CHEST X-RAYS AS A TEACHING AID IN PHYSICAL ASSESSMENT OF THE CHEST OF THE ADULT

by

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s.m.h.

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CHAPTER I

INTRODUCTION

The current trend for nurses to assume more responsibility in patient care has motivated them to increase their knowledge and skills in systematic assessment of patients. Increasing these skills requires classroom and clinical instruction in the physical assessment of the patient.

Anatomy and physiology must be understood before the nurse can carry out any patient assessment. One method of reinforcing anatomical landmarks is through the use of radiology. According to Hynes (1973), radiology can interpret practical living anatomy for the medical student. Transparent overlays of anatomical diagrams superimposed on x-rays can show the student how anatomical structures relate to the x-ray and to the patient. One area in which anatomical landmarks are particularly important is in assessment of the thorax and lungs. This radiologic teaching method in medicine should be equally as effective in nursing education.

Review of Literature

A review of the nursing education literature provides evidence that academic achievement does not vary significantly with the method of instruction used (Langford, 1972; Stein, 1972; Thompson, 1972; Arnold, 1978 & Blatchley, 1978). However, an increasing number of nursing education programs include the use of audiovisual and other forms of mediated instruction since a preference for these alternate instructional methods is often reflected by students and faculty (Deegan, 1972; Langford, 1972; Stein, 1972; Thompson, 1972; VanMondfrans, Sorensen & Reed, 1972; Collart,

1973; Griggs, 1977; Huckabay, 1977; Arnold, 1978 & Blatchley, 1978). Pertinent studies have been selected to demonstrate these points.

To individualize the learning process, the faculty at Evanston Hospital School of Nursing (Thompson, 1972) developed a pilot modular course to compare the autotutorial method of instruction with the traditional lecture method. Areas for comparison were immediate academic achievement, retention of information and preference for instructional method. A group of 40 second-year Medical-Surgical nursing students were selected for the pilot study. The course was divided into three modules with structured content presented through media and books. Examination scores revealed no statistically significant difference between the two groups in immediate achievement or retention of information one year later. However, 55 per cent of the students in the pilot study favored the media approach to the traditional lecture.

Stein, Steele, Fuller and Langhoff (1972) compared the independent laboratory technique with traditional classroom instruction by examining cognitive, affective and psychomotor aspects of learning. Subjects included 60 sophomore nursing students assigned to either an experimental or a control group. The groups were matched according to specific variables such as gradepoint average, anxiety, achievement orientation and extroversion. The experimental group worked independently at their own pace with modern autotutorial equipment; the control group attended traditional lectures. Midterm and final exam scores and clinical grades indicated no significant differences in learning between the two groups. However, the two groups differed in teacher ratings, interaction process analysis and evaluation of classroom environment. Significantly more students in the experimental group engaged in self-analysis ($p \leq .01$),

problem structuring ($p < .01$) and giving of information ($p < .01$). The experimental group rated overall satisfaction with the course more highly than did the control group ($p < .001$).

Arnold (1978) reported similar findings to the above studies. She compared the effectiveness of three teaching strategies for a learning module in a Fundamentals of Nursing course. The strategies included programmed materials, lecture-discussion and a student-choice format. One hundred and sixty freshman nursing students were randomly assigned to one of three groups. There were no significant differences in scores on the written tests among the three groups. There was no correlation between the students' written test results and scores on the college laboratory performance tests. Given a choice of teaching strategies, however, the students preferred that more than one instructional method be available in the same course. The conclusion was that students should be allowed to choose teaching strategies to accommodate their individual learning preferences.

Although overall academic achievement does not vary significantly with the method of instruction used, VanMondfrans, Sorensen & Reed (1972), Griggs (1977),Huckabay, Cooper and Neal (1977), and Meyers (1978) reported significant results in learning between teaching methods in relation to certain specific objectives. The three most recent studies are presented to demonstrate the types of learning that are significantly influenced.

Huckabay et al. (1977) investigated the effects of four different teaching techniques on cognitive learning, transfer of theory to hypothetical cases and affective behaviors of nurses. The teaching techniques used were lecture only, lecture with discussion, filmstrip only and filmstrip with discussion. The experimental design included randomized

assignment of subjects to one of four groups; the experimental group taught by means of filmstrip with discussion and three control groups taught by means of lecture, lecture with discussion or filmstrip only. Subjects included 131 registered nurses in an inservice education class. Pre and posttests were given to measure cognitive learning and transfer. Affective behavior was measured only by posttest.

Although there were no overall significant differences between the experimental group and the control groups on amount of cognitive learning and affective behaviors, the major finding was that the group taught by filmstrip with discussion could transfer theory into hypothetical cases significantly ($p < .05$) more than subjects with lecture only. These methods of instruction produced almost equal amounts of learning in nurses. However, the nurses preferred the lecture with discussion and filmstrip with discussion methods significantly more than the lecture only or filmstrip only methods.

Griggs (1977) also compared two different instructional methods and found significant results. The subjects included 137 Allied Health students randomly placed in four treatment groups; programmed instruction, audiovisual, a combination of the first two, and control without exposure to the minicourse. Pretest scores revealed homogeneity of the sample in academic ability. Findings showed that all three groups exposed to one or both methods of the minicourse scored higher than the control. The group that received the combined methods, programmed instruction and audiovisual, scored the highest. Subjective data indicated an ambivalence of feelings toward the minicourse. Most appreciated the effort to improve methods of teaching, but stated the course lacked relevance to their clinical rotations which varied in terms of patient care assignment.

Meyers (1978) compared performance of students taught by means of traditional instruction with those taught by means of a combination of traditional and autotutorial instruction. The sample consisted of three consecutive classes of all sophomore nursing students enrolled in Fundamentals I and II at the University of South Carolina School of Nursing. A static group design was used. The first class received traditional instruction. The second and third classes received traditional instruction with the addition of autotutorial instruction using audiovisual aids and study guides.

Student performance was measured by final course grades for each semester and National League for Nursing Achievement Test scores in two areas at the end of each year. In Fundamentals I, there was a significant increase in the number of A's and B's between the first and third classes ($p < .01$). Percentage of failures declined from four per cent the first year to zero per cent the second and third years. Fundamentals II showed a significant increase in number of A's and B's between the first and second years ($< .01$). Failures declined from nine per cent the first year to three per cent the second year to two per cent the third year.

