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SCOLIOSIS SCREENING BY SCHOOL NURSES IN A PUBLIC SCHOOL

by

Mary Jon Wilcox

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A Thesis Submitted to the Faculty of the

COLLEGE OF NURSING

In Partial Fulfillment of the Requirements  
For the Degree of

MASTER OF SCIENCE

In the Graduate College

THE UNIVERSITY OF ARIZONA

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## ABSTRACT

The purpose of this study was to determine school nurses' level of knowledge about scoliosis and the application of that knowledge to scoliosis screening. The study sample consisted of twenty school nurses registered to practice in the state of Arizona. The nurses were employed by Tucson Unified School District One.

The school nurses were asked to complete a questionnaire designed to measure knowledge about scoliosis and scoliosis screening procedures. The study findings indicated no significant relationship between the nurses' knowledge of scoliosis and knowledge about scoliosis screening procedure. There was no significant relationship noted between the participants' knowledge regarding scoliosis and scoliosis screening and age of the participants, assignments, or years employed.

## CHAPTER 1

### INTRODUCTION

Scoliosis, a side to side curvature of the spine, is a progressive disease which can result in structural deformity, impairment in the function of vital organs, and pain if the condition is not recognized early and treated. Approximately 140 of every 100,000 Americans have scoliosis. In about 30 percent of the cases the disease is secondary to other disorders, while the remaining 70 percent of the cases are classified as idiopathic (Cantrell 1976). Scoliosis affects to varying degrees nearly 600,000 adolescents in the United States. Of those affected, approximately 120,000 youngsters ages ten through fifteen years will need treatment (Kane et al. 1978).

Although scoliosis is a potentially disabling disease, Dunn (1978) reports serious deformity can be averted through early detection and treatment. Keim (1977) relates that most spinal curvatures can be treated nonoperatively when detected before becoming too severe. Ironically, the best therapeutic results are obtained when treatment begins with curvatures of 20 to 25 degrees (Winter 1974).

According to Cronis and Glieson (1974), systematic screening can significantly affect the rate of early detection of scoliosis. The screening examination is relatively simple, can be performed by

physicians, nurses, physical education instructors, and others who are trained in the technique. The screening takes only thirty to sixty seconds per individual (Drennan, Campbell and Ridge 1977).

Adolescents ages ten through fourteen years are a target population for early scoliosis detection because the most common type of scoliosis, adolescent idiopathic scoliosis, is generally detected during this age period (Keim 1978). Since school is where the most numbers of students are available for screening, a school scoliosis screening program can be effective for the detection of scoliosis. Fortunately, school-based screening programs which are in effect in a number of states have shown significant results in the early detection of scoliosis (Kane et al. 1978).

School nursing services emphasize health maintenance and prevention. Since secondary prevention includes screening for health defects, school nurses need to be involved in the active promotion, coordination, and implementation of scoliosis screening program (Wold and Dagg 1978). The nurse can be instrumental in the prevention of further impairment by learning the necessary examination techniques for screening all susceptible students for scoliosis.

#### Statement of the Problem

The following questions were investigated in this study:  
What is the level of knowledge of school nurses regarding scoliosis and scoliosis screening.

### Statement of the Purpose

The purpose of this study was to determine school nurses' knowledge about scoliosis and the application of that knowledge to scoliosis screening.

### Significance of the Problem

Scoliosis can become a significantly debilitating physical problem if not detected early. The progress of the disease can be slowed or corrected through early detection thereby preventing scoliosis from becoming a serious problem (Lonstein et al. 1977). Screening for scoliosis has been established as a valuable method for early detection of the disease. School nurses can be actively involved in screening programs that included screening for scoliosis. To adequately initiate, coordinate, and conduct the program, school nurses must be knowledgeable about the disease and about the specific examination for detecting curvatures of the spine.

Several authors (Cantrell 1976; Hungerford 1975; Drennen et al. 1977; Lezberg 1974; Lonstein et al. 1976; Kane et al. 1978) have stressed that the school system is a prime target area for initiating scoliosis screening programs since school is one place where all the children routinely are available. To date, programs have been established by physicians, public health nurses, school nurses, and physical therapists. School nurses are in a position to easily conduct the screenings. However, depending on the nurses' interests, education, previous experiences, and school assignments, they may or

may not be aware of the epidemiology of the disease and the means for early detection of scoliosis.

Knowledge of scoliosis and application of that knowledge are necessary to conduct an effective screening program. The investigator has not found any studies that have been conducted to determine school nurses' level of knowledge regarding scoliosis. Such a study will hopefully add information to the current knowledge about scoliosis. In addition, the data may serve as a basis for future nurse education, possible organization of scoliosis screening programs within the school system, and early detection of the disease.

#### Conceptual Framework

The concepts of knowledge and prevention served as the conceptual framework for this study.

##### Knowledge

The cognitive domain deals with recall or recognition of knowledge and the development of intellectual abilities and skills. Bloom (1956) has developed a classification system or taxonomy which sets levels of performance for the cognitive domain. There are six hierarchical categories in the taxonomy of the cognitive domain: knowledge, comprehension, application, analysis, synthesis and evaluation.

Knowledge is the recall of specifics and universals, the recall of methods and process, or the recall of a pattern, structure, or setting (Bloom 1956). Knowledge includes giving evidence that

one remembers either by recalling or by recognizing some idea or phenomenon with which the individual has had experience. Remembering, a psychological process, is called upon to extract specific knowledge from the mind. In order to test knowledge, a problem needs to evoke specific cues that effectively allow an individual to remember. To solve a specific problem, it may be necessary to organize and reorganize pertinent facts (Bloom 1956).

Bloom (1956) notes that a problem requiring knowledge of specific facts is more easily answered than a problem requiring analysis and synthesis because knowledge of facts is basic for application, synthesis, and ultimately for the evaluation of a problem. To be able to master a higher area or class, one would need to have mastered the preceding classification. For example, to be able to apply a specific method, an individual would need to have knowledge of that method and comprehension of how that knowledge could be applied.

