COMPARISON OF KNOWLEDGE GAIN AND RETENTION OF HOSPITAL AND RETAIL PHARMACISTS PARTICIPATING IN THE SAME CONTINUING EDUCATION ACTIVITY

by

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A Thesis Submitted to the Faculty of the DEPARTMENT OF PHARMACEUTICAL SCIENCES
In Partial Fulfillment of the Requirements For the Degree of MASTER OF SCIENCE WITH A MAJOR IN PHARMACY

In the Graduate College

THE UNIVERSITY OF ARIZONA

1979
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RICHARD HAMMEI, 8-12-79
Assistant Professor of Pharmaceutical Sciences
Dedicated to my parents
who taught me the value of
"completing what you start"
ACKNOWLEDGMENTS

Acknowledgment is given to my thesis committee for their advice, assistance, and patience.

Acknowledgment is given to the faculty at The College of Pharmacy who encouraged me in my projects.

Acknowledgment is given to my husband, Kevin, and my daughter, Erinn, who waited patiently and complimented my efforts.
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ABSTRACT

This study investigated the knowledge gain and retention of hospital and retail pharmacists participating in the same continuing educational activity. The activity was a clinically oriented study of cardiovascular diseases. The activity consisted of three 2-hour lectures.

Data were collected from eighty pharmacists throughout the six-month duration. There were three tests given: (1) a pretest before the series; (2) a posttest after the series; and (3) a post, posttest six months after the series. Analyses included test score statistics, frequencies and percentages, matched pair t-test, and two-way and repeated measures analysis of variances.

All of the results showed gains in the test means from the beginning to six months after the lecture series. The hospital pharmacists had higher means for the tests. The difference between the two groups was statistically significant for the posttest. The pretest did not have a significant effect on test performance. The post, posttest mean scores for the groups were significantly higher than the posttest mean scores indicating knowledge gain and retention over the six-month period.
Results indicated a need for further research concerning the use of testing and evaluating program usefulness for the pharmacists.
CHAPTER 1

INTRODUCTION

As a result of new technological advances and a better informed public, new role definitions for pharmacy manpower have emerged (Nakamoto and Verner, 1972). Throughout the health care field there has been an accelerated growth of knowledge, an increase in professional specialization, and a proliferation of specific role definitions. As the pharmacy profession has moved to expand its functional role in the professional field, it has met difficulty in narrowing the gap between scientific knowledge and skills demanded by educators, the public, peers, and employers (Lemberger and McCormick, 1975). Continuing education activities were developed to assist the professional in staying current with new professional developments. It is, at times, difficult for pharmacists to apply information from continuing education activities. There is limited perceived need by the practitioner for the knowledge and/or skills being taught by faculty at activities that provide various educator-determined program topics (Nakamoto and Verner, 1972).

Program content and method of distributing information have been controversial components of continuing
education. There are a variety of methods used to present educational material. This variation has contributed to the inequality of surveys and research analyses that are presently being used to identify subject matter required by participating professionals (Knowles, 1973; Houle, 1972).

Participation in continuing education programs is believed to improve professional competency, attitudes, and behavior (Houle, 1975). Leaders in the profession and program providers continue to debate the question of how to guarantee participation of health professionals in educational activities. Mandatory attendance and competency testing have been utilized as methods of assuring participation (Hesbaugh, Miller and Wharton, 1973). However, Lemberger and McCormick (1975) found that among pharmacists, mandatory attendance does not guarantee learning or keeping up-to-date with new knowledge. Arizona may soon join several other states by voting on the issue of instituting mandatory attendance at pharmacy continuing education activities as a condition for relicensure. No legislation to date has been developed to determine program effectiveness.

Quality continuing education can assist pharmacists in adapting to and demanding change; however, there are conflicts between pharmacy education and practice (Lemberger and McCormick, 1975). The curricula for professionals in the past did not provide the background required for patient
advising and extensive communicative involvement. Current graduates are being educated for many new role demands, but they are unable to find positions that will accept this new behavior. Conflicts between employers and the public concerning how a pharmacist is to function also require resolution. If the inconsistent demands on and expectations of pharmacists continue, educational programs will provide little enlightenment. Effective continuing education must interface with undergraduate training and the conditions of employment (Schwartz, 1975; Lemberger and McCormick, 1975).