The percentile of scores on the first National League for Nursing Achievement Test increased from 75 per cent the first year to 89 per cent the second year ($p < .01$). Although these scores decreased the third year, they were not lower than scores the first year. The second National League for Nursing Achievement Test consisted of questions related to nursing observations and judgments and natural science applications to patient care. These scores remained the same each year. The significant increase in scores on the first National League for Nursing Achievement Test was considered to be due to the large number of self-instructional programs in the

areas covered by the exam. The lack of change among the classes in the second National League for Nursing Achievement Test scores was concluded to be related to the insufficiency of learning programs on the topics in the examination. This data does support the use of autotutorial instruction when it planned to meet specific objectives and when adequate resources were available. The Hawthorne effect could be important here because the students in the second year knew they were the initial group to receive the autotutorial instruction. No student preference evaluation was carried out.

Although much of the objective data on comparison of instructional methods showed insignificant findings, students and faculty still prefer alternate forms of teaching. Deegan (1970) and Collart (1973) reported student and faculty preference for self-directed learning techniques without any objective data collection.

Deegan (1970) discussed student and faculty satisfaction with two innovations into the program at Washington Hospital. Basic sciences, nutrition and diet therapy were integrated into a single course using self-directed study with a well-equipped audio-tutorial laboratory. Weekly small group sessions were conducted by a student to clarify the week's content. An instructor was present to give a quiz to the students. The study concluded that student-centered learning produced more satisfaction and lasting results than the teacher-centered learning.

A computer assisted instruction program on closed drainage systems of the chest was studied by junior nursing students at Ohio State University (Collart, 1973). Students unanimously ranked this method of learning first before all other methods. They enjoyed the immediate response to their questions, the opportunity to move quickly through understood material and

being active in their own learning.

In summary, review of nursing education literature did not consistently show increases in learning with alternate teaching methods. However, three studies (Griggs, 1977; Huckabay, et al., 1977 & Meyers, 1978) demonstrated significant findings when an alternate method was added to a traditional method such as lecture instead of replacing the traditional method. Ellis (1965) and Huckabay, et al. (1977) suggested that these findings may be attributable to the fact that redundant stimuli are more effective than a single stimulus in learning.

Additionally, a majority of the studies indicated subjective preference for mediated instruction by both students and faculty. Similar findings appear in the medical education literature on the use of radiologic material as a supplement to traditional medical school coursework.

Radiology Instruction in Medical Schools

Traditionally, instruction in radiology has been dependent upon the medical student's prior knowledge of anatomy. Currently, medical schools place emphasis on integrating radiologic anatomy and radiologic pathology into the curriculum at the same time that basic sciences are being taught (Johnson, 1969; Squire, 1969 & Hynes, 1973).

Several medical school courses have been designed using radio-diagnosis to illustrate basic anatomic principles, to introduce pathological conditions that can be used to explain anatomic relationships and to assist in the concept of learning by problem-solving (Hynes, 1973). Through the use of x-rays in anatomy classes, many radiologists (Johnson, 1969; Cockshott, 1973 & Tegtmeyer, 1974) have contributed to the medical student's understanding of the aspects of morphology, dynamic pathology and clinical management. Emphasizing the importance of this early integration of

courses, Squire (1969) stated:

> "Few graduates in medicine ever see much actual gross pathology either at surgery or at autopsy after their internship except as represented on the film studies; therefore, an appreciation of the way in which the x-ray relates to disease is vital in preparation for reviewing pathology in the years postgraduation." (p. 486)

At the University of Texas (Schreiber, 1971), a 20-week freshman course in normal radiologic anatomy was offered concurrently with the student's studies in the gross anatomy laboratory. The purpose was to increase the student's understanding of the normal before introducing radiologic pathology. In the sophomore year, radiologic pathology was emphasized. The focus was not on teaching film interpretation, but using visual images to point out pathophysiology and to relate what the student knew about pathology to clinical situations. The University of Michigan had instructed the medical students in radiology in a similar sequence to present the roentgenologic and fluoroscopic appearances of anatomical and physiological functions as early as 1945 (Hodges).

Several studies have compared methods of instruction in teaching radiology (Johnson, 1969; Squire, 1969; Cookshott, 1973; Tegtmeyer, 1974 & Moss and McLachlan, 1976). Johnson (1969) documented the significant effect that small group conferences had upon the learning of radiology. He found that when a freshman class of 93 students was divided into groups of 24 or less, the examination scores were higher for the students in the small groups compared with the scores of students in the undivided group of 80 students. In the same study, it was shown that performance was higher on test scores in groups where original x-rays were employed rather than 35 mm.

slides or overhead projections. As indicated by opinionnaire responses, students appreciated the relationship of structures better when they viewed original films.

In contrast to the above study which suggested students' preference for viewing original x-rays, Moss and McLachlan (1976) had a group of six medical students assess the use of videotapes in teaching diagnostic radiology. They concluded that the medium of videotapes was an appropriate method for presenting radiographs. Because of the ratio of undergraduate students to radiologists, Cockshott (1973) also foresaw the increasing need for audiovisual systems in radiology education.

In review, the use of x-rays has been reported to be an effective aid in teaching anatomical and physiological principles to medical students. Various instructional methods have been used successfully when measured on student perference. Johnson (1969) demonstrated higher performance outcomes with the use of original x-rays.

Statement of the Problem

Because of the vast amount of information presented to nursing students, effective methods of instruction are needed. Research of the effectiveness of instructional media in nursing education generally indicates no difference in learning between students taught through use of media and those taught by lecture. However, some significant findings have resulted when media have been used in addition to lecture.

In view of the recent inclusion of physical assessment courses in nursing school curricula, research is needed to determine efficient methods of teaching physical assessment. Introduction of x-rays in anatomy and physiology courses in medical schools has been found useful. A visual aid

in the form of chest x-rays may be an appropriate way of illustrating anatomic, physiologic and pathologic principles to a presentation on physical assessment of the chest.

Purpose of the Study

To determine if use of chest x-rays does increase the student nurse's knowledge in physical assessment of the adult chest, the following hypothesis was tested:

> Associate Degree student nurses taught physical assessment of the adult chest with the use of chest x-rays in addition to the traditional lecture will score higher on a posttest than Associate Degree student nurses taught physical assessment of the adult chest without the addition of chest x-rays.

CHAPTER II

METHODOLOGY

Subjects and Setting

The subjects selected for the study were from the second year class of the Associate Degree Nursing program at Clark College in Vancouver, Washington. This particular sample was selected to test the hypothesis because the researcher was a nursing instructor in the program at the time of the study.

The researcher contacted the Director of the program to request permission to involve the students in the study. Written permission was granted (See Appendix A). Because the lecture content was a part of the scheduled teaching program, no informed consent was required of the students to add the x-rays to selected class sessions. The setting was a classroom in the Health Sciences Building on the Clark College campus.

Design

The design was a field experiment. The subjects voluntarily signed up for one of four instructional sessions that best coordinated with their time schedules. The order of presentation and thus assignment to group was done by non-replacement random sampling (See Table 1).