#### Prevention

According to Hilbert (1977), prevention is an activity which can keep something from happening. Many diseases and health hazards can be minimized or eliminated by specific actions to forestall the development of disease or injury. Hilbert has classified prevention activities into three areas. First, there are governmental prevention activities which include water purification, food inspection, control of vectors, and quality air control. The public is a passive recipient of the benefits of this preventive classification. Second,

there are medical care activities offered by health professionals. Blood pressure measurement, immunizations, x-rays, and blood tests are but a few of the services offered to the consumer. For these services to be effective, cooperation between the consumer and the health professional is necessary. Third, individuals may be actively involved in their preventive care. The individual learns to avoid smoking, takes prescribed medications, and follows diet regimes. In this category of prevention, the consumer is directly responsible for his care.

Prevention can also be observed in those activities which protect the health of the community. The activities can be classified into primary, secondary, and tertiary levels of prevention (Wold and Dagg 1978). Primary prevention includes those interventions initiated for health promotion and specific protection such as immunization for specific communicable diseases. Secondary prevention includes early casefinding, prompt treatment, and limitation of disability. Screening for scoliosis is a secondary prevention activity. Wold and Dagg (1978) relate that tertiary prevention focuses on rehabilitation and/or re-education such as needed if a client became a paraplegic.

Nurses have a significant role in the promotion of health and the prevention of disease. The school nurse's role encompasses all levels of prevention. At the secondary prevention level, casefinding includes identifying factors and situations which have a potential for producing illness (Tamann 1971). Since school nurses are involved in screening for casefinding and ultimately for prevention,

they should be knowledgeable about those factors which contribute to the prevention, incidence, control, and treatment of disease in general as well as scoliosis.

School nurses provide health related care which is based on an accumulation of scientific knowledge. Since knowledge is the basis for the practice of nursing, nurses, in order to effectively apply their skills, need to know the rationale for a particular action (King 1971). Beland (1972) stresses that prevention of disability involves the knowledge of factors in the development of the disability and what can be done to prevent or minimize the disability. The relationship between knowledge and application is vital for preventive health activities.

#### Definition of Terms

For the purpose of this study, the following four terms have been defined.

1. Knowledge--factual material possessed by the participants.
2. School Nurse--a registered nurse licensed in the State of Arizona and employed in a school district as a school nurse.
3. Scoliosis--a side to side curvature of the spine.
4. Scoliosis screening--a specific method of examination to detect curvature defects of the spine.

### Summary

Scoliosis can become a severely debilitating disease. Since school health services emphasize health maintenance and prevention, it is logical that school nurses be involved in screening for scoliosis. The school nurse can have a major role in conducting scoliosis screening programs in the schools. To effectively conduct the programs, school nurses need to be knowledgeable about the disease and the procedure for detection.

## CHAPTER 2

### REVIEW OF LITERATURE

A review of the literature revealed numerous articles that described scoliosis, the value of scoliosis screening for early detection, and proper techniques for scoliosis screening. In addition, articles reviewed related information about existing screening programs as well as results from those screening programs. No studies were found which measured or evaluated school nurses' knowledge about scoliosis and application of that knowledge to screening for scoliosis.

#### Scoliosis

"Scoliosis is a complicated deformity that is characterized by both lateral curvature and vertebral rotation (Keim 1978:4)." Progression of the disease can involve a twisting of the spinal column which in turn forces the ribs to fan outward on one side and the ribs to compress inward on the other side (Kane et al. 1978). Changes in the back and chest can eventually result in the significant alteration of pulmonary function and cardiac status due to the defects in the thorax and the decreased lung space. Pathological changes can occur in the vertebrae and other structures near the curvature. Kyphosis (hunchback) and lordosis (swayback) may often be associated with the curvature. If scoliosis is not recognized and treated early,

long term effects of the disease may result in pain, disfigurement, and impairment of cardiac and pulmonary function (Winter and Moe 1972).

Scoliosis is classified into two main types: nonstructural and structural (Appendix C). Nonstructural scoliosis is a flexible side-to-side curvature of the spine, involving no vertebral changes, and may be caused by muscle spasm, leg-length discrepancies or unilateral muscle weaknesses (Hungerford 1975). Keim (1978) relates that the curve is flexible and corrects on side-bending toward the convex side. The spinal curvature is referred to as a functional deformity, requires no specific medical treatment, and may be correctable.

According to Hill and Romm (1977), structural scoliosis is a fixed side-to-side curvature of the spine and the vertebrae are malformed and rotated. The spinal curvature fails to correct on side-bending. Also, physical changes such as the "rib hump" become visible during forward-bending (Keim 1978).

Structural scoliosis is further classified according to the etiologic basis: 1) congenital, 2) neuro-muscular, and 3) idiopathic (Hungerford 1975; Keim 1977 and 1978). Congenital scoliosis is probably not genetic and is usually apparent from birth whereas neuro-muscular scoliosis occurs with other diseases such as muscular dystrophy, cerebral palsy, and polio. Approximately 70 percent of reported structural spinal curvatures are idiopathic in nature which means the cause of the curvature remains obscure in the majority of cases (Hill and Romm 1977).

Keim (1978) stresses that while extensive research in the last thirty years has not revealed specific causes for the idiopathic classification, studies have strongly suggested that about 90 percent of all idiopathic curves are probably genetic in nature. The terms genetic and idiopathic have been used synonymously.

Idiopathic structural scoliosis is classified by age of onset of the spinal curvature as infantile, juvenile, or adolescent (Keim 1978). Infantile idiopathic scoliosis occurs from birth to three years of age and usually affects males. It is thought that the curvature may be due to molding in utero. Approximately 80 percent of the cases in this category resolve spontaneously.

Juvenile idiopathic scoliosis is categorized by those spinal curvatures which occur between the ages of four to ten years. Both males and females are affected almost equally. Most curves in this category are right thoracic curves. Keim (1978) stresses that it is impossible to separate cases of late infantile onset from those of early juvenile onset.

Adolescent idiopathic scoliosis is the most common type of scoliosis and is detected from approximately ten years of age to skeletal maturity. The spinal curvatures are frequently recognized at the time of the adolescent growth spurt which varies among individuals. Adolescent idiopathic scoliosis may affect males and females. Studies have found that 7 to 10 percent of adolescents exhibit some evidence of spinal curvature (Keim 1977). Of these, approximately

2 to 3 percent require active treatment for the curvature such as bracing or periodic observation.