Through evaluation, providers should be able to determine if they are offering positive educational experiences for the professional (Knox, 1969; Knowles, 1973; Houle, 1975). Methods include reactive, knowledge, and behavioral evaluations besides the program evaluation and attendance. Reactive evaluation includes questionnaires, opinionnaires, and attendance records. For program evaluation, the simplest parameter to measure is knowledge gain; the most popular method is pretesting and posttesting. Behavioral change is the most accurate and desirable, but least practical to measure. It is difficult to define behavior change that is a result of an educational activity. Monitoring the change is time consuming and expensive, and, therefore, most programs are presently judged by participant reaction and knowledge gain.
**Purpose**

The purpose of this investigation was to compare the knowledge gain and retention as one method of program evaluation for hospital and retail pharmacists participating in the same continuing education activity.

The objective was to determine if diverse work environments within the profession of pharmacy contribute to differences in knowledge gain and retention when the professionals participate in the same continuing education activity. Significant differences could affect program content.

The criteria used in the determination were based upon whether or not participants, upon completing a course in cardiovascular diseases, (1) exhibited a significant gain in mean score on a knowledge test; and (2) exhibited no loss in mean score on a knowledge test six months after completion of the course.

**Assumptions**

Several assumptions were made for this study. First, the professional was assumed to have been graduated from an accredited College of Pharmacy and was interested in continuing learning. The majority of the participants in the study were to view education as a part of their professional duties whether voluntary or mandatory. Second, the topic Cardiovascular Diseases was considered timely, and the lecture
format was the most appropriate method of delivery. Third, the testing method was assumed to be able to measure the learning of the participants, and the test items were within the program objectives. Fourth, the pretested group reflected the base knowledge of the participants. Finally, the participants were expected to answer the questions to the best of their ability without the use of outside sources.

Limitations

The design of the investigation compared pharmacists in only two practice settings. Also, the pharmacists participated voluntarily in the activity or were required by another state to attend continuing education for maintaining licensure. The sample was self selecting from the state's population of registered pharmacists; hence, this sample may not be representative of the practitioners in the state of Arizona.

For each participant there was a personal limitation which related to the cognitive strain and risk the individual must experience in taking the tests and participating in the program. There is also an educational barrier to be overcome. Due to the nature of the body of pharmacy, there are several educational levels of practicing pharmacists. There are three-, four-, five-, and six-year graduates from colleges of pharmacy.
Clarification of Terms

A **practitioner** is a person who is licensed to practice a profession and is working within that area of skill. A **professional** is a person educationally trained within an area of knowledge and is oriented with knowledge use rather than working with materials for production. A **health professional** is a certified or registered individual that practices skill and knowledge within the health field.

The term **continuing professional education** can be synonymous with adult education. The term in this paper includes any activity for health practitioners planned as systematic learning. This includes the learning that is planned with formal courses through conferences, conventions, institutes, workshops, and clinical traineeships. **Adult education**, in the purest sense, is a process in education that attempts to match the nature of the information with a format that will constitute programs that are relevant, meaningful, and substantive (Knowles, 1973).

In contrast to adult education, **professional education** provides a structured curriculum for the health professional. The process is institutionally defined by educators. The undergraduate student has the option to participate or not in the programs, but could risk not becoming a practitioner.
Providers and/or administrators of the programs are those organizations, institutions, or corporations that coordinate, plan, and present educational programs or activities for continuing professional education.

A participant in the continuing education programs is a practitioner who attends voluntarily or is mandated to attend to maintain pharmacy licensure.

In this paper, continuous professional learning, involves the practitioners in activities that are defined as satisfying educational needs. These educational needs assist them in their professional practice by increasing competency levels and by improving coping mechanisms that should help them function in a changing society. It is a coordinated effort of academicians and practitioners (Heming, 1975).
Adult educators formulate objectives, select materials, and organize learning experiences to bring about behavioral change. Without continuous evaluation, educators are unable to grasp the magnitude of program successes and failures. Evaluation results are used to develop and implement improved activities by coupling comprehensive background information about the health professionals with the process of defining objectives. The practitioners do not feel the need to attend because of time constraints and knowledge resistance. Adult educators may be able to help practitioners overcome these barriers to continuing education.