A pretest was administered to each group prior to the lecture to determine a reference for entry level of knowledge. A lecture with original chest x-rays as visual aids was presented to the experimental group; a lecture only was presented to the control group. One week after the lecture, a common posttest was administered to both groups to evaluate

Table 1

Order of Presentation to Subjects in Both Groups as Determined by Random Assignment

Session				Group to which subjects were assigned: Experimental	Control
I	Monday	--	11:30am	X	
II	Monday	--	1:30pm		X
III	Wednesday	--	8:00am		X
IV	Wednesday	--	10:00am	X	

the effectiveness of the independent variable; the use of chest x-rays as a teaching aid in assessment of the adult chest.

Independent Variable

The independent variable was the addition of the chest x-ray as a teaching aid in assessment of the adult chest. Six chest x-rays were selected; three were normal adult chest x-rays and three were abnormal adult chest x-rays. The normal x-rays demonstrated three views of the chest; anterior-posterior, right lateral and left lateral. Transparent overlays were placed over the normal x-rays to emphasize anatomical landmarks and lobes of the lung. The anterior-posterior view had an overlay showing the three right lobes, the two left lobes, the trachea, bronchi, imaginary antatomical lines and the costal angle. The right lateral chest x-ray demonstrated the three right lobes. The left lateral chest x-ray demonstrated the two left lobes. The abnormal chest x-rays selected were: pneumonia process, pneumothorax and fluid-filled lung. These were shown to contrast to the normal chest x-rays. No overlays were used on the abnormal x-rays.

Dependent Variable

Student achievement was measured by posttest scores. Both groups received the same posttest which consisted of the same 13 items included in the pretest plus 47 items that were designed to measure the effectiveness of the chest x-ray as a visual aid in adult chest assessment (See Appendices B and C for pretest and posttest questions).

Data Collection Procedure

One week before the beginning of the experimental period the researcher announced the following:

> I am presenting a lecture titled "Physical Assessment of the Chest of the Adult". It will be given at four different times. I am dividing the class into four groups according to clinical laboratory schedules. The Tuesday-Wednesday laboratories will sign up for the lecture on Monday at 11:30 or 1:30. The Thursday-Friday laboratories will sign up for the lecture on Wednesday at 8:00 or 10:00. Each session will be one hour, 15 minutes long. There is a limited number of 15 students per session. I am passing around a sheet for the sign-ups. Thank you.

The order in which the groups received the presentation was determined by random selection from a hat to control for the effect of repeated presentations by the researcher. The result was experimental, control, control, experimental.

Both groups received the pretest prior to the lecture to determine if the samples were from the same population. The pretest consisted of 13 objective questions.

On Monday, Groups I and II received one hour of presentation with time allocated according to Table 2 (See Appendix D for an outline of the lecture content).

Table 2

Allocation of Time in Each Lecture Session

Regardless of Group

TOPIC	TIME
Introduction	5 minutes
Pretest	15 minutes
General Approach	5 minutes
Inspection	10 minutes
Palpation	5 minutes
Percussion	5 minutes
Auscultation with or without Chest X-rays	30 minutes
Total Time	75 minutes

On Wednesday, Groups III and IV followed the same presentation format as Groups I and II.

At the beginning of each session, the investigator announced the following:

> The topic of this lecture is "Physical Assessment of the Chest of the Adult". This presentation is in partial fulfillment of my Master's degree. Consequently, I do not want you to discuss any of today's lecture material with anyone that is not present in this particular group. There will be a followup session on next Monday at 8am in Foster Auditorium at which time you will be given a posttest. The purpose of the posttest is to evaluate the method of instruction and what you have gained from today's lecture, not what you have gained from outside study. After the posttest you may ask questions concerning the study, and you may then discuss this with anyone you want to. During this one hour, 15 minute session, I want to accomplish two goals; first, to find out your entry level of knowledge on this topic by administration of a pretest, and second, to present the information to you. Use your social security number as identification on the pretest. Write your social security number in the upper righthand corner of the test. You have 15 minutes to complete the test. Only ask questions for clarification.

On the following Monday, the posttest was administered to all students in the study.

Analysis of Data

Means and standard deviations were calculated for both groups pre and posttest scores. A one-tailed t-test was then applied to all the data. The .05 confidence level was accepted as indicating a statistically significant difference. Item difficulty indices were computed for the 47 posttest items.

CHAPTER III

RESULTS AND DISCUSSION

The entire second year class of 56 students of the Associate Degree Nursing program at Clark College in Vancouver, Washington were the subjects of this study. Fifty-four of the 56 students signed up for one of the four scheduled sessions. Thirty-three students or 59 per cent of the potential sample actually attended the lectures. The investigator was unable to contact all of the students who didn't attend the instructional sessions. However, the 15 students contacted who did not attend gave these reasons: twelve had a conflict in time schedules; one sprained his ankle and was in the hospital, one already had sufficient information on chest assessment; one forgot.

Twenty-nine of the 33 students attending the lectures completed the pretest and posttest. These 29 students became the sample for the study. Fifteen students were in the control group and fourteen were in the experimental group.

Means and standard deviations for the pretest scores for both groups were computed from the raw scores. The mean pretest score of the control group was 4.57 with a standard deviation of 1.28. The mean pretest score of the experimental group was 4.27 with a standard deviation of 1.83. A one-tailed t-test for uncorrelated data demonstrated that at .05 confidence level there was no significant difference between the groups (t_{obs} = .52, See Table 3). This indicated that both groups entered with an equivalent level of knowledge prior to the lecture presentation.

The hypothesis stated that a group of student nurses taught physical assessment of the adult chest with the addition of chest x-rays as a visual aid would score higher on a posttest than a group of student nurses taught physical assessment of the adult chest without the addition of chest x-rays. The dependent variable, the posttest, consisted of 60 items. The first 13 items on the posttest were the same as the 13 items on the pretest. The remaining 47 items were designed as an additional measurement of the effectiveness of the independent variable.

Means and standard deviations were computed from the raw scores for both groups for the 60-item posttest. The mean 60-item posttest score for the control group was 43.80 with a standard deviation of 8.08. The mean 60-item posttest score for the experimental group was 47.71 with a standard deviation of 6.17. A one-tailed t-test for uncorrelated data for the 60-item posttest scores was $t_{obs} = 1.46$ demonstrating no statistical significance at the .05 confidence level (See Table 3). Thus the hypothesis was not supported.

Because the posttest included 13 items from the pretest, means and standard deviations were computed for both groups for the 47-item posttest scores from the raw scores. These 47 items were considered by the investigator to include the information best presented by the addition of the x-ray. The mean score for the 47-item posttest for the control group was 35.93 with a standard deviation of 6.80. The mean 47-item posttest score for the experimental group was 38.93 with a standard deviation of 6.06. A one-tailed t-test for uncorrelated data was $t_{obs} = 1.25$ demonstrating no significance in learning between the two groups (See Table 3).