Curvatures of the spine may or may not progress, but the younger the child when the curve develops, the more likely the chance of serious progression. Numerous authors (Hill 1977; Winter 1974; Cantrell 1976; Keim 1978; Baker and Zangger 1976) have emphasized that early detection and diagnosis is important for the prognosis and treatment of scoliosis and that early detection of a spinal curvature may spare individuals needless surgery. Hungerford (1975:1518) stresses that "While the key to the effective treatment of scoliosis is early detection, the key to early detection is specific examination." Early detection and active treatment can avert serious physical and pathological consequences of scoliosis (Winter 1974).

#### Scoliosis Screening

Annual scoliosis screening of adolescents between the ages of ten and fourteen years is vital in the early detection of adolescent idiopathic scoliosis (Winter 1974). An effective measure to detect spinal curvature is through periodical school screening programs. Cantrell (1976) contends that seven million out of the fifty-five million school-age children do not visit physicians except for extreme illnesses. Since the majority of children attend school, the screening programs should be conducted within the school health systems.

A school health program in Falmouth, Massachusetts, has been restructured to include scoliosis screening (Lezberg 1974). Using

specific screening methods, physical education teachers have performed initial screening examinations for scoliosis and have referred suspected cases to the school nurse. The nurse then confirms the screening results and relates the information to parents. During the 1971-1972 school year, six thousand students in grades kindergarten through twelfth have been screened and more than eighty cases of scoliosis have been detected. Based on the results from one year, it has been determined that the scoliosis screening program is relevant as a preventive component of the school health program. Presently, the screenings are being conducted twice a year in grades five through nine and for those younger siblings of students known to have scoliosis (Lezberg 1974).

According to Lonstein et al. (1976), 80,144 students in grades five through eight were screened for scoliosis during the 1973-1974 school year in Minnesota. Findings revealed that the incidence rates for scoliosis detection were 2.5 percent for boys and 4.3 percent for girls. Annual routine screening of school-age children within the schools was considered a rapid, effective method for early detection of spinal deformities. As a result, an annual structured scoliosis screening program was established with the schools.

Cronis and Glieson (1974) have reported that in Delaware statewide scoliosis screening programs have been conducted by the state health department. During a ten year period from 1962 through 1972, 269,046 students have been screened. The screening programs have detected 601 cases of scoliosis and 3,681 other orthopedic

conditions. There are three counties in Delaware and each year individuals in one county are screened by the state health department teams.

Cumberland county schools in Minnesota have been involved in scoliosis screening. According to Weiter (1974), in the years 1966 through 1968 three percent of the children in the sixth through eighth grades showed signs of a spinal curvature. Statistics on 70 percent of the children who received a follow-up consultation revealed that 92 percent had positive findings for scoliosis.

A scoliosis screening study within the Denver, Colorado public school system was conducted during the 1973-1974 school year. Students (4,861) in the seventh grade were evaluated for spinal curvature. The study findings revealed that 155 students (3.2%) had signs of scoliosis. In addition, 12,529 fifth and sixth graders were evaluated for spinal curvature. Of these, 125 students (1.0%) had positive findings for scoliosis (Drennan et al. 1977).

In Athens, Greece, 3494 school children between the ages of 11 and 12 years were screened for scoliosis. Of the school children screened 222 children (6.4%) showed radiographic evidence of an abnormal curvature of the spine (Smyrnis et al. 1979).

Screening for scoliosis was initiated in the Charlottesville-Albemarle public schools in September 1975 (Dunn 1978). In the 1975-1976 school year, 2,608 sixth and eighth graders were screened for scoliosis. Of these, 87 students (3.3%) were referred. During the 1976-1977 school year, 2,440 students were screened and

81 students (3.3%) were referred. As a result of the program, Virginia has initiated a statewide program for scoliosis screening (Dunn 1978).

#### School Nurse Involvement with Scoliosis Screening

School nurses are involved in the promotion of health and the prevention of disease in school aged children. Wold and Dagg (1978) suggest that school nurses be actively involved in planning, implementing, and follow-up activities for prevention. With the assistance of other school personnel, school nurses can effectively screen large numbers of school children (Cantrell 1976): As members of the health team, school nurses have been active in a majority of established scoliosis screening programs. Where programs have not been established, school nurses can effectively initiate screening for scoliosis.

While conducting a literature search, the investigator was able to find one article which dealt with school nurse initiated scoliosis screening programs. Baker and Zangger (1976) described a program in which nurses screened 125 students within a school. Of those screened, thirty-four students had been referred for consultation and five had been x-rayed. Of the five students x-rayed, two were scheduled for re-evaluation at a later date and three were fitted with Milwaukee braces.

#### Summary of Literature Review

A review of the literature revealed that scoliosis can be a seriously debilitating disease. Screening for scoliosis for early

detection of the disease is important since early detection can aid in preventing scoliosis from becoming a severe problem. A number of articles have stressed that screening programs should be made available within the school health system. Studies of those programs have been conducted within the school system have shown that a significant number of cases of scoliosis have been detected. These studies help to substantiate the significance of early detection of spinal problems through screening for scoliosis.

School nurses can be instrumental in establishing scoliosis screening programs in the school health system by learning the appropriate examination techniques. By applying these skills, the nurse can be effective in the early detection of structural changes.

## CHAPTER 3

### METHODOLOGY

This chapter describes the study design, the study sample, the method of data collection, the measurement instrument, and the analysis of data.

#### Study Design

This was a descriptive study designed to determine school nurses' level of knowledge about scoliosis and the application of that knowledge to screening for scoliosis. To determine the level of school nurses' knowledge about scoliosis, subjects were asked to answer questions about scoliosis and scoliosis screening methods. Demographic data were also gathered and correlated with data from the questions.

This study was approved by the Human Subjects Committee of the University of Arizona. A written disclaimer was attached to the front of each questionnaire. The letter explained the purpose of the study and assured participants that their participation was voluntary. The nurses were assured that refusal to participate in the study would in no way affect their employment. No names were asked for on the questionnaire and subjects were informed that the findings would be reported as grouped data. There were no costs or risks to the participants if they chose to complete the questionnaire. The

questionnaire required approximately fifteen minutes to complete. Completion of the questionnaire indicated that the subjects willingly consented to participate in the study (Appendix A).

