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Standardizing Contact Investigation Protocols

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SUMMARY

SETTING: The State of Alabama Department of Public Health Division of Tuberculosis Control.

OBJECTIVE: To standardize contact investigation protocols and implement an intervention to increase TB field worker adherence to the protocols with the goal of promoting efficiency and effectiveness in contact investigations.

DESIGN: A process evaluation of existing data collection and management systems and protocols was performed. Standardized protocols and an intervention to increase TB field worker adherence to the protocols were created and pilot tested. These were then implemented and formative evaluation data were collected.

RESULTS: The process evaluation revealed considerable variance among field workers with regard to protocols and definitions of variables related to contact investigations. Protocols were standardized and an intervention targeted at TB field workers was developed. The intervention consisted of a training workshop and the development of a computer-based contact investigation module. This was successfully implemented throughout the state.

CONCLUSIONS: To perform effective contact investigations and conduct studies to improve the effectiveness of these investigations, TB control programs must pay careful attention to precisely defining variables and concepts related to the contact investigation. Furthermore, protocols must be standardized and resources devoted to training of TB field workers to ensure adherence to protocols.

Keywords

contact investigation; tuberculosis; process evaluation

IMPORTANT COMPONENTS of a tuberculosis (TB) control program include case identification and treatment, and the investigation of contacts for recent transmission of infection. Contacts of active TB cases are an important and readily identifiable risk group for consideration of preventive measures to reduce the incidence of TB disease in the future. The traditional approach to contact investigation, involving the concentric circle method of defining contacts as either close or casual based on risk assessments, presents difficulties in obtaining standard and consistent definitions of a close contact, determining contact priorities and making decisions to end the search for contacts.^{1,2}

The University of Alabama at Birmingham (UAB) and the Alabama Department of Public Health (ADPH) Division of Tuberculosis Control (DTBC) standardized contact investigation protocols and implemented an intervention to: 1) enhance TB field workers' interviewing and data collection skills, and 2) promote efficiency and effectiveness in contact investigation. The intervention consisted of the implementation of new standardized protocols, a computer module for contact investigation data collection, and a training workshop. The training workshop was designed to enhance field workers' interviewing skills and teach use of the new protocols and computer module. This paper describes the process of standardizing the contact investigation protocols and implementing the intervention aimed at increasing adherence by TB field workers to these protocols.

STUDY POPULATION AND METHODS

Overview

To develop standard protocols, we had to complete four tasks: 1) perform a process evaluation of existing contact investigation protocols; 2) develop standardized protocols and the intervention used to increase adherence to the protocols; 3) pilot test and implement the protocols and intervention; and 4) collect formative evaluation data.

Subjects

The state of Alabama has 11 public health areas, each with a manager responsible for all TB related activities. Each manager has a staff of TB field workers composed of registered nurses and disease intervention specialists who are college graduates with subsequent training in TB. The number of TB field workers in each area is based on TB morbidity for that area. Field workers are responsible for performing all case management activities, including directly observed therapy and contact investigation.

This study was reviewed, approved, and monitored by UAB's Institutional Review Board. In addition, the ADPH provided monitoring to ensure that the confidentiality of all TB patients was maintained throughout the study.

Process evaluation

The process evaluation of existing protocols included conducting separate focus group discussions³⁻⁵ with TB area managers and field workers. Each group contained 6-8 participants and was moderated by one of the UAB investigators and either the Director or Assistant Director of the ADPH DTBC. Refreshments were provided and group discussions were audiotaped and then transcribed. Narrative reduction techniques were used to discover key words, phrases, and ideas to identify issues related to standardizing contact investigations.⁶ The primary outcome of the focus groups was to understand the existing process for contact investigation and to identify issues relevant to the development of standard protocols.