In order to investigate why the 47-item posttest scores did not reveal any difference in learning between the groups, an item difficulty index was

Table 3

Means, Standard Deviations and T-ratios for Pretest and Posttest Scores for Uncorrelated Data

Examination	Control (N=15)		Experimental (N=14)		
	$\bar{x}$	s	$\bar{x}$	s	t-ratio
Prestest: 13 items	1.27	1.83	4.57	1.28	.515
Posttest: 13 items	7.87	2.32	8.79	1.72	1.24
Posttest: 60 items	43.00	3.08	47.71	6.17	1.46
Posttest: 47 items	35.93	6.80	38.93	6.06	1.25

computed for each of these items (See Appendix E). These item difficulty indices were calculated to assess if the insignificant results in posttest scores between groups could be attributed to the instrument rather than the independent variable. The item difficulty index is defined as the number of individuals who answer an item correctly divided by the number of individuals taking the test (Downie, 1970). Items that fell within the range .40-.60 were accepted as good questions. This range was selected because the items falling within this range are considered good questions. That is, they are neither too hard nor too easy.

Forty-three items or 91 per cent ranged between .60-1.0. These questions were rejected as being too easy. An example was number 14 which asked the student to identify the anatomical structure on the chest diagram. The answer was the trachea. Although this information was needed for chest assessment, it was probably already part of their basic knowledge since all students had taken a course in anatomy and physiology. Two items fell below .40; these were rejected as too difficult. For example, number 16 had a difficulty index of zero. It asked the student to name a part of the sternum. It seemed to request too specific an answer in light of the content presented. Another explanation for these low difficulty indices might be that the importance of the information to chest assessment wasn't emphasized. Only two items of the 47 considered to provide the best evidence supportive of the x-ray content fell within the acceptable range. Thus, the instrument was considered to be an inadequate measure of the effectiveness of the independent variable.

One significant finding occurred when the 13-item posttest scores were compared with the 13-item pretest scores for each group to assess the

amount of learning within each group. The mean of the 13-item posttest scores for the control group was 7.87 with a standard deviation of 2.32. The one-tailed t-test for correlated data of 6.87 indicated a significant difference between pretest and posttest scores for the control group (See Table 4). The mean of the 13-item posttest scores for the experimental group was 8.79 with a standard deviation of 1.72. The one-tailed t-test for correlated data of 8.73 (See Table 4) showed a significant difference between pretest and posttest scores for the experimental group. Thus both groups showed a significant gain on the 13-item posttest after the instructional sessions. However, the experimental groups showed more improvement when compared to the control group. This was interesting since both groups entered the lecture presentation with an equivalent level of knowledge. One explanation for this result might be that the students in the Associate Degree Nursing program were accustomed to the autotutorial method of instruction with the aid of audiovisual materials. Because they were accumstomed to mediated instruction, the experimental group might have felt more confident with concepts presented in a visual medium. A possible explanation for the significant increase in the 13-item posttest scores for both groups might be that the students were self-motivated and considered the information relevant to clinical practice as suggested by Hodges (1945), Johnson (1969), Squire (1969), Schreiber (1971), and Hynes (1973).

The remaining 47-item posttest scores revealed no significant increase in learning within groups or between groups. However, subjective feedback indicated that the experimental group seemed more stimulated and though they had learned more because of the use of chest x-rays as a visual aid. Even though no significant improvement in learning was shown in either group,

Table 4

Means, Standard Deviations and T-ratios for 13-Item Posttest Scores for Correlated Data

Examination	Control (N=15)			Experimental (N=14)		
	$\bar{x}$	s	t-ratio	$\bar{x}$	s	t-ratio
Posttest: 13 items	7.87	2.32	6.87*	8.79	1.72	8.73*

*significant at .05 confidence level

$p < .0001$

students preferred lecture with chest x-rays. This finding agrees with the results of Deegan (1970), Langford (1972), Stein (1972), Thompson (1972), Huckabay, et al. (1977), Arnold (1978), and Blatchley (1978).

Subjective feedback in this study revealed that students taught with chest x-rays seemed more stimulated as evidenced by the number and quality of questions they asked during and after the lecture. These students also remained after the lecture to more closely view the x-rays for anatomical landmarks. The experimental group wrote comments on the posttest indicating appreciation and a sense of learning from the lecture because of the use of chest x-rays. The subjective feedback was obtained through verbal comments from students, written notes on posttests and observations made by the researcher. However, no formal preference evaluation was given to the groups.

The experimental group questioned why x-rays were not used in their anatomy and physiology course to show how the anatomical structures related to one another. These students expressed amazement at how x-rays clarified or altered their ideas concerning the size and location of the lungs and heart. They also expressed a better understanding of how these anatomical structures correlated to one another.

Because of what the chest x-ray encompassed, the students in the experimental group were able to observe the elevation of the right hemidiaphragm with its relationship to the liver. The chest x-ray also showed the trachea with its bifurcation into the right and left mainstem bronchi. Students in this study were in agreement with students in other studies (Hodges, 1945; Squire, 1969; Schreiber, 1971 & Hynes, 1973) in that anatomical principles were better illustrated with the use of x-rays.

Because of the particular chest x-rays selected to depict pathologic anatomy, the students were overwhelmed by the contrast between normal and abnormal findings. This seemed to have reinforced the importance of respiratory nursing care for the patients with pneumonia and pneumothorax. The abnormal chest x-rays seemed to have provided more meaning to respiratory nursing care for both prevention and for treatment of pathology.

In summary, although no significant increase in learning was demonstrated by the experimental group, both groups did show an increase in knowledge as measured by the 13-item pretest-posttest scores. Students reported a preference for the use of chest x-rays as a visual aid. It would be interesting to find out if there would be a significant difference in retention of information between the control group and the experimental group after a longer period of time.

CHAPTER IV

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The current trend for nurses to assume more responsibility in patient care has motivated them to increase their knowledge and skills in systematic assessment of patients. Anatomy and physiology must be understood before the nurse can carry out any patient assessment. One method of teaching anatomy and anatomical landmarks for use in physical assessment is through the use of radiology. Review of the literature concerning the use of x-rays as teaching aids in anatomy revealed the application of this method in schools of medicine but not in schools of nursing. Therefore, twenty-nine students from the Associate Degree Nursing program at Clark College participated in a field experiment comparing two methods of instruction.

Results of this study showed that the experimental group taught physical assessment of the adult chest with the addition of chest x-rays as a visual aid and the control group taught physical assessment of the adult chest without the addition of chest x-rays did not achieve a statistically significant increase in level of knowledge as revealed by the 60-item posttest scores. Thus the hypothesis was rejected.

