) | 17 | 19 | Medical Psychological |
| Morriss et al., 2007 (19)    | Reattribution model training       | Three 2h training sessions at the practice work base | General medicine  | PSB; HADS    | 66 (0.97) 3.06 (0.84) | 75 (0.99) 2.86 (1.02) | 8 | 8 | Medical Psychological |
| Penner et al., 2013 (9)       | Common in group intervention       | -                                 | General medicine  | SF-20; PPDS  | 42 (0.42) 3.85 (0.82) | 30 (0.49) 3.83 (0.71) | 7 | 7 | Communication Psychological Medical |
| Penner et al., 2013 (9)       | Common in group intervention       | -                                 | General medicine  | SF-20; PPDS  | 30 (0.66) 5.41 (0.92) 5.25 (0.66) 4.90 (1.10) | 23 (1.53) 4.56 (1.33) 4.72 (0.97) | 7 | 7 | Communication Psychological Medical |
| Penner et al., 2013 (9)       | Common in group intervention       | -                                 | General medicine  | SF-20; PPDS  | 20 (0.52) 5.43 (0.52) 5.03 (0.71) 4.63 (1.03) | 21 (1.50) 4.55 (1.50) 4.49 (0.97) | 7 | 7 | Communication Psychological Medical |
| Rutter et al., 1996 (20)      | Training in communication          | Two meetings, two days apart based on a handbook - discussions and booklets | Oncology          | HADS         | 18 (5.4) 3.9 (3.7) | 18 (6.9) 4.6 (4.5) | 3 | - | Medical Psychological |
| Shilling et al., 2003 (21)    | Communication skills training course | Intensive 3 day training           | Oncology          | PSCQ         | 439 (4.28) 77.90 (4.28) | 425 (4.07) 77.86 (4.07) | 425 | 410 | Psychological |
| Stewart et al., 2007 (22)    | The state-of-the-art CME program   | Principles of adult education and experiential learning and with 5 key elements | General medicine  | 12-item questionnaire based on Henbest et al. (2000); CDIS | 11 (0.9) 3.28 (0.49) 82.06 (5.80) 0.40 (0.40) | 91 (0.49) 3.14 (0.49) 77.78 (8.07) 0.46 (0.38) | 25 | 26 | Communication Medical Psychological |
programs do not improve the communication between physician and patient. The effect size for medical outcome ($N = 8, g = 0.088, 95\% CI = -0.043; 0.219, I^2 = 4.134; p > 0.05$) is not significant. Finally, for psychological outcome ($N = 13, g = 0.161, 95\% CI = 0.003; 0.048, I^2 = 12.75; p < 0.05$) is significant, therefore intervention programs applied on physicians support a higher level of psychological state improvement in patients. Figure 6 represents the funnel plots as follows: (a) mixed outcomes; (b) communication outcome; (c) medical outcome and (d) psychological outcome. These effects were not symmetrical, and the trim and fill analysis suggested adjustment to these mean effect sizes (23).
**TABLE 2. Standardized effect sizing of interventions and of medical specialty moderator**

| Model     | Outcome       | N-comp | g (95% CI)      | Std. er. | Variance | LL      | UL      | Z        | I²   |
|-----------|---------------|--------|----------------|----------|----------|---------|---------|----------|------|
| Fixed     | Mixed         | 14     | 0.040          | 0.030    | 0.001    | -0.019  | 0.098   | 1.318    | 86.612|
| Random    | Mixed         | 14     | 0.113          | 0.093    | 0.009    | -0.070  | 0.296   | 1.205    | 32.110|
| Fixed     | Communication | 6      | 0.027          | 0.039    | 0.002    | -0.050  | 0.104   | 0.491    | 91.988|
| Random    | Communication | 6      | 0.169          | 0.168    | 0.160    | -0.160  | 0.497   | 0.315    | 21.787|
| Fixed     | Medical       | 8      | 0.137          | 0.042    | 0.002    | 0.055   | 0.218   | 3.288    | 18.756|
| Random    | Medical       | 8      | 0.088          | 0.067    | 0.004    | -0.043  | 0.219   | 1.315    | 4.134 |
| Fixed     | Psychological | 13     | 0.136          | 0.033    | 0.001    | 0.072   | 0.200   | 4.147*   | 50.293|
| Random    | Psychological | 13     | 0.161          | 0.058    | 0.003    | 0.048   | 0.274   | 2.801*   | 12.746|
| Fixed     | General Medicine | 10   | 0.159          | 0.040    | 0.002    | 0.082   | 0.237   | 4.024*   | 62.464|
| Random    | General Medicine | 10   | 0.234          | 0.082    | 0.007    | 0.073   | 0.395   | 2.855*   | 35.340|
| Fixed     | Oncology      | 6      | -0.123         | 0.046    | 0.002    | 0.032   | -2.664  | 0.008*   | 92.482|
| Random    | Oncology      | 6      | -0.134         | 0.192    | 0.037    | -0.509  | 0.242   | -0.698   | 18.308|