Developing standardized protocols and the intervention

The intervention and contact investigation protocols were developed using social cognitive theory and the health belief model.⁷⁻¹¹ Social cognitive theory assumes a triadic, reciprocal model in which the environment, the person and the behavior all interact such that a change in one factor affects the other two factors.^{12,13} Thus, the TB worker must be trained in the desired contact investigation behaviors and components of the TB control system must be changed to support the new behaviors. The intervention consisted of a training work-shop with subsequent feedback through a computer-based contact investigation module and individual supervisors. The workshop was designed to enhance field workers' behavioral and interview skills to promote efficiency and effectiveness in the contact investigation. The training was task-oriented, and included a review of the risk factors for TB transmission and infection, an

overview of effective interviewing skills, the introduction of the contact interview protocols and a computer-based training module with simulated case scenarios for contact interviews. Behavioral mechanisms employed in the training session emphasized active learning, demonstration, practice with individual feedback and assessment, and documentation of competence in use of contact investigation protocols.

The health belief model also provided the frame-work for training TB field workers to use motivational strategies with the index case in order to identify contacts. This model states that the likelihood of an individual taking action is determined by: 1) the person's perceptions of vulnerability to the condition and of the seriousness of the consequences of the condition; and 2) the person's evaluation of the benefits of taking action weighed against barriers, risks, or costs of taking action.^{7,14} In addition, there must be a cue to action, or stimulus, to trigger the appropriate behavior.¹⁵ The concepts of perceived vulnerability and seriousness were applied to the case, but in reference to the contact. The case must perceive that the contact is at risk for serious consequences from TB infection. For instance, the case may not understand the concept of airborne transmission and fail to identify all individuals with whom he/she has had a close relationship who are at risk of becoming infected and subsequently developing TB. There may also be a lack of awareness that simple preventive therapy is available to eliminate these negative consequences.

Pilot testing and implementation of the protocols and intervention

The process evaluation results were used to develop a draft of the standardized contact investigation protocols. This draft was sent to focus group participants for review and suggestions. Suggestions were incorporated and the standardized protocols were pilot tested by asking focus group participants to use them in a contact interview. We then obtained feedback and made final revisions to the protocols. Once the protocols were finalized, a contact investigation module was developed and integrated into the DTBC computer-based data collection and case management system. The intervention and new protocols were then pilot tested in two areas with the active involvement of the area manager and several field workers.

The behavioral intervention was implemented throughout the state to facilitate adoption of the standardized protocols. Training of TB field staff and area managers occurred over a 2-month period using regional workshops. Use of the computer system was begun immediately following each training workshop. For 6 months, TB field staff used the computer system and participated in monthly meetings with UAB investigators and the Director of the ADPH DTBC to refine and modify the system as necessary.

Collection of formative evaluation data

Formative evaluation activities included monthly interviews with area managers and TB field workers to identify problems or difficulties that needed refinement. In addition, members of the research team conducted a review of computer records to determine the extent of missing data, the number and nature of errors made by staff entering data, and the number of prompts required during the data entry process. These activities were used to continually modify and improve the contact investigation protocols and intervention.

RESULTS

Process evaluation

The DTBC Director, Assistant Director, and UAB physicians involved in the DTBC were concerned that the risk classification of a contact as either close or casual varied among TB field workers. Existing protocols recommended that the classification of contacts be a function of 1) time (duration, frequency, and regularity) of exposure to the case; 2) expected degree of

infectiousness of the index case; 3) characteristics of the environment shared, and 4) susceptibility of the contact. However, experience indicated that contact investigations were often determined solely by the medical information on the TB index case or suspected case. Field workers appeared to use the concentric circle analysis to examine groups of contacts according to their risk exposure, but were classifying contacts differently. Therefore, implementation of this method varied by individual worker. It had also been suspected that there was significant disagreement on definitions of variables related to contact investigation. In summary, ADPH protocols called for investigation of contacts with close and prolonged exposure to the case. However, there was considerable latitude and variance among field workers about what constituted close and prolonged contact.