However, both groups showed a significant increase in knowledge as indicated by the 13-item posttest scores, with the experimental group scoring the highest. This was of interest since both groups entered the lecture presentation with an equivalent level of knowledge. Item analysis of the posttest revealed it to be an inadequate measure of the independent

variable. Subjective feedback in the study revealed that students taught with chest x-rays seemed more stimulated and asked more questions than the control group.

Conclusion

Although the hypothesis was not supported, the inadequacy of the instrument may account for these findings. Subjective feedback revealed that students taught with the chest x-rays seemed more stimulated and asked more questions during and after the lecture presentations.

Recommendations for Further Study

On the basis of the present study, it is suggested that the following recommendations be considered:

1. Replication of this study using larger numbers of students with random assignment of subjects.

2. Refinement of the discriminatory characteristics of the test instrument used to improve the range of acceptable questions when the chest x-ray is used as a visual aid.

3. Subsequent nursing research studying the use of x-rays as a teaching aid demonstrating anatomy related to other body systems.

4. Future research to demonstrate the effect of the use of chest x-rays on retention and transfer of learning over a longer period of time.

5. Inclusion of other forms of media, especially audiotapes of breath sounds in research done in the area of chest assessment.

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APPENDIX A

Letter Granting Request of Permission for Study

CLARK COLLEGE
A PUBLICLY SUPPORTED COMMUNITY COLLEGE

October 24, 1978

Dr. Barbara Gaines
University of Oregon School of Nursing
3181 S. W. Sam Jackson Park Road
Portland, Oregon 97201

Dear Dr. Gaines:

Permission is hereby granted for Miss Susan Horky to carry out her research project involving the cooperation of Clark College Nursing students. Miss Horky, a member of the nursing instructional staff at Clark College, is taking graduate study at the University of Oregon School of Nursing.

Sincerely,

Mary Ann Thimmes

Mrs. Mary Ann Thimmes
Director of Nursing Programs

MAT:rs
cc - Susan Horky

1800 E. McLOUGHLIN BLVD · VANCOUVER, WASHINGTON · 98663 · 206-694-6521

APPENDIX B

Pretest

PRETEST

Circle the letter of the correct answer. Write your Social Security Number in the upper righthand corner of this page.

1. In the normal adult, what is the relationship of the anteroposterior diameter of the chest to the lateral diameter of the chest?

   a. larger than
   b. smaller than
   c. the same as

2. Which sign or signs demonstrate increased respiratory effort?

   1. use of accessory muscles
   2. barrel chest
   3. retraction of interspaces during inspiration
   4. inspiratory phase shorter than expiratory phase

   a. 1,2,4
   b. 2,3,4
   c. 1,2,3
   d. 1,3
   e. all of the above

3. The rate of respirations per minute for the normal, resting, awake adult is:

   a. 20-26
   b. 10-16
   c. 4-10

4. Which terms refer to thoracic cage deformities?

   1. kyphosis
   2. emphysema
   3. scoliosis
   4. thoracotomy

   a. 1,3
   b. 1,3,4
   c. 2,4
   d. 1,2,3
   e. all of the above

5. Which sign or signs demonstrate splinting?

   1. slow, deep respirations
   2. asymmetrical chest wall expansion
   3. Cheynes-Stokes respirations
   4. shallow respirations

      a. 2,3,4
      b. 1,3
      c. 2,4
      d. 3,4
      e. all of the above

6. In which direction should the chest wall move upon inspiration?

   a. upward and outward
   b. inward and downward
   c. outward only

7. In a tension pneumothorax, the trachea will deviate:

   a. away from the affected side
   b. toward the affected side
   c. no change

8. In auscultating the chest, the examiner should ask the patient to:

   a. breathe normally with his mouth open
   b. breathe normally with his mouth closed
   c. breathe deeply with his mouth open
   d. breathe deeply with his mouth closed

9. Diminished or absent breath sounds may indicate:

   1. pneumothorax
   2. bronchitis
   3. atelectasis
   4. pneumonia

      a. 3 only
      b. 1,3,4
      c. 1,2,3
      d. 1,4
      e. All of the above

   Name the four kinds of normal breath sounds.

10.

11.

12.

13.

APPENDIX C

Posttest

POSTTEST

The Posttest consists of the following 60 items. Circle the letter of the correct answer. Write your Social Security Number in the upper righthand corner of this page.

1. In the normal adult, what is the relationship of the anteroposterior diameter of the chest to the lateral diameter of the chest?

   a. larger than
   b. smaller than
   c. the same as

2. Which sign or signs demonstrate increased respiratory effort?

   1. use of accessory muscles
   2. barrel chest
   3. retraction of interspaces during inspiration
   4. inspiratory phase shorter than expiratory phase

      a. 1,2,4
      b. 2,3,4
      c. 1,2,3
      d. all of the above

3. The rate of respirations per minutes for the normal, resting, awake adult is:

   a. 20-26
   b. 10-16
   c. 4-10

4. Which terms refer to thoracis cage deformities?

   1. kyphosis
   2. emphysema
   3. scoliosis
   4. thoracotomy

      a. 1,3
      b. 1,3,4
      c. 2,4
      d. 1,2,3
      e. all of the above

5. Which sign or signs demonstrate splinting?

   1. slow, deep respirations
   2. asymmetrical chest wall expansion
   3. Cheynes-Stokes respirations
   4. shallow respirations

      a. 2,3,4
      b. 1,3
      c. 2,4
      d. 3,4
      e. all of the above

6. In which direction should the chest wall move upon inspiration?

   a. upward and outward
   b. inward and downward
   c. outward only

7. In a tension pneumothorax, the trachea will deviate:

   a. away from the affected side
   b. toward the affected side
   c. no change

8. In auscultating the chest, the examiner should ask the patient to:

   a. breathe normally with his mouth open
   b. breathe normally with his mouth closed
   c. breathe deeply with his mouth open
   d. breathe deeply with his mouth closed

9. Diminished or absent breath sounds may indicate:

   1. pneumothorax
   2. bronchitis
   3. atelectasis
   4. pneumonia

      a. 3 only
      b. 1,3,4
      c. 1,2,3
      d. 1,4
      e. all of the above

   Name the four kinds of normal breath sounds.

10.

11.

12.

13.

14-20. Name the anatomical structures according to the numbers below.

1.

2.