Adults want immediate accomplishment of measurable goals. Evaluation of professional education could develop the application of alternative processes to choose, in each case, the one program or activity that best meets the requirements of the situation (Knox, 1969; Shearon, 1970). Continued participation in educational activities will result if the practitioners are shown that they are making progress. Educational providers should be able to demonstrate that there are important behavioral changes taking
place, bringing about personal satisfaction for the
learners. Program support and participation will improve
when providers can report on the results of participation in
education rather than upon their efforts being made (Shearon,
1970). The application of adult education theory and
process could be integrated into the continuing education
process for health professionals (Nakamoto and Verner, 1972).

Continuing Education for
Health Professionals

Health professionals are significantly threatened
by change: individual participation in educational programs
can foster adaptability. The individual has failed to
respond independently, and the programs have failed to
respond to the individual. The Kellogg Project (Nakamoto
and Verner, 1972, p. 24) reports that "the professions have
not modified their traditional perceptions of learning and
education in light of new scientific knowledge about adult
education. Programs usually do not achieve the learning
and the changes in behavior necessary to improved patient
care." Houle (1975) suggests that the programs are ad hoc
or piecemeal because of the new demand for the knowledge and
the programs. Evaluation has been haphazard and failed to
provide information about program needs and areas for
improvement.

There is a need to look at some of our present
policies and beliefs. The general idea that everyone
should learn more than he knows prevails. The "more the better" theory arises—more meetings, more courses, more lectures, more journals, more books, more everything. The consequences are the churning out of generalized programs for anyone who will attend (Nakamoto and Verner, 1972). A variety of approaches could be used in considering areas of program content for the special needs of distinctive occupational groups. Programs are being built on a sense of urgency rather than the needs of the practitioners (Hardigan, 1973). The demand has caught the practitioners and providers "off guard."

Health sciences' continuing education needs to develop purpose, professional interest, and competence in provision and conduct of educational activities (Houle, 1975). The gap between the explosion of health care knowledge and the delivery of improved health care can be narrowed with the concept of continuous or lifelong learning (Lemberger and McCormick, 1975).

**Participation of Practitioners**

Pharmacists do not perceive the same motivators as physicians for attending continuing education activities (Buerki, 1967). Mandatory attendance has therefore become the greatest motivator (Gross, 1975). Physicians attend programs to increase knowledge, to improve patient care, to increase personal prestige, and to escape from the everyday
routine (Williams, 1967). The fear of medico-legal implications motivates the physicians to improve and update their practice. There are few new and varied role definitions present for the physicians. Continuing education can create interaction with peers (Gross, 1975).

Berlow and Blarg (1975) state that pharmacists felt there was no need for "new fangled ideas" because things have not changed. New pharmacy undergraduate programs are designed more to prepare the individual for a different function in the practice of pharmacy (Gross, Romano and Weiner, 1975). Effective education can bring together the practice of pharmacy and the new emerging role of pharmacy in health care delivery.

Hardigan (1973) determined that programs that bring knowledge within the light of the practitioners' experience and assist them in problem-solving for new professional demands can be called relevant for pharmacy. The Kellogg Project (Nakamoto and Verner, 1972) reported that the relevancy of programs would only evolve from precise and uncomplicated objectives. It will then be possible to plan useful programs, select content, choose appropriate instructional methods and techniques, and measure learning achievement. Hardigan (1973) expressed a need for programs to be more convenient and less expensive.

The literature indicates that the seminar was the most frequently used method of program presentation.
Seminars are a one time learning process that can rarely reach depth. Active participation is at a minimum. Gourley and Bradberry (1974) evaluated a lecture-discussion series presented at the University of Nebraska College of Pharmacy. It was discovered that the series was not capable of accomplishing the behavioral objectives that had been set forth. The study revealed that the programs must be more informative, practical and stimulating. The practitioner needs to experience satisfaction in successful learning and to determine his specific educational needs by particular occupational demands.

Program Evaluation for Pharmacy Continuing Education Activities

The American Council of Pharmaceutical Education, Division of Continuing Education (1977), has set forth the principles that providers need to observe in order to be accredited:

1. The programs must be designed for an appropriate audience.
2. The practitioners must be involved in defining their needs.
3. Various methods of program presentations must be made available.
4. The programs must be educational and postgraduate in nature.
5. The statement of goals and objectives must be made for each program.