Focus groups discussed current methods and protocols for the contact interview and the meanings of all variables and definitions associated with contact investigation. Variables such as time spent with the contact, ventilation and size of the space where the exposure occurred, and contact exposure frequencies were found to be defined and categorized differently by field workers. Multiple exposures, though common, were often not reported. In addition, the existing field worksheet asked TB staff to list exposure hours per week.* Focus group participants indicated this was very difficult to pinpoint and suggested using several variables to capture exposure information. Participants also expressed difficulty assigning the ventilation of the exposure location into the current categories, and suggested new categories. The need to standardize definitions and quantify information were basic premises of the study design, but this need became evident to all the TB managers and field workers during the focus group process. Varying degrees of understanding of the methods for elicitation of information and the use of the concentric circle analysis also became apparent to the group. While TB area managers had years of experience, their staff's experience ranged from less than a year to a little over 5 years. Level of training for field workers also varied from extensive training to only minimal training about effective contact investigation methods.

The process evaluation also elicited barriers involved in identifying contacts. The most common barriers included mistrust by the cases, who were often suspicious of the TB field workers, and misunderstandings about the importance of identifying contacts. In addition, the population with whom TB field staff worked often use nicknames, thereby making contacts difficult to locate. Participants felt that children, sexual contacts outside of marriage, and partners in illegal activities were usually not identified as contacts by the TB case. However, these contacts were often observed to be present when the field worker was carrying out other case management activities such as directly observed treatment (DOT). Education of the case arose several times during the discussion as a possible solution to identified barriers. DTBC protocols called for this type of education for the case; however, TB field workers reported that they felt their educational strategies were inadequate. Field workers knew that education was important, but often felt that the case did not understand the information they presented. Workers were also unsure whether they were effectively relating the importance of identifying all contacts. Focus group discussions also revealed that while contact investigations do not end at any particular point, the most important period is the initial interview. Workers stated that 75-80% of information was obtained in the initial interview.

Developing standardized protocols and the intervention

Based on process evaluation, contact investigation protocols were standardized by the UAB investigators and the ADPH DTBC staff in consultation with the TB area managers and field workers. The process evaluation also indicated that we needed data gathering instruments and procedures that would ensure that all field staff collected consistent, accurate and precise data

* Available from the authors on request.

from the index cases and contacts on variables important to the contact investigation. Therefore, a significant part of the standardization process included developing and obtaining consensus on a new Contact Exposure Assessment Worksheet.[†] The new worksheet more precisely defined the place and environment in which the exposure took place by using three variables to capture this information: place, size (if inside), and ventilation (if inside). The categories into which a contact's exposure environment could be placed were clearly indicated on the worksheet, allowing workers to choose from one of the standard definitions. In addition, exposure frequency and duration was defined by collection of data for three variables: dates of exposure, frequency of exposure and number of exposure hours in each encounter. The categories for these variables were also precisely defined and listed on the exposure assessment worksheet to facilitate acceptance and use of the standard definitions by field workers.

An intervention was developed both to create a change in the TB control system related to the contact investigation and to increase adherence by the TB field workers to the new protocols. The system change consisted of the development of the standardized protocols, forms, and a contact investigation module¹⁶⁻¹⁸ which was incorporated into the DTBC's newly developed computer-based data collection and case management system. The contact investigation module was developed to accomplish three main goals: 1) provide the TB field workers with unambiguous specification of agreed-upon behaviors for effective contact investigation; 2) enhance follow-up of contacts; and 3) enable UAB investigators and the Director of the DTBC to assess protocol implementation. This module used prompts and error messages to provide immediate feedback to the TB field workers and enhance adherence to the contact interview protocol. The prompts and error messages were also intended to reduce missing information. Pull-down options were used to ensure that field workers adhered to the standardized definitions outlined in the new protocols.* A key component of the intervention included training TB staff to enter data into this computer module using a laptop computer. The data were to be transferred daily to area servers and then via modem to UAB. To ensure quality control, field staff data entry and use of the computer module was reviewed monthly. Adherence to the new protocol was also discussed at bi-monthly meetings with area managers. Follow-up educational interventions and revisions to the computer system were performed as necessary.

