

## Written Instruction and Compliance with Return Visits for Reading Mantoux (PPD) Skin Tests in a Large General Pediatric Practice

**Background:** Effectiveness of tuberculosis screening may be impaired by noncompliance with Mantoux test reading. We wished to determine whether a written instruction sheet improves compliance with return visits to have Mantoux skin tests read.

**Methods:** In Step 1 of a 2-step study, we distributed a written instruction sheet on randomly assigned days; in Step 2, we compared compliance with return visits before and after use of a written instruction sheet as routine practice.

**Results:** During Step 1, a 5% increase in compliance ( $n = 619$ ,  $p = .10$ ) was associated with use of the instruction sheet. In Step 2, a 7% increase was seen ( $n = 991$ ,  $p = .015$ ). When data from Steps 1 and 2 were pooled, the 5% improvement was statistically significant ( $p = .02$ ).

**Conclusion:** Use of the written instruction sheet is associated with a small improvement, which may not be clinically relevant, in return visits for Mantoux test reading. Further research is needed to identify cost-effective methods to improve compliance with Mantoux test reading.

### Introduction

The Mantoux (also known as PPD) skin test is the preferred test for detecting tuberculosis.<sup>1-3</sup> Proper reading of the test requires skilled examination of the skin test site within a limited number of days after skin test placement.<sup>4</sup> Readings taken by patients or by their parents are unreliable.<sup>5,6</sup> Therefore, the value of the Mantoux test is limited by patients' failure to return for interpretation of the skin test result.

Compliance with return visits for Mantoux test reading has historically been problematic at our medical center, part of a large prepaid health maintenance organization serving an ethnically diverse, predominantly working-class population. Previous reports in the literature suggest that compliance with return visits for skin test reading is problematic in many settings, and compliance rates range from 34% in a poor urban population in Seattle, Washington<sup>7</sup> to 85% in a university-sponsored screening program.<sup>8</sup>

Although written instruction may improve adherence to medical recommendations,<sup>9</sup> Roberts et al<sup>8</sup> in a university-sponsored screening drive, found no difference be-

tween patients given written and verbal instruction and verbal instruction only.

This study was designed to test whether providing a written instruction sheet improves compliance with instruction to return for Mantoux test reading in the setting of a large general pediatric practice.

### Methods

As the first step in a 2-step procedure, all pediatric outpatients at our medical center who had a Mantoux skin test ordered by a pediatrician during the study periods were either given a preprinted instruction sheet (Appendix) and verbal instruction to return in two to three days to have the skin test read (intervention group) or were given the verbal instruction alone (control group). The intervention group (267 patients) received written instruction on randomly assigned weekdays; the control group (352 patients) received verbal instruction alone on other days.

Although a small portion of the study population was Hispanic, the instruction sheet was provided in English only. Parents' literacy level

was not assessed. To reflect clinical practice, wording of the verbal instruction was not standardized. The verbal instruction was given by nursing staff administering the Mantoux test, and the written instruction sheet was given by clerks registering patients for the test. Nurses and clerks were not blinded as to intervention group assignment; physicians ordering the Mantoux tests were blinded as to group assignment.

Patients who returned within two to five days to have the Mantoux test read were defined as compliant. Patients who did not return within this period were defined as noncompliant. No attempt was made to contact families of noncompliant patients.

Compliance rates for control and intervention groups during Step 1 were higher than the clinic's historical baseline rate; therefore, after Step 1 concluded, we undertook Step 2 by collecting compliance data for another 499 consecutive patients given verbal instruction alone. This group had lower compliance than either the intervention or control groups during Step 1, so we gave the preprinted instruction sheet and verbal instructions to another 492 consecutive patients and determined compliance rates for both groups.

Data were analyzed via 1-tailed z-score to test for improved compliance in the intervention compared with the control groups. For data pooled from Steps 1 and 2, we used the chi-squared test to determine whether day of the week influenced compliance with Mantoux test reading. Statistical significance was accepted if  $p < .05$ . Patients aged  $>18$  years who received a Mantoux test during the study period were deleted from the data analysis.

Patients receiving the preprinted instruction sheet were informed that it was being given as part of a research study. The study proto-

*"To reflect clinical practice, wording of the verbal instruction was not standardized. The verbal instruction was given by nursing staff administering the Mantoux test, and the written instruction sheet was given by clerks registering patients for the test."*



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Dear Parent,

Your child has received a skin test for tuberculosis (the PPD test). **You must return in two or three days. It is important for us to read the test.** A parent may not notice the test reaction. We need an accurate reading of the test for your child's medical record.

**It is easy to have a skin test read. Come to the pediatric clinic in two or three days. Ask for the screening nurse.**

The nurse will examine the skin where the injection was given. If the test suggests tuberculosis infection, the nurse will help you get a chest x-ray and a doctor's appointment.

Tuberculosis is on the rise. One of every five tuberculosis cases in the United States is from California. Tuberculosis is easy to treat if caught early -- before symptoms develop and before the tuberculosis bacteria cause any damage. Without treatment, the infection may slowly progress, causing damage to many parts of the body, including the lungs and the brain.