*p < 0.05; N-comp – number of participants; Std. er. – standard error; LL – lower limit; UL – upper limit; I² – heterogeneity

**Intervention moderators**

The subgroup analysis of medical specialty revealed no statistically significant differences among oncology specialty (N = 6, g = -0.134, 95%CI = -0.509; 0.242, I² = 18.308; p > 0.05) but significant result in general medicine specialty (N = 10, g = 0.234, 95%CI = 0.073; 0.395, I² = 35.34; p < 0.05) and medium heterogeneity (Table 2). Therefore, the impact of the communication interventions on physician is higher for oncology patients.

The range of the years studied were published, vary between 1996 and 2017. The results of meta-regression analysis are displayed in Table 3. Statistical analyses are positive assuming that there is a significant impact of year of publication on effect sizes (Z = 2.48, 95%CI = 0.069; 0.059, p < 0.000) and the heterogeneity was high (I² = 86.61), indicating that more recent studies reported higher effects.

**DISCUSSIONS**

The purpose of this study was to examine the efficacy of communication programs interventions on physicians to improve health behaviors and health-related outcomes in patients. We conducted a meta-analysis including all communication interventions on physicians tested in RCTs for relevant outcomes on patients. Interventions were considered as therapeutic programs to facilitate a better relationship between physician and patient and improvement in patients psychological and medical condition. We examined the intervention effects for clinical patients, subclinical and nonclinical participants. We also analyzed two general moderators, one from the perspective of physician characteristics and one from the studies characteristics, with possible implication for further studies.

From all 3,470 studies 14 were selected. Overall, the meta-analysis included 1,390 physicians, 710 in the intervention group and 680 in the control group. From all 4,583 patients who rate the physician’s changes, 2,271 were in the intervention group and the rest of 2,312 patients in the control group. Patients measured outcomes were diverse and clustered in three main categories: (a) communication outcome (satisfaction with the medical interview, patient centeredness, doctor-centeredness, inter-personal skills, physician trust or satisfaction with the consultation); (b) medical outcome (treatment adherence, clinical anxiety and depression, physical health concerns or shorter duration of symptoms) and (c) psychological outcome (sub-clinical anxiety, affection, mental health concerns, self-management, psychological distress or psychological impact on life).

Our first research question asked whether better communication skills in physicians can improve the relationship between physician-patient and moreover if there are any health outcomes on patient. Results revealed that these interventions are not generally efficacious (24,25). Interventions applied on physicians attempted to improve only the psychological outcomes. On psychological level, a safe physician-patient relationship involves patient participation in decision-making and enhance in patient a higher level of self-determination (26). For the second question, whether medical specialty and year of the studies are significant moderation, results reviled that recent communication-based intervention are more efficient. General practitioners show more communication skills and attention to patient concerns and create an affective atmosphere for patient wellbeing (27).

This meta-analysis has a series of limitations. First, the small number of RCTs studies limited the analysis to 14 included studies. For further research it is recommended to be included RCTs with more than one follow-up time and longitudinal studies. The intervention programs vary from a study to another. Each program had its own methodological and duration of the inter-
FIGURE 6. Funnel plots of standard error for outcomes
vention that can contribute to different outcomes in patients’ condition. Some potentially important mod-
erators such as severity of patients’ symptoms and so-
cioeconomic variables (e.g., ethnicity, education) could
be considered. Future research should therefore con-
sider the impact of these important moderators.

**CONCLUSIONS**

The results points it is necessary to set a goal devel-
opment of an universal training in communication skills

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