The behavioral change sought in the TB field workers was adherence to the standardized protocols. The components of the intervention targeted at TB field workers consisted of a training workshop and the use of feedback from the contact investigation computer module and individual supervisors. The training workshop included a review of the risk factors for TB infection, an overview of interviewing skills, the introduction of the contact interview protocols and simulated case scenarios for contact interviews. Field workers were taught how to perform a contact investigation using the standardized protocols and how to collect and maintain precise data on the variables related to contact investigation. This included training on the new forms and computer module, using approximately 20 simulated cases. The training session was designed to increase the TB worker's capability to perform the new protocol and their level of self-efficacy for performance. In addition, field workers were taught the concepts of the health belief model and how a case's willingness to identify contacts is related to his or her perceived seriousness of the disease and his or her perception of contacts' susceptibility to infection. Field workers were taught how to provide education to the case and how to assess the case's understanding of the material presented. TB field workers were taught how to emphasize the confidentiality of the contact investigation process to ease any suspicions the case may have regarding the process. Field workers also learned how to look for clues that there may be

[†]Original and revised worksheets available from the authors on request.

*Sample screens available from the authors on request.

contacts who were not mentioned in the initial interview (such as children's toys in the home when no children were mentioned as contacts).

Implementation of the standardized protocols and intervention

The protocols and intervention were implemented by means of six small group (8-10 participants) regional training sessions. Use of the computer module began immediately after the training session. TB field staff used the computer module in addition to standard paper systems for 6 months before the ADPH implemented mandatory use of the computer module. This allowed TB field workers to become familiar with the new program and data entry screens and provide feedback to UAB investigators and the DTBC Director's office on using the system.

Formative evaluation data

Evaluations of the training sessions by participants were very positive. Two attributes (quality and value) were assessed for each of the six components in the workshop, and an overall assessment of the training was obtained. The overall quality of the training sessions received a mean rating of 4.61, and overall value was rated at 4.71 (scale 1-5; 5=excellent). The lowest overall rating for any training component was 4.37 for one of the demonstration cases.

TB field workers used laptop computers to enter their data, which were to be transferred daily to area servers and then via modem to UAB. The Biostatistics Unit of the Comprehensive Cancer Center at UAB received the data and performed monthly quality control and logic checks. Missing or illogical data were reported back to area managers for use in monitoring quality of performance. During these quality control checks it was observed that data from the field workers' laptop computers were being transferred about once a week. Follow-up throughout the state was required to increase the frequency of transfer. Certain areas were found to have inadequate telephone lines for ease of transfer. Upgrading of the system, including purchasing newer modems, improved but did not eliminate the problem. These quality control checks also revealed that, in general, very few changes to the contact investigation module were made after the initial contact data were recorded.¹⁸ Small group discussions revealed that many field workers kept notes on contact investigation and did not enter data into the computer until after the investigation was complete. Discussions with TB field workers revealed that, due to the location of contact interviews, there was concern about theft of the computer. This concern was partially resolved by counseling workers to keep daily notes and enter data into their laptop on returning to the office or another secure location. Even with counseling and supervision by TB managers, this problem continues, and we believe that more portable and user-friendly hand-held devices will be the eventual solution.

Missing and illogical data were frequent during the initial months after implementing the computer system, but slowly decreased in frequency over time. The monthly quality control checks also allowed the DTBC Director to monitor the performance of each area in the state. The use of monthly quality control checks in combination with the computer prompts for missing data had a strong impact on missing information. Examination of the data at completion of the study showed that there were almost no missing data.

When problems were identified, specific educational interventions were performed as rapidly as possible. For example, two areas were identified as having contact infection rates of 100%.¹⁹ When examined by the DTBC Director's office, it was discovered that these areas were entering information on a contact into the computer module only when the contact had a positive tuberculin skin test. This indicated a lack of adherence to the protocols and possible misunderstanding of the importance of certain elements of the contact investigation. Individual counseling and further training of the TB managers and field workers in these areas eliminated

the problem. Other problems identified using the program data included significant differences in the number of contacts identified per case by area. Examination of this problem indicated that certain areas needed further training in using strategies to identifying all contacts at risk. This training was provided.