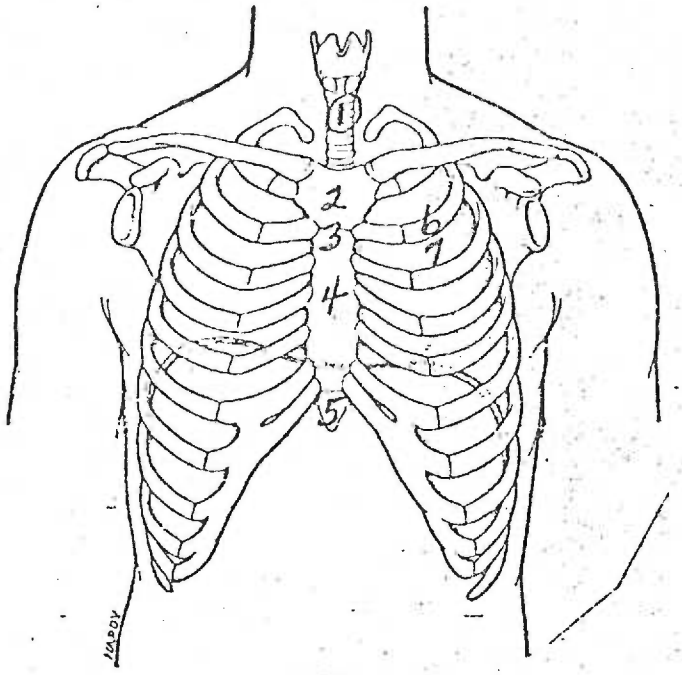
3.

4.

5.

6.

7.



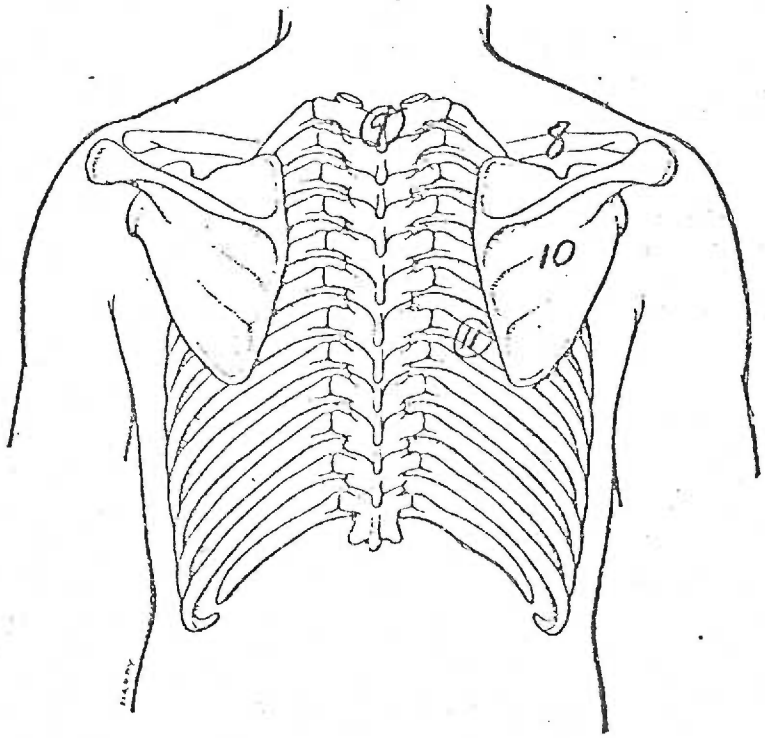
21-24. Name the anatomical structures according to the numbers below.

8.

9.

10.

11.



25-31. Name the imaginary vertical lines using the following numbers. Place the numbers on the respective lines in the diagrams.

1.

2.

3.

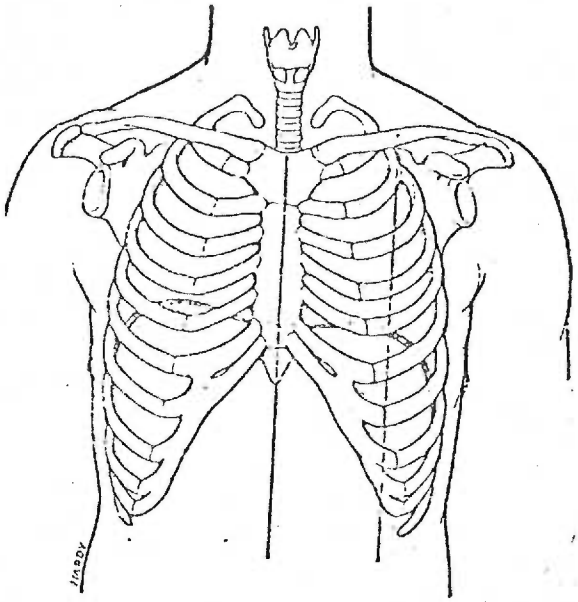
4.

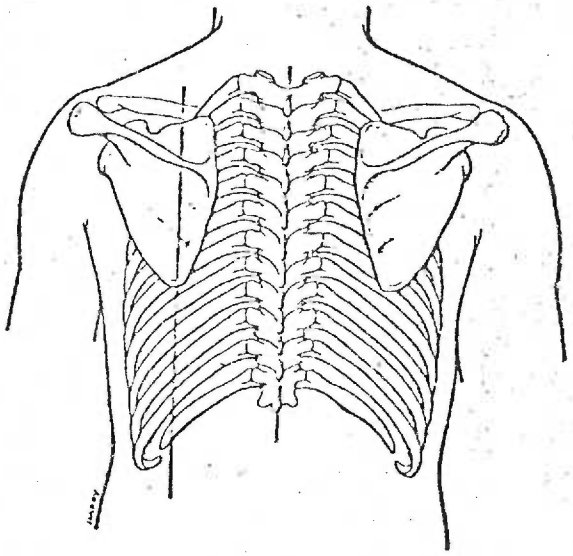
5.

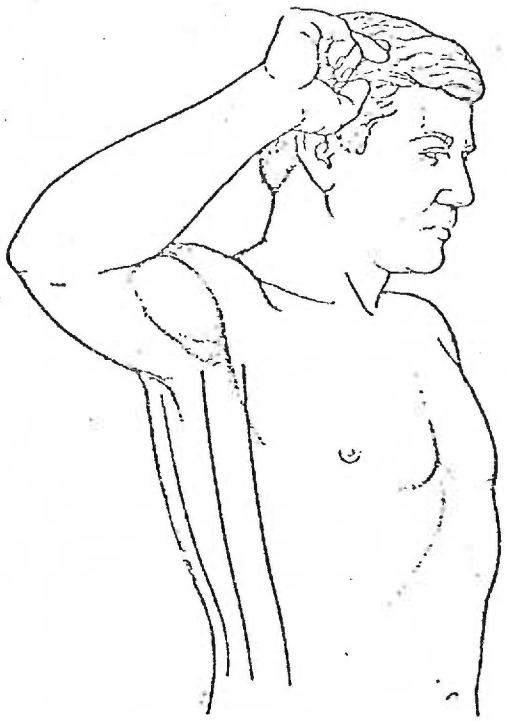
6.

