

# Effect of Physician Reminders on Preventive Care: Meta-Analysis of Randomized Clinical Trials

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*The objective of this study was to assess the clinical value of the physician reminder, an information intervention, in increasing compliance for selected preventive health care measures. Meta-analysis was used to combine the quantitative evidence from randomized controlled clinical trials meeting the eligibility criteria.*

*The trials included in this meta-analysis were conducted in a family or internal medicine clinic. Physician reminders were used in the trials to influence utilization and compliance of preventive health care activities. The use of physician reminders for preventive health care activities resulted in a homogeneous effect for the subcategories of cervical cancer screening (test for heterogeneity  $X^2_2 = 4.122$ , non-significant) and tetanus immunization (test for heterogeneity  $X^2_2 = 3.139$ , non-significant). Similarly, the odds ratio from the combination of evidence from the three cervical cancer screening trials was significant (1.180, 95 percent CI: 1.020 to 1.339). The resulting odds ratio from the combination of evidence from the three tetanus immunization trials was significant (2.819, 95 percent CI: 2.664 to 2.975).*

*The results of the meta-analyses for cervical cancer screening and tetanus immunizations indicate that physician reminders are an effective information intervention and can improve compliance for these two preventive health care procedures. Based on the results of this meta-analysis, further trials testing the effect of physician reminders on tetanus immunization would be unnecessary and probably unethical.*

## INTRODUCTION

The continuously evolving standards of medical practice create a clinical need to decrease the use of some procedures and to increase the use of other clinical procedures. Changes in physician practice patterns can be promoted through the provision of information. Information is a relatively inexpensive intervention used to change the process and outcome of patient care. Utilization can be effected by providing information at crucial points during the process of care.

An information intervention is referred to as a reminder when it arrives at the time of the decision making. A reminder is often delivered as an alert, effectively prompting the physician to make a decision. A reminder can also be presented in the form of immediate feedback. This method provides the physician with information when the decision is made.

The objective of this study was to assess the clinical value of the physician reminder intervention in increasing compliance with preventive health care measures. This objective was met through the conduction of a meta-analysis and an exploration of the effect of physician reminder intervention on utilization and compliance.

## METHODS

The trials selected for this study were abstracted from the Columbia Registry [1]. The Columbia Registry includes over 300

randomized controlled clinical trials from the areas of information and utilization management. Database searches, manual searches, and informal contacts have been used to create the registry. To meet eligibility criteria for inclusion, the published study must be: i) a randomized controlled clinical trial; ii) a comparison of information or utilization management intervention in the study group with no similar assistance in the control group; and iii) an evaluation of the change in the process and/or outcome of patient care. The Columbia Registry trials containing a physician reminder intervention were selected for this study. Of the physician reminder trials, the focus for the meta-analysis became the effect variables of cervical cancer screening and tetanus immunization.

The qualitative information and quantitative utilization data were abstracted from the eligible trial reports. The utilization data were abstracted in the form of the number of clinical actions performed and the number of clinical actions not performed for the control group and the physician reminder intervention group. If additional trials met the selection criteria, but did not contain the utilization data in a form to be abstracted and transformed into an odds ratio, the authors were contacted.

This meta-analysis used the odds ratio method to compare utilization. Utilization was calculated as the ratio of preventive cancer screening or immunizations performed compared to preventive cancer screening or immunizations not performed. The odds ratio for single study confidence levels and the pooled odds ratio for intervention success used the Peto modification of Mantel-Haenszel method described by Yusuf [2]. The method assumes identical effects in the pooled studies (homogeneity of treatment effect), and variances around each mean effect depend on the size of the study. The Breslow-Day chi square test for heterogeneity was used to determine if the binary end-point variables of the selected physician reminder trials constituted a homogeneous sample [3]. In estimating odds ratios, 95 percent confidence intervals were calculated for the individual studies and also for the combined effect. The tolerance was

calculated using the method proposed by Rosenthal [4].

## RESULTS

Ten eligible trials were identified from the Columbia Registry that measured either cervical cancer screening, tetanus immunization, or both of these preventive health care procedures. However, the appropriate data were not available from six of the trials. These eligible trials were eliminated from the analysis when only percentages or means were listed in the results, and a crucial number, such as total number of patients, was missing from the trial report. However, data in an appropriate form was available for three of the cervical cancer screening trials [5] [6] [7] and three of the tetanus immunization trials [6] [7] [8]. With the exception of one report on cervical screening, all eliminated trials indicated significant positive results.