DISCUSSION

This paper describes the process used by the ADPH and UAB investigators to standardize contact investigation protocols across a state TB control system. The long-standing collaborative efforts between the ADPH and UAB are unique, and allowed for such an ambitious undertaking. Over the past 30 years, the ADPH has developed and maintained an excellent infrastructure related to TB control. This has included prioritizing control efforts and using specially trained workers to provide all case management activities, including contact investigation. The UAB and the ADPH collaborated before the current study to develop contact investigation protocols. However, even under these ideal circumstances, we found that differences in the interpretation of definitions related to contact investigation (such as size and ventilation of the exposure environment) existed among TB field workers and area managers. Even those workers with years of experience in TB control had different interpretations of variables and contact investigation protocols.

Two recent studies by the Centers for Disease Control and Prevention indicated that a lack of consistent contact definitions and data collection procedures are common throughout the United States.^{20,21} As discussed by both Reichler et al.²¹ and Marks et al.,²⁰ the variations in definitions and types of data collected limit the ability to analyze data on contact investigations. Furthermore, both groups noted that factors that are critical to optimal contact investigation and determination of priority for contact investigation are often not recorded. Such factors as type and amount of contact exposure to the case and contact risk for progression to active TB are essential to determine the risk of TB transmission and need for preventive treatment. Both studies noted that workers were more likely to record information for tuberculin skin test-positive than-negative contacts;^{20,21} however, to examine factors related to transmission of disease and prioritization of contacts, identical data must be collected.

Reichler et al. note that their study was conducted in TB control programs that were considered to be some of the best organized in the country, and thus that their data may underestimate the need for improvement in the contact investigation process.²¹ They advocate that a standard approach for contact investigation has the potential to improve outcomes. To accomplish this, they recommend developing standard definitions and criteria for investigation along with developing effective data management systems to handle the data. This is the process we followed.

The discussions and activities involved in standardizing existing protocols required significant interaction and collaboration among UAB investigators, DTBC staff, and TB field workers. In addition, these activities required a much greater amount of time and effort than expected. Our experience shows that ensuring quality contact investigation procedures requires significant amounts of resources devoted to the process of standardizing protocols and procedures, as well as the continued maintenance of these procedures. However, ensuring standardization of contact investigation protocols allows a TB program to use its data for program management as well as research. We believe that standardizing our protocols allows us to more effectively monitor our contact investigation procedures and will lead to more efficient and effective procedures.

In Alabama, all TB field workers are involved in case management and contact investigation, thereby providing continuity of involvement with the cases and the contact investigation that does not always exist elsewhere. Without this type of continuity, much information related to

contact investigation can be lost. For example, although TB field workers reported that approximately 75-80% of all useful information related to contacts is revealed in the initial interview, very useful and pertinent information is occasionally elicited on subsequent DOT visits. TB field workers reported that children or sexual partners outside marriage (who were not reported in the initial interview) were seen in the house and in this way were identified as contacts. This type of information, which is extremely relevant to efficient contact investigation, is lost without the continuity of a single TB field worker.

The Institute of Medicine and the Advisory Council for the Elimination of Tuberculosis cite the importance of developing more effective methods of identifying contacts with a high risk of infection.^{22,23} However, in order to collect quality data to allow investigators to properly study this issue, health departments and TB control programs must be sure that existing contact investigation protocols are standardized.^{20,21} The process of standardization achieved by our study enabled the research team to collect such data and develop a model of TB infection that predicts contacts at greatest risk of infection.^{24,25} These models are currently being tested to determine if their use can improve the efficiency and effectiveness of contact investigation. As we discovered, even statewide and centralized TB control programs, such as the one in Alabama, lack standardization in key terminology and data collection procedures, and can therefore benefit from this type of process.

CONCLUSIONS

Effective contact investigation is both a science and an art, and is not easy to perform. Even TB workers with extensive experience in contact investigation have different perspectives on the meanings of 'close and prolonged' contact. To perform effective contact investigations and conduct studies to improve the efficacy of these investigations, TB control programs must pay strict attention to precisely defining variables and concepts related to contact investigation. Furthermore, protocols must be standardized and resources devoted to training TB field workers to ensure adherence to these protocols. Interventions to increase staff adherence to protocols should include both biological science training in the transmission of tuberculosis and behavioral interventions with the TB field worker.

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