6. There must be a procedure for evaluation. The major portion of program evaluation in continuing education activities for health professionals has been descriptive. The survey method is the most popular, but it suffers greatly from lack of controls, inadequate sampling procedures, and incomplete data processing. It is difficult to determine if the results are reliable. More recent literature indicates that attempts are being made to utilize adult education concepts to design professional education activities. With more research in program effectiveness and evaluation of the undergraduate curricula, more information can be gained about the actual educational needs of the target population. Testing is one facet of evaluation. Providers should be able to determine if the material was utilized in practice, the presentation was effective, or the information for the professional was relevant (Knox, 1969; Knowles, 1973; Houle, 1975).

The most common testing method is to measure knowledge gain, but the most important and most difficult type of evaluation is to measure behavioral change that occurs from an activity. Pretests are used to determine if the program is needed, and posttests determine if the program content improved the practitioners' abilities in a specific area. A follow-up interview may help to assess the
application of the knowledge gain (Hardigan, 1973). A pre-
and posttest design can be useful in determining data from
subgroups (Buerki, 1967). Gain or loss for each item
compared to the professional subgroup participating offers
insight into the relative importance of the information
presented and the program's effectiveness.

Testing can include practical and theoretical infor-
mation and can be used to compare pharmacists' performance
and preference. Practitioners will accept the program
content when it is related to their practice regardless of
the presentation method (Gross et al., 1975). Testing can
be a powerful evaluation and learning tool when the objec-
tives are stated and the learner can decide personally what
is necessary for professional practice (Houle, 1975;

There is much research outside the health professions
that investigates the use of testing for evaluation and
learning purposes. Hartley (1973) determined the effects of
the pretest on the posttest performance. He stated that the
pretest could (1) have no effect on the posttest; (2) pro-
duce higher posttest scores; and/or (3) produce higher
scores on a posttest with different questions but concerning
the same or related material. In another experiment,
Samuels (1969) used pretests as a learning tool within feed-
back discussion sessions. The participants were motivated
to find the answers if the questions were related to the
course objectives. The retention on the post, posttests was higher for the group that experienced questions concerning the reading material and discussion of the questions after taking the test. Within the pharmacy framework, Coleman (1977) found that the one group pretest and posttest design could be used as an objective evaluation for short-term continuing education programs. In his experiment, identical tests were used that contained multiple choice questions that were submitted by the seminar faculty. The reliability of the test was considered low because it was structured by the faculty members without objectives prepared for the program. The results did show a significant gain in knowledge. Learning takes place for the length of the program, but the participants' use of the information after the program is a sparsely researched subject.

Blank, Kirk and Weinswig (1975) matched test scores for knowledge gain with variables relating to characteristics of the population. The significant variable effect was that pharmacists with ten years or less in practice had better test scores. This would correlate with the changes in pharmacy undergraduate curriculum. Arndt, DeMuth and Weinswig (1975) found that pharmacists practicing in hospitals who were 35 to 45 years of age and routinely participated in educational activities had higher test scores on evaluation instruments for continuing education activities.
Consideration of practice settings within the profession of pharmacy and the information that they determine pertinent to their situation can be evaluated by the basic use of testing and retesting. Various forms of evaluation are encouraged, so providers can determine the program effectiveness and educational needs of the practitioners (Knowles, 1973). Knowles (1973) encourages three types of evaluation:

1. **Reactive** evaluation records data as it takes place by using forms, interviews, and group discussions. Each session can be used for modification.

2. **Learning** evaluation accounts for the principles, facts, and techniques in the program. Pre- and posttests can be used for knowledge gain; performance tests indicate what skills have been learned; and information recall, problem-solving exercises, attitudinal scales, role playing, simulation or critical incidence tests can be useful if supported by valid objectives.

3. **Behavioral** evaluation can be done before, during, and after treatment either from observation; self-rating, diaries, interviews, or questionnaires.

With the methods of evaluation and use of program objectives, providers are able to apply adult education concepts to program planning. The literature indicates more progress is necessary in instituting a value of continuing education as a lifelong process (Hesbaugh et al., 1973;
Education can help change and create adaptability. The literature indicates that this is a difficult behavioral area in pharmacy. Evaluation can serve to improve programs and to determine appropriateness.

It appears that three factors involving evaluation have surfaced from the literature:

1. Reactive, knowledge, and behavioral evaluation should be conducted for all programs (Knowles, 1973; Houle, 1972).

2. Evaluation criteria should be developed from