**HELP BEAT TUBERCULOSIS.  
GET TESTED AND GET THE TEST READ!**

\_\_\_\_\_ needs to return on \_\_\_\_\_ , \_\_\_\_\_  
(name) (day) (date)

or \_\_\_\_\_ , \_\_\_\_\_  
(day) (date)

Thank you  
 Pediatric clinic staff.

Preprinted instruction sheet given to pediatric patients at Kaiser Permanente Medical Center, Hayward, California who had pediatrician-ordered Mantoux skin test during the study periods.

col was approved by the Kaiser Permanente Medical Care Program, Northern California Institutional Review Board.

### Results

Mean (SD) age of the intervention group in Step 1 was 5.1 (4.4) years; mean (SD) age of the control group was 5.7 (4.7) years. Median age for both groups combined was 4 years.

Mean (SD) age of the control group in Step 2 was 6.9 (4.9) years; median age was 5.0 years. Mean (SD) age of the intervention group was 5.8 (5.4) years; median age was 4 years.

Of the 267 patients given written and verbal instruction in Step 1, 187 (70%) returned for skin test reading as did 230 (65%) of the 352 patients given verbal instruction only ( $p = .10$ ).

During Step 2, 261 (52%) of the 499 patients given only verbal instruction returned for skin test reading as did 291 (59%) of the 492 patients given the preprinted instruction sheet and verbal instruction ( $p = .02$ ).

Data pooled from Steps 1 and 2 showed no significant difference in compliance ( $p = .37$ ) for the different days of the week.

Of 969 skin tests read in Steps 1 and 2 combined, six (.6%) were interpreted as positive. The size of the reaction was not recorded for one patient, was 13 mm for another patient, and was >15 mm (17-40 mm) for the remaining four patients.

When the written instruction sheet was given on random days (Step 1), improvement in compliance with Mantoux test reading was small (5%) and not statistically significant ( $p = .10$ ). In contrast, during Step 2, when data were collected for the 499 patients in the control group and for the 492 patients in the intervention group, the improvement in compliance was statistically significant ( $p = .02$ ) although small (7%).

### Discussion

Step 2 included 991 subjects and therefore had greater power to detect a small improvement than Step 1, which included 619 subjects. If, to achieve greater power, we were to combine data from Steps 1 and 2, 478 (63%) of the 759 patients in the intervention group would have been found compliant vs 491 (58%) of the 851 patients in the control group ( $p = .02$ ). This finding suggests that the preprinted instruction sheet increased compliance by 5% to 7%. This small improvement may not be clinically significant.

An unexpected finding was that compliance was higher for the control group during Step 1 (intervention given on random days) than for the control group after Step 1 concluded (but before the intervention portion of Step 2). The magnitude of this difference was greater than that attributed to the intervention. Possible explanations for this finding include a time effect (ie, different compliance rates at different times of the year) and the Hawthorne effect, which refers to the independent tendency of group productivity to increase because of social aspects of the research environment (attention, excitement, prestige).<sup>10</sup> The enthusiasm generated by the study may have improved the quality and energy of verbal instruction given to patients by our staff.

Even with use of the preprinted instruction sheet, noncompliance with return visits for Mantoux skin test reading in a general pediatric practice remains high. This population had a low rate of tuberculin



reactivity; however, diagnoses might be missed in populations having higher prevalence of tuberculosis infection. Improved, cost-effective, methods of increasing compliance rates are needed.

Cheng et al<sup>11</sup> in an urban children's hospital, compared different methods to improve compliance with tuberculin skin test reading and found that the negative reinforcement of withholding school forms until the test was read increased adherence by 26%. Tanke et al,<sup>12</sup> in a study at a public health clinic, found that an automated telephone reminder system (TeleMinder®) led to a small (5%) improvement in compliance with tuberculin test reading. In both of these studies, all subjects were given both written and verbal instructions.

In Cheng's study,<sup>11</sup> a 13% improvement in compliance was observed between baseline and study periods without any other intervention. The Hawthorne effect observed in both our study and that of Cheng suggest that the energy, interest, enthusiasm, and commitment of the person giving the instruction can influence compliance rates.

These results suggest that improving compliance with tuberculin skin test reading will be challenging. The combination of written and verbal instructions may provide a small improvement. The work of Cheng<sup>11</sup> suggests a large improvement in the rate of return visits for skin test reading can be achieved if there is an adverse consequence (withholding school forms) to noncompliance; however, this strategy does not apply in situations other than school-mandated screenings. ❖

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***"These results suggest that improving compliance with tuberculin skin test reading will be challenging."***

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## Shagging Flys

"I don't want to play golf. When I hit the ball, I want someone else to go chase it."

*Rogers Hornsby, Cardinals Infielder (1915-26)*

## Speaking of Baseball

"It's just throwing and catching and hitting and running. What's simpler than that?"

*Paul Richards, Orioles Manager (1955-61)*