7.

32-38.





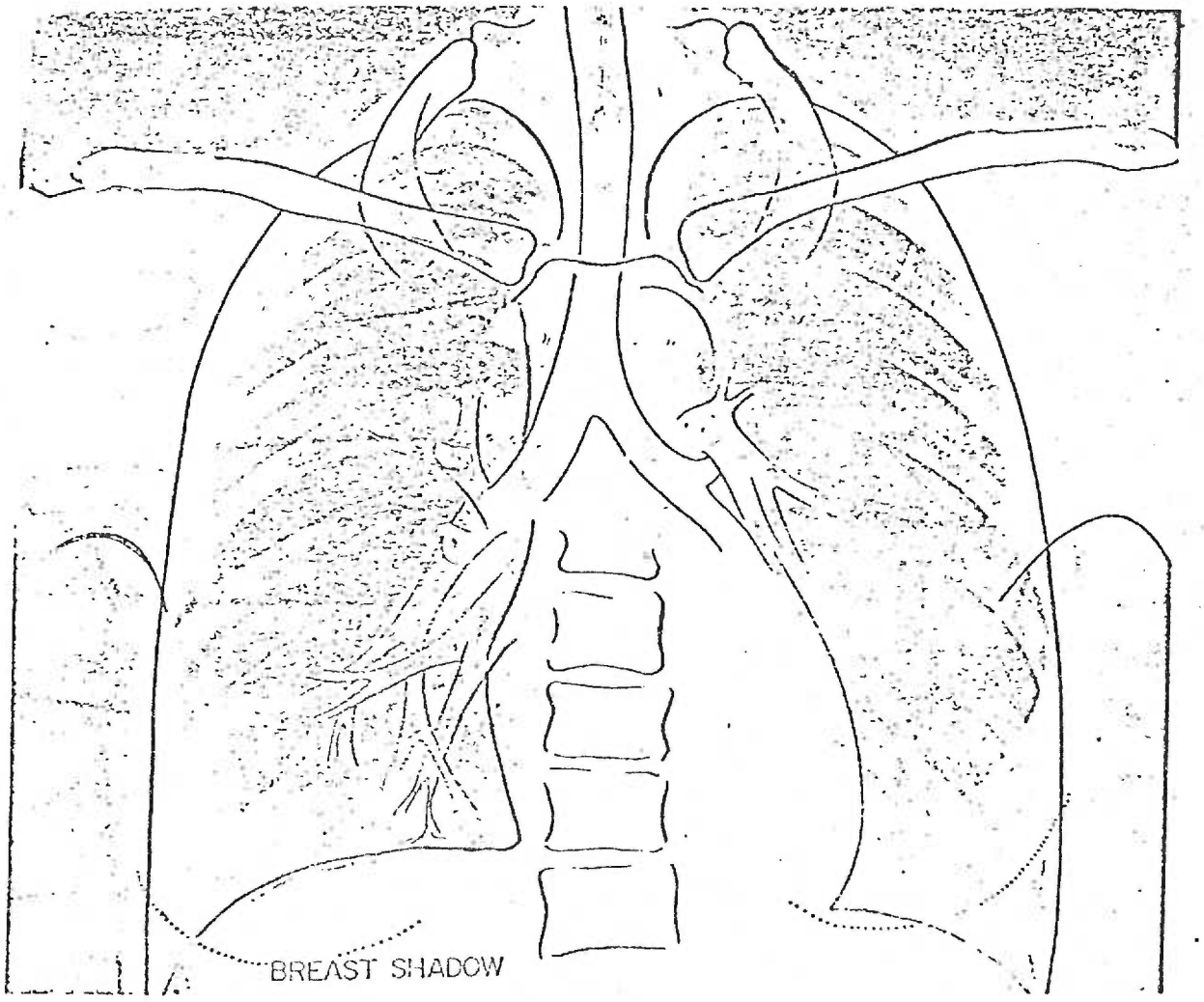


39-42. In the numbered spaces provided below, list the terms used for the four kinds of normal breath sounds. Place that number in the area where you would auscultate for that breath sounds. Use the diagram below.

1. 3.

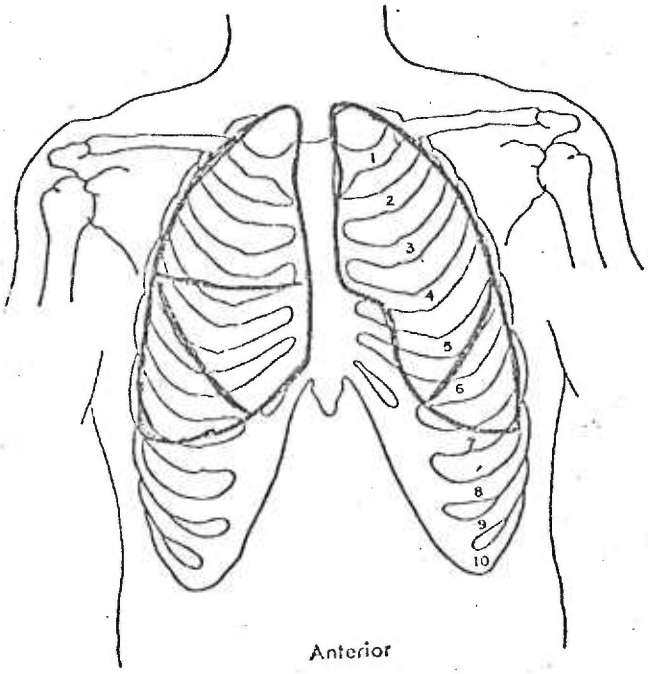
2. 4.

43-46.



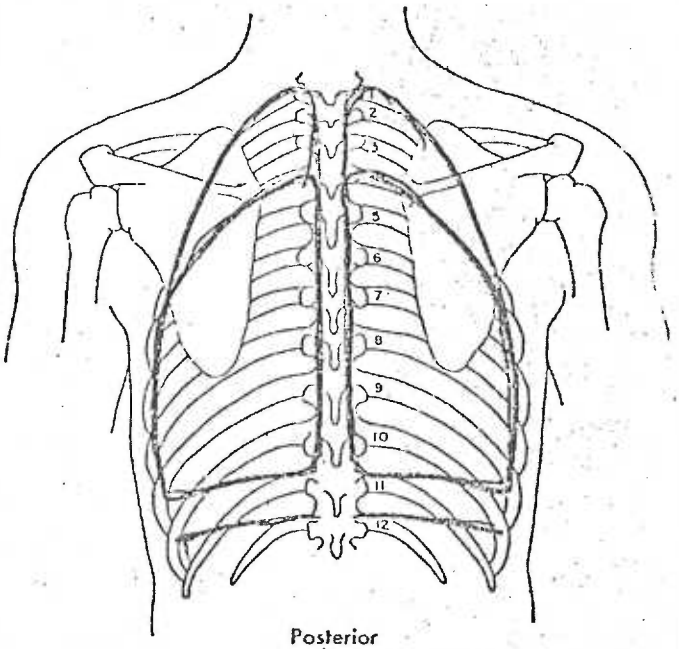
47-60. Label the lobes of the lungs according to the four views: anterior, posterior, right lateral, left lateral.