Permission to conduct the study in Tucson Unified School District One was obtained from the director of nursing. The investigator met with the director of nursing, explained the purpose of the study, the use of the questionnaire, and obtained verbal permission to conduct the study.

#### Study Sample

The subjects for this study consisted of nurses who met the following criteria: (1) licensed to practice as a registered nurse in the State of Arizona; (2) employed as a school nurse in Tucson Unified School District One; and (3) agreed to participate in the study.

The setting for the study was Tucson Unified School District One which is the largest school district in Arizona. The school district is located in Tucson, a city in the Southwestern United States with a population of approximately 400,000.

#### Method of Data Collection

Data collection took place during a monthly staff meeting for Tucson Unified School District One school nurses. The investigator was introduced to the group, explained the purpose of the study and distributed questionnaires to thirty-five school nurses who agreed to participate in the study. Anonymity was assured by the investigator. Twenty (57.14 percent) completed questionnaires were returned

to the director of nursing and the investigator collected the questionnaires from the director of nursing.

#### Measurement Instrument

The measurement instrument for this study consisted of a questionnaire with three sections. The first two sections were designed to measure knowledge about scoliosis and scoliosis screening. The third section gathered demographic data (Appendix B).

The first section of the questionnaire, "Scoliosis Screening for Early Detection," was used with the written permission of Multi-Video International, Incorporated. The questionnaire was included in the programmed instruction for conducting a scoliosis screening program titled: "Scoliosis Screening for Early Detection." The self-assessment tool was designed to measure knowledge about scoliosis and scoliosis screening procedures. No information was available on the reliability or validity of the tool. Completion and multiple choice questions were used and there were a total of fourteen correct answers.

The second section of the questionnaire consisted of a "Scoliosis Screening Procedure Quiz." School nurses' level of knowledge about the scoliosis screening procedure was measured by their responses to eight multiple choice questions. This section was adapted from a checklist included in the programmed instruction "Scoliosis Screening for Early Detection." With the exception of question 2, all questions had more than one correct answer. There were thirty-two correct answers in this section.

Demographic data were obtained from responses to section three of the questionnaire. These data were correlated with the number of correct answers to the questionnaires. Question one asked for the age of the participant and question two asked for educational preparation, that is, diploma, associate degree, bachelor's degree, or master's degree. Questions three and four asked for the number of years the participant was employed as a school nurse and the place of present assignment, that is, elementary, junior high, or high school. Questions five and six dealt with the school nurses' participation in scoliosis screening programs and whether students had been referred to the school nurses for scoliosis screening.

#### Analysis of Data

Data from the three sections of the questionnaire were submitted for analysis that included frequency distribution, mean, and standard deviation. The Pearson Correlation Coefficient was used to analyze relationships between participants scores on the level knowledge about scoliosis and knowledge of the scoliosis screening procedure (Andrews et al. 1974). It was also used to analyze possible relationships between knowledge scores and the years the participants were employed as school nurses, the ages of the participants, and the assignment as school nurse.

Correlations were not calculated on the participant's education level to knowledge of scoliosis and scoliosis screening because sixteen participants (80%) responded they had baccalaureate degrees in nursing.

Eighteen participants (90%) indicated they had participate in scoliosis screening, therefore, correlation was not done for that response.

For the purpose of statistical correlation, if subjects responded that their present assignment was elementary and junior high, the information was recorded in the elementary school category. Also, when the participant responded to several levels of educational preparation, the highest level was recorded.

## CHAPTER 4

### PRESENTATION AND ANALYSIS OF DATA

This study asked the following questions: What is the level of knowledge of scoliosis among school nurses? Is the knowledge applied to scoliosis screening? This chapter will present data that were collected and statistical analysis of the data in order to answer the questions proposed in this study.

#### Characteristics of the Sample

A total of twenty nurses completed the questionnaire (Appendix B for questionnaire). All participants were registered nurses licensed to practice nursing in the State of Arizona, were employed as school nurses in Tucson Unified School District One, and were willing to participate in the study. Thirty-five questionnaires were distributed to school nurses who agreed to participate in the study. Twenty completed questionnaires (57.14%) were returned to the investigator.

Demographic data included the participant's age, educational preparation, years employed, assignment, and participation in scoliosis screening. All participants were female.

### Age

Table 1 presents the ages reported by seventeen of the twenty respondents. Three participants did not specify their ages. The ages of the school nurses ranged from 29 to 59 years with a mean of 41.1 years.

### Education

Table 2 presents the highest level of educational preparation in nursing for the twenty respondents. The educational levels include: diploma, associate degree, bachelor's degree, and Master's degree. Sixteen (80%) of the school nurses have bachelor's degrees.

### Years Employed as School Nurse

The years employed in school nursing reported by nineteen of the twenty respondents is presented in Table 3. One participant did not respond to this question. The number of years employed ranged from 1 through 17 years. The mean number of years employed was 7.3.

### Assignment

Table 4 presents the school assignments for the twenty respondents. Fourteen nurses were employed in an elementary school assignment and six nurses were employed in a senior high school assignment. If a subject responded that her assignment was elementary and junior high, the information was recorded in the elementary school category. None of the twenty nurses responded that they were assigned only to a junior high school. Fourteen (70%) of the school nurses

Table 1. Ages of School Nurses

Age (years)	Frequency (N = 20)	Relative Frequency (%)
29 - 35	4	20.0
36 - 40	5	25.0
41 - 45	3	15.0
46 - 59	5	25.0
Not Specified	3	15.0
Total	20	100.0
Mean = 41.1 years		

Table 2. Educational Preparation of School Nurses

Degree	Frequency (N = 20)	Relative Frequency (%)
Diploma	1	5.0
Associate Degree	1	5.0
Bachelor's Degree	16	80.0
Master's Degree	2	10.0
Total	20	100.0

Table 3. Years Employed as a School Nurse

Years Employed	Frequency (N = 20)	Relative Frequency (%)
11 - 17	3	15.0
6 - 10	9	45.0
1 - 5	7	35.0
Not Reported	1	5.0
Total	20	100.0
Mean = 7.3 years		

Table 4. Assignment of Nurses by Type of School

Assignment	Frequency (N = 20)	Relative Frequency (%)
Elementary	14	70.0
High School	6	30.0
Total	20	100.0

were assigned to elementary schools while six (30%) of the school nurses were assigned to high school.

#### Participation in Scoliosis Screening

Participation in scoliosis screening by the 20 respondents is presented in Table 5. Eighteen (90%) subjects reported they had participated in scoliosis screening programs. Two (10%) subjects reported they had not participated in scoliosis screening programs.

#### Findings Related to Knowledge about Scoliosis

The first eight questions in Section I of the questionnaire pertained to the school nurses' knowledge about scoliosis (see Appendix B for questionnaire). There were a total of fourteen correct answers. The answers were determined as correct or incorrect according to information obtained from the literature review.

Total knowledge scores for each subject were computed according to the number of correct answers to the first eight questions on the knowledge section of the questionnaire. The scores ranged from 7 to 14 correct answers with a possible total of 14 correct answers (see Table 6). One subject (5%) answered fourteen items correctly; three subjects (15%) answered thirteen items correctly; five subjects (25%) answered twelve items correctly; one subject (5%) answered eleven items correctly; two subjects (10%) answered ten items correctly; two subjects (10%) answered nine items correctly; three subjects (15%) answered seven items correctly. The average number of questions

Table 5. Participation by Nurses in Scoliosis Screening

Participation	Frequency (N = 20)	Relative Frequency (%)
Yes	18	90.0
No	2	10.0
Total	20	100.0

Table 6. Number of Questions Answered Correctly in the Knowledge Section of the Questionnaire

Number Correct	Frequency (N = 20)	Relative Frequency (%)
14	1	5.0
13	3	15.0
12	4	20.0
11	2	10.0
10	2	10.0
9	2	10.0
8	3	15.0
7	3	15.0
Total	20	100.0

Mean = 10.4

SD = 2.29

answered correctly by each subject was 10.4. The standard deviation was 2.29.

Further analysis of the knowledge section of the questionnaire revealed minimal variability in participant response. Table 7 illustrates the pattern of correct answers in relation to the questions.

All twenty participants correctly answered questions 1, 2, 3 and 8. These questions concerned scoliosis definition, target age for screening, susceptibility by sex, and early detection. Question 5, which asked for the percentage of children aged 10 to 13 years who show some evidence of spinal curvature, was answered correctly by five subjects (25%). Question 6, which asked for the percentage of children tested who would need active treatment, was answered correctly by 6 subjects (30%). Question 7, which dealt with results of advanced scoliosis, was answered correctly by 9 participants (45%). Seventeen participants (85%) correctly answered question 4 which tested knowledge about familial tendency in scoliosis.

#### Findings Related to Knowledge about the Scoliosis Screening Procedure

Questions 9 through 13 on the first section of the questionnaire and questions 1 through 8 of the second section were determined by the investigator as related to the scoliosis screening procedure (Appendix B). There were a total of 32 correct answers.

Scores for each subject were computed from the number of correct answers to the thirteen questions presented about scoliosis screening procedures. As illustrated in Table 8, the scores ranged from 14 to 30.

Table 7. Number and Percent of Subjects Correctly Identifying Knowledge Items about Scoliosis

Question	Frequency (N = 20)	Relative Frequency (%)
1. Scoliosis definition	20	100.0
2. Target age for screening	20	100.0
3. Susceptibility by sex	20	100.0
4. Familial tendency	17	85.0
5. Percent who show evidence of scoliosis (age 10-13)	5	25.0
6. Percent of tested who need further treatment	6	30.0
7. Results of advanced scoliosis	9	45.0
8. Early detection	20	100.0
Mean = 14.6		

Table 8. Number of Questions Answered Correctly about Scoliosis Screening

Number Correct	Frequency (N = 20)	Relative Frequency (%)
25 - 30	12	60.0
21 - 24	4	20.0
14 - 20	4	<u>20.0</u>
	20	100.0

Mean = 23.2

SD = 4.33

The average number of correct answers for each subject was 23.2 and the standard deviation was 4.33

Questions 9 and 10 in Section I and questions 1, 2, 3 and 5 in Section II tested knowledge about the proper positioning for scoliosis screening. Table 9 presents the number and percentage of subjects who correctly answered the questions about positioning during the scoliosis screening procedure.

Eighteen participants (90%) correctly responded that shoulders should be level, seventeen participants (85%) responded that the hips should be level while eight participants (40%) correctly responded that shoulder blade prominence needed to be evaluated. Seventeen participants (85%) correctly responded to the student position of bent toward examiner, 90° at hips, eleven participants (55%) responded correctly that the arms be straight down, and five participants (25%) responded correctly that the fingers be straight, with tips together.

Nineteen participants (95%) correctly answered that for observation males strip to the waist and sixteen participants (80%) responded that females strip to waist for observation. In answer to the position of the examiner sixteen participants (80%) identified the correct response. Nineteen participants (95%) correctly responded that the student stand erect for the back examination while fourteen participants (70%) correctly responded that feet be together during the back examination. Sixteen participants (80%) correctly responded that during the forward bending position the arms be straight down. Four participants (20%) answered that the palms be together and nine

Table 9. Number and Percent of Subjects Correctly Identifying Scoliosis Screening Positioning

Question	Frequency (N = 20)	Relative Frequency (%)
<b>Section I</b>		
<b>9 <u>Evaluating Bare Back</u></b>		
Shoulders level	18	90.0
Hips level	17	85.0
Shoulder blade prominence	8	40.0
<b>10 <u>Student position for observation</u></b>		
Bend toward examiner, 90° at hips	17	85.0
Arms straight down	11	55.0
Fingers straight, tips together	5	25.0
<b>Section II</b>		
<b>1 <u>Students prepared for observation</u></b>		
Males strip to waist	19	95.0
Females strip to waist	16	80.0
<b>2 <u>Position of Examiner</u></b>		
Sit facing student at four feet	16	80.0
<b>3 <u>Position of student for exam of back</u></b>		
Stand erect	19	95.0
Feet together	14	70.0
<b>5 <u>Student in forward bending position</u></b>		
Arms straight down	16	80.0
Palms together	4	20.0
Feet apart	9	45.0

participants (45%) correctly responded that the feet be apart in the forward bending position.

Question 11 in Section I and questions 4 and 6 in Section II relate to those abnormalities to observe during scoliosis screening. Table 10 illustrates the number and percentage of participants who correctly identified abnormalities to observe during scoliosis screening.

Sixteen subjects (80%) correctly identified that a hump on one side of the upper back was an abnormality to be observed while 14 participants (70%) correctly responded to identifying a compensating hump on the other side of the lower back. All twenty participants correctly identified that the shoulder level should be observed for abnormal positioning and 19 subjects (95%) noted that hip levels should be observed. Fourteen participants (70%) correctly answered that the position of the spine should be examined. Nineteen participants (95%) correctly identified that the position of the shoulder blades and presence of humps should be observed.

Question 6 in Section II of the questionnaire identified what should be observed during the forward bending examination. Fifteen subjects (75%) correctly identified that the differences in the upper and lower back should be observed while 19 subjects (95%) responded correctly that the differences in the levels between the two sides of the back and humps on the back should be observed.

Table 10. Number and Percent of Subjects Who Correctly Identified Abnormalities to Observe for during Scoliosis Screening

Question	Frequency (N = 20)	Relative Frequency (%)
Section I		
11 <u>Abnormalities Identified in Bending Position:</u>		
Hump on one side of upper back	16	80.0
Compensating hump on other side of lower back	14	70.0
Section II		
4 <u>During Exam of Back, Observe For:</u>		
Shoulder level	20	100.0
Hip levels	19	95.0
Position of spine	14	70.0
Position of shoulder blades	19	95.0
Presence of humps	19	95.0
6 <u>During Exam in Forward Bending Position Observe For:</u>		
Differences in upper and lower back	15	75.0
Differences in levels between both sides of back	19	95.0
Humps on the back	19	95.0

Question 12 in the first section and questions 7 and 8 in the second section of the questionnaire tested subject knowledge regarding what actions should be taken when abnormalities are detected. Table 11 illustrates how participants responded to these questions.

Twenty participants (100%) answered correctly that a recheck should be done if scoliosis was suspected. Thirteen participants (65%) agreed that referral was needed, and 5 participants (25%) answered correctly that a follow-up examination be done. For question 7 six participants (30%) responded correctly that the student's back should be observed when bending away from the examiner. Fourteen participants (70%) answered that a more skilled examiner should observe the student's back. Seventeen participants (85%) answered correctly that letters should be sent to parents if scoliosis was detected, and 18 participants (90%) responded correctly that follow-up action was needed to determine if the student had received additional consultation.

Analysis of the data using Pearson Correlation Coefficient indicated no significant relationship between the participants' scores on the level knowledge of scoliosis and the scores on knowledge of scoliosis screening procedures (Appendix D for correlation matrix).

The knowledge scores were also correlated with demographic data obtained from the participants' responses to section three of the questionnaire. The participants' ages, the number of years employed as school nurses and school nurse assignments were compared with the participants' scores on knowledge of scoliosis and scores on knowledge of scoliosis screening procedures. Using the Pearson Correlation

Table 11. Number and Percent of Subjects Correctly Identifying Actions to Be Taken when Abnormalities Are Detected in Scoliosis Screening

Questions	Frequency (N = 20)	Relative Frequency (%)
Section I		
12 <u>Actions taken if scoliosis is suspected</u>		
Recheck	20	100.0
Refer	13	65.0
Follow-up	5	25.0
Section II		
7 <u>In a questionable case examiner</u>		
Observes student while student bend away from examiner	6	30.0
Have more skilled examiner observe back	14	70.0
8 <u>If scoliosis is detected</u>		
Send letter to parent	17	85.0
Follow-up regarding further consultation	18	90.0

Coefficient and a .05 level of significance, no significant relationships were found (Appendix D for correlation matrix).

Correlations were not done on the educational levels of the school nurses since sixteen (80%) had baccalaureate degrees in nursing. In addition, since eighteen participants (90%) indicated they had participated in scoliosis screening, no correlation was done for that response.

#### Summary of Findings

The findings of this study were presented in the following areas: characteristics of the sample, knowledge of scoliosis, and knowledge of scoliosis screening procedures. The sample consisted of twenty nurses who completed the questionnaire. All participants were registered nurses licensed to practice nursing in the State of Arizona and were employed as school nurses in Tucson Unified School District One.

In the section of the questionnaire related to the knowledge of scoliosis, all twenty participants correctly answered the questions about detection. There were a total of fourteen correct answers in this section and scores ranged from a low of seven correct answers to a high of fourteen correct answers. One participant (5%) identified correctly all answers in this section.

The knowledge portion of the questionnaire related to scoliosis screening procedure was divided into three sections: scoliosis screening positioning, abnormalities to observe for during scoliosis screening, and actions taken after abnormalities are detected. The

investigator determined that there were a total of 32 correct answers in this section. Scores ranged from a low of 14 correct answers to a high of 30 correct answers. None of the participants answered all the questions correctly in this section.

A correlation was done between the participants' scores regarding level of knowledge about scoliosis and scores for knowledge of scoliosis screening procedures using the Pearson Correlation Coefficient. Analysis of the data indicated no significant relationship (Appendix D for correlation matrix).

In addition, the knowledge scores were correlated with demographic data obtained from responses to Section III of the questionnaire. Knowledge scores were correlated with the age of the participants, the number of years employed as school nurses using the Pearson Correlation Coefficient (Appendix D for correlation matrix).

## CHAPTER 5

### DISCUSSION OF FINDINGS

The purpose of this study was to determine school nurses' level of knowledge about scoliosis and application of that knowledge to scoliosis screening. Since no studies were found in the review of literature that measured school nurses' knowledge about scoliosis and application of that knowledge to scoliosis screening, results of this investigation cannot be discussed in relation to other studies. The study findings identified possible patterns of information which need further investigation.

#### Characteristics of the Sample

The study population consisted of twenty registered nurses employed by Tucson Unified School District One. The average age of the participants was 41.1 years. Educational preparation included 1 participant (5%) with a diploma degree, 1 participant (5%) with an associate degree, 16 participants (80%) with bachelor's degrees, and 2 participants (10%) with master's degrees. Seven subjects (35%) had been employed less than five years while 9 subjects (45%) were employed 6 to 10 years and 3 subjects (15%) were employed 14 to 17 years. Fourteen participants (70%) were assigned to elementary schools and 6 subjects (30%) listed their assignments as high school.

Eighteen participants (90%) had previously participated in screening procedures for scoliosis, while 2 participants (10%) had not.

### Knowledge

The knowledge items on the questionnaire did not provide significant variability of subject responses. Participants' knowledge scores about scoliosis ranged from 7 through 14 with 14 the highest attainable score. The average score was 10.4. In answer to the percentage of 10-13 year old individuals who show evidence of scoliosis, five participants (25%) responded correctly. The question asking for the percentage of youngsters tested who needed further treatment was correctly answered by six participants (30%). The low scores may have been due to the fact that both items asked for recall of specific facts which would not affect the scoliosis screening procedure. The individuals may not have felt these facts were important.

Participants' knowledge about the scoliosis screening procedure ranged from 14 to 30 with 32 the highest attainable score. The average score was 23.2. The question asking about the student positioning with the fingers straight and the fingertips together was correctly answered by five participants (25%). The question asking about observation of the shoulder-blade prominence was correctly answered by eight participants (40%). In the forward bending position, four participants (20%) correctly answered that the palms be together and nine participants (45%) correctly answered that the feet be apart. The question pertaining to follow-up action after the detection of

abnormalities was answered correctly by five participants (25%) while the question about the examiner's procedure when a questionable case was found was answered correctly by six participants (30%).

Analysis of the data indicated no significant relationship ( $r = -.06$ ) between nurses' knowledge scores about scoliosis and knowledge scores about scoliosis screening procedure. Participants' number of correct answers were correlated with the age of the participants, number of years employed as a school nurse, and school nurse assignments. No significant relationships were found between knowledge scores and demographic data.

## CHAPTER 6

### SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

#### Summary

This descriptive study was designed to measure school nurses' level of knowledge about scoliosis and application of that knowledge to the scoliosis screening procedure. The conceptual framework for this study was based on the concepts of knowledge and prevention. Knowledge about scoliosis was viewed as a motivating factor for the school nurses to take preventive action. The preventive action of the school nurses was represented by screening for scoliosis. A relationship between knowledge and application was seen as vital for preventive health practices.

The study sample consisted of twenty school nurses employed by Tucson Unified School District One. To determine the level of knowledge subjects possessed regarding scoliosis, they were requested to respond to a questionnaire that tested factual knowledge regarding scoliosis. The second section of the questionnaire included items about the scoliosis screening procedure. Both completion and multiple choice questions were used in the questionnaire.

Demographic data obtained from responses to section three of the questionnaire were correlated with the knowledge scores of

scoliosis and the scoliosis screening procedure. No correlations were done on the educational levels of the participants since sixteen (80%) had baccalaureate degrees in nursing. Since eighteen participants (90%) indicated they had participated in scoliosis screening, no correlation was done for that response.

The Pearson Correlation Coefficient was selected for data analysis (Andrews et al. 1974). Using a significance level of .05, no significant relationship ( $r = -.06$ ) was found between participants' scores on level of knowledge about scoliosis and scores which reported knowledge about scoliosis screening procedures. No significant relationship was found between the level of nurses' level of knowledge and the years employed as school nurses, school nurse assignments, or ages of the participants (Appendix D for correlation matrix).

### Conclusions

The following conclusions have been derived from the data presented in the preceding pages:

1. There was no significant relationship ( $P = .05$ ) between school nurses' level of knowledge about scoliosis and the application of that knowledge to scoliosis screening.
2. No significant relationship ( $P = .05$ ) was found between knowledge scores of scoliosis and scoliosis screening procedure and the participants' ages, assignments, or years employed as a school nurse.

### Recommendations

The following recommendations have been derived from the data presented in the preceding pages:

1. Test the validity and reliability of the measurement tool used in the study utilizing a random sample of sufficient size.  
Redesign questions as needed as based on findings.
2. Determine if the participants have had training for scoliosis screening before doing the study. This information could be used in determining a need for inservice education on scoliosis screening.
3. Investigate the frequency of scoliosis screening programs.  
Observe scoliosis screening procedure to determine if the examination is being done correctly.
4. Investigate scoliosis referral and follow-up practices to determine if scoliosis cases are detected and treated.

## APPENDIX A

### LETTER OF INTRODUCTION

#### KNOWLEDGE AND APPLICATION OF SCOLIOSIS SCREENING BY SCHOOL NURSES

This questionnaire is part of a research study entitled "Knowledge and Application of Scoliosis Screening by School Nurses." Screening is necessary for early detection of scoliosis and through early detection, scoliosis can be prevented from becoming a severe problem. The purpose of this study is to determine what school nurses know about scoliosis and screening procedures for early detection of the disease. The information obtained from the study will add to the accumulation of knowledge regarding scoliosis. In addition, it may serve as a basis for future nurse education and organization of scoliosis screening programs.

Your participation in this study is completely voluntary. The completion of this questionnaire will require approximately fifteen minutes of your time and there will be no costs or risks to you from participation in this study. You may withdraw from the study at any time. Your participation will in no way affect your employment status. Completion of the questionnaire indicates that you have willingly consented to participate in this study. Be assured that all questionnaires are anonymous and all information will be kept confidential. Information obtained from the questionnaire will be used for completion of a community health nursing master's degree at the University of Arizona.

Your participation is greatly appreciated. The success of the project depends upon your participation. After completion, the investigator will be available to answer questions concerning the questionnaire. A summary of the results of the study will be provided upon request.

Mary Wilcox  
Graduate Student  
College of Nursing,  
University of Arizona

APPENDIX B

QUESTIONNAIRE

SCOLIOSIS SCREENING FOR EARLY DETECTION\*

Section I

Self-Assessment Quiz

1. Define scoliosis: \_\_\_\_\_
2. Because of the frequent development of the deformity during these years, what age group must be screened for scoliosis? (Check one)  
\_\_\_ 1-4 yrs. old, \_\_\_ 5-9 yrs. old, \_\_\_ 10-13 yrs. old, \_\_\_ 13-16 yrs. old, \_\_\_ 16-19 yrs. old.
3. Are \_\_\_ females or \_\_\_ males more susceptible to scoliosis? (Check one)
4. Scoliosis tends to run in families: \_\_\_ True \_\_\_ False
5. What percent of youngsters in the critical age group show some evidence of curvature of the spine? (Check one) \_\_\_ .4%, \_\_\_ 1%, \_\_\_ 2%, \_\_\_ 3%, \_\_\_ 4%, \_\_\_ 8-11%.
6. What percent of children tested will need active treatment--bracing and/or surgery--for scoliosis? (Check one) \_\_\_ .4%, \_\_\_ 1%, \_\_\_ 2%, \_\_\_ 3%, \_\_\_ 4%, \_\_\_ 8-11%.
7. In advanced cases of scoliosis, which of the following results may occur? (Check as many as apply) \_\_\_ spinal nerve impaired, \_\_\_ breathing problems, \_\_\_ lung collapse, \_\_\_ premature death, \_\_\_ arthritic symptoms, \_\_\_ pain, \_\_\_ incapacitation.
8. If scoliosis is detected early, usually a brace alone can solve the problem and the child can lead essentially a normal life.  
\_\_\_ True \_\_\_ False

\*Copyright ©1975 Multi Video International, Inc., Minneapolis, Minn.  
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9. What three factors must be carefully checked when observing the bare back of a standing child?
- \_\_\_\_\_
  - \_\_\_\_\_
  - \_\_\_\_\_
10. Describe the position the child should be in for observation of the bare back in the bending position?
- \_\_\_\_\_
- \_\_\_\_\_
11. What two abnormalities should the examiner look for with the child in the bending position?
- \_\_\_\_\_
  - \_\_\_\_\_
12. If scoliosis is detected or suspected, what actions should be taken?
- \_\_\_\_\_
  - \_\_\_\_\_
13. Fill in the following blank to indicate how long a scoliosis screening takes:

## Section II

### Scoliosis Screening Procedure Quiz\*

This section of the questionnaire relates to scoliosis screening. Please check the correct answer or answers. There may be more than one correct answer given.

- Students should be prepared for observation by:
  - \_\_\_ males strip to waist
  - \_\_\_ males may wear T-shirts.
  - \_\_\_ females may wear bra or body suit.
  - \_\_\_ females strip to waist.
- Position of examiner. The examiner should:
  - \_\_\_ stand facing the student at a distance of four feet.
  - \_\_\_ sit facing student at a distance of four feet.

\*Adapted from 1975 Multi Video International, Inc., Minneapolis, MN

3. The student's position during back examination includes:
  - a. \_\_\_ standing erect.
  - b. \_\_\_ bringing feet together.
  - c. \_\_\_ arms placed on hips.
  
4. During examination of the back, the examiner should observe for:
  - a. \_\_\_ shoulder levels.
  - b. \_\_\_ hip levels.
  - c. \_\_\_ position of spine.
  - d. \_\_\_ position of shoulder blades.
  - e. \_\_\_ presence of humps.
  
5. The student's position during forward bending position includes:
  - a. \_\_\_ student bends away from the examiner at a 45° angle
  - b. \_\_\_ legs straight, knees bent.
  - c. \_\_\_ arms hanging straight down.
  - d. \_\_\_ palms together.
  - e. \_\_\_ feet apart.
  
6. During examination of the student in the forward bending position the examiner should observe for:
  - a. \_\_\_ differences in upper and lower back.
  - b. \_\_\_ differences in levels between the two sides of the back.
  - c. \_\_\_ humps on the back.
  
7. If there is a questionable case, the examiner should:
  - a. \_\_\_ immediately refer to private physician.
  - b. \_\_\_ observe the back while the student bends away from the examiner.
  - c. \_\_\_ have a more skilled examiner examine the back.
  
8. If scoliosis is detected:
  - a. \_\_\_ tell student to notify parents.
  - b. \_\_\_ phone parents to notify of screening results.
  - c. \_\_\_ send letter to parents.
  - d. \_\_\_ follow-up to make sure student has received further consultation.

Section IIIDemographic Data

Please complete the following:

1. Age \_\_\_\_\_
2. Educational Preparation in Nursing:
  - Diploma \_\_\_\_\_
  - Associate Degree \_\_\_\_\_
  - Baccalaureate \_\_\_\_\_
  - Master's Degree \_\_\_\_\_
3. Years employed as a school nurse \_\_\_\_\_
4. Present Assignment:
  - Elementary \_\_\_\_\_
  - Jr. High \_\_\_\_\_
  - High \_\_\_\_\_
5. Have you ever participated in a scoliosis screening program?
  - Yes \_\_\_\_\_
  - No \_\_\_\_\_

If no, have you ever identified a child with scoliosis and referred for consultation and/or treatment?

  - Yes \_\_\_\_\_
  - No \_\_\_\_\_

If yes, what was the age of the student?
6. Has any one referred a student to you for scoliosis screening?
  - Teacher \_\_\_\_\_
  - Administrator \_\_\_\_\_
  - Parent \_\_\_\_\_
  - Student \_\_\_\_\_
  - Other \_\_\_\_\_ please list \_\_\_\_\_

Comments:

## APPENDIX C

### SCOLIOSIS CLASSIFICATION

- I. NONSTRUCTURAL SCOLIOSIS
- II. STRUCTURAL SCOLIOSIS
  - A. CONGENITAL
  - B. NEUROMUSCULAR
  - C. IDIOPATHIC (GENETIC)
    - 1. INFANTILE
    - 2. JUVENILE
    - 3. ADOLESCENT

APPENDIX D

CORRELATION OF KNOWLEDGE AND DEMOGRAPHIC DATA

Table D-1. Correlation Matrix of Age, Years of Employment, and Assignment Level with Knowledge of Screening Procedure

	Age	Years of Employment	Assignment Level	Knowledge of Scoliosis	Knowledge of Screening Procedure
Age	1.00	N.A.	N.A.	-.17 (17)	-.51 (17)
Years of Employment	N.A.	1.00	N.A.	-.12 (19)	-.52 (19)
Assignment Level	N.A.	N.A.	1.00	.15 (20)	-.08 (20)
Knowledge of Scoliosis	-.17 (17)	-.12 (19)	.15 (20)	1.00	-.06 (20)
Knowledge of Screening Procedure	-.51 (17)	-.52 (19)	-.08 (20)	-.06 (20)	1.00

Level of Significance = .05

N.A. = Not Applicable. Correlation not done.

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