Table 1 contains the qualitative description of the four articles included in the meta-analyses of cervical cancer screening and tetanus immunization. The sites of the four trials were family or internal medicine clinics in the countries of United States, Canada, and Israel. The providers were either family or internal medicine physicians. In addition to the physician reminder contained in all four trials, two trials also examined the effect of patient letter reminders and patient telephone reminders [5] [7]. The four trials also examined blood pressure recording compliance, smoking status assessment, thyroxine screening compliance, fecal occult blood screening compliance, and pneumococcal immunization status in addition to the preventive care procedures of interest to this meta-analysis.

Figure 1 graphically represents the odds ratios with 95 percent confidence intervals for cervical cancer screening compliance in each of the studies and the overall effect. The three trials were homogeneous (test for heterogeneity  $X^2_2 = 4.122$ , non-significant). The primary effect variable in two of the trials had a non-significant effect variable because 1.000 was included in the

Trial	Providers	Patients	Effects
McDowell 1989	family medicine physicians	family medicine 662 patients	cervical screening
Rosser 1991	family medicine provider teams	family medicine 2874 patients	cervical screening
			tetanus immunization
Tape 1993	internal medicine residents	internal medicine 1809 patients	cervical screening
			tetanus immunization
Weingarten 1989	family medicine physician, nurse	family medicine 222 patients	tetanus immunization

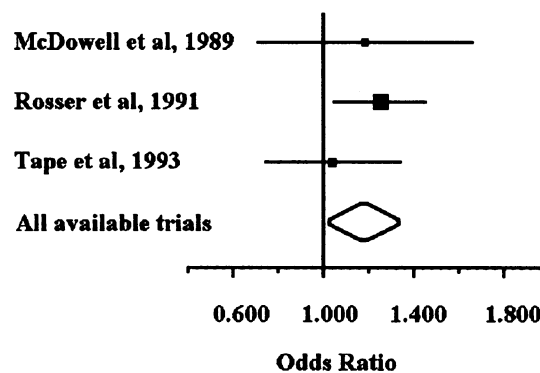
**Table I** Characteristics of the trials

95 percent confidence interval [5] [6]. One trial had a significant odds ratio and 1.000 was not included in the 95 percent confidence interval [7]. However, when the three trials were combined, the overall odds ratio became significant (1.180, 95 percent CI: 1.020 to 1.339).

Figure 2 graphically represents the odds ratios with 95 percent confidence intervals for tetanus immunization compliance in each of the studies and the overall effect. The three trials were homogeneous (test for heterogeneity  $X^2_2 = 3.139$ , non-significant). The primary effect in all three trials was significant because 1.000 was not included in the 95 percent confidence intervals for any of the three trials. When the three trials were combined, the overall odds ratio was significant (2.819, 95 percent CI: 2.664 to 2.975).

The tolerance of the three studies combined in the meta-analysis of cervical cancer screening was 0.794. This is below the level of 25 studies recommended by Rosenthal [4]. This number indicates that a few cervical cancer

screening studies with negative effect could overturn the results of this meta-analysis. On the other hand, the tolerance of the three studies combined in the meta-analysis of tetanus immunization was 105.220. This number substantially exceeds the threshold level calculated by the Rosenthal method [4].



**Figure 1** Cervical screening

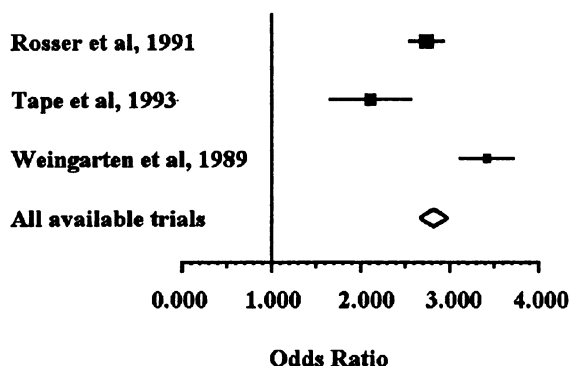


Figure 2 Tetanus immunization

## DISCUSSION

It is well-known that reminders represent the most frequently tested information intervention category. Many reminder trials have been conducted. However, when specific interventions are examined, enough evidence to draw a valid conclusion may not be present. By examining the tolerance calculation, the evidence for the use of reminders for tetanus immunization is much stronger than for the use of reminders for cervical cancer screening. The evidence for tetanus immunization is strong enough to indicate that further randomized controlled clinical trials on tetanus immunization reminders would probably be unethical.

The physician reminder intervention is very suitable for computerization. In fact, it would be difficult to effectively administer physician reminders without computerization. The timeliness of the physician reminder is crucial to the success of this information intervention. Therefore, the physicians will require either on-line access to a computer or have a form, including preventive care reminders, printed by the computer just prior to each patient encounter.

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