47-51.



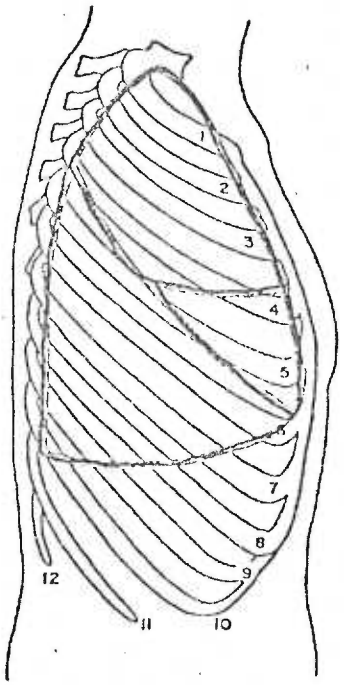
Anterior

52-55.



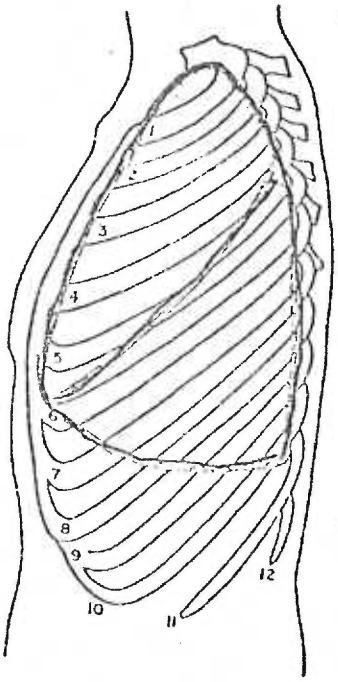
Posterior

56-58.



Right lateral

59-60.



Left lateral

APPENDIX D

Outline for Lecture Content

Outline for the Lecture Content
Physical Assessment of the Chest of the Adult

I INTRODUCTION: General Approach

II INSPECTION

A. The configuration of the thorax.
B. The rate and pattern of respirations.
C. The movement of the thorax during respiration.

1. Assessment of the thoracic expansion.
2. Type of respiratory movement.

III PALPATION

A. Palpation of the trachea.
B. Palpation of the thoracic wall.

1. Reasons.
2. Technique.

C. Vibratory palpation of the lungs and pleurae.

1. Definition.
2. Procedure used.
3. Vocal or tactile fremitus.

IV PERCUSSION

A. Definition.

1. Sonorous.
2. Definitive.

B. Thoracic anatomy.
C. Topography of the lobes of the lungs.
D. Basic principles of sound physics.
E. Techniques for percussion.

1. Immediate or direct.
2. Mediate or indirect.

F. Characteristics of percussion notes.

1. Tympanic.
2. Hyperresonant.
3. Resonant.
4. Dull.
5. Flat.

IV PERCUSSION continued

G. Procedure in thoracic percussion.

V AUSCULTATION

A. Use of the stethoscope.
B. Origin of breath sounds.
C. Normal breath sounds.

1. Tracheal.
2. Bronchial.
3. Bronchovesicular.
4. Vesicular.

D. Altered breath sounds.

1. Decreased.
2. Absent.
3. Increased.

E. Voice sounds.

1. Normal.
2. Bronchophony.
3. Whispered pectoriloquy.
4. Egophony.

F. Adventitious sounds.

1. Rales or crackles.
2. Rhonchi or wheezes.
3. Friction sounds.

APPENDIX E

Difficulty Indices for 47 Posttest Items

Difficulty Indices for 47 Posttest Items

Item Number	Difficulty Index
14	1
15	.17
16	0
17	.93
18	.93
19	.97
20	.93
21	1
22	1
23	1
24	1
25	.93
26	1
27	.90
28	1
29	1
30	.90
31	.97
32	.93
33	1
34	.90
35	1
36	1
37	.90
38	.97
39	.83
40	.79
41	.72
42	.72
43	.72
44	.66
45	.55
46	.62
47	.69
48	.69
49	.69
50	.62
51	.66
52	.62
53	.62
54	.62
55	.59
56	.69
57	.69
58	.69
59	.69
60	.69

AN ABSTRACT OF THE CLINICAL INVESTIGATION OF

SUSAN M. HORKY

For the MASTER OF NURSING

Date of Receiving this Degree: June 8, 1979

TITLE: Chest X-rays as a Teaching Aid in Physical Assessment of the Chest of the Adult

Approved: [redacted]

Barbara Gaines, R.N., D.Ed., Associate Professor
Clinical Investigation Advisor

The current trend for nurses to assume more responsibility in patient care has motivated them to increase their knowledge and skills in systematic assessment of patients. Increasing these skills requires classroom and clinical instruction in the physical assessment of the patient. One way of reinforcing anatomical landmarks is through the use of radiology. The purpose of this study was to determine if the use of chest x-rays does increase the student nurse's knowledge in physical assessment of the adult chest.

Twenty-nine student nurses from Clark College in Vancouver, Washington participated in this study. The design was a field experiment. The subjects voluntarily signed up for one of four instructional sessions. The order of presentation and thus assignments to group was non-replacement random sampling. They were either assigned to an experimental or a control group.

A pretest was given to each group prior to the lecture to determine a reference for entry level of knowledge. A lecture with original chest

x-rays as visual aids was presented to the experimental group; a lecture only was presented to the control group. One week after the lecture, a common posttest was administered to both groups to evaluate the effectiveness of the independent variable; the use of chest x-rays as a teaching aid in assessment of the adult chest.

Results of this study showed that the experimental groups taught physical assessment of the adult chest with the addition of chest x-rays as a visual aid and the group taught physical assessment of the adult chest without the addition of chest x-rays did not achieve a statistically significant increase in level of knowledge as revealed by the 60-item posttest scores. Thus, the hypothesis was rejected. However, both groups showed a significant increase in knowledge as indicated by the 13-item posttest scores, with the experimental group scoring the highest. Subjective feedback in the study revealed that students taught with chest x-rays seemed more stimulated and asked more questions than the control group. Although the hypothesis was not supported, the inadequacy of the instrumentation may account for these findings. Recommendations for further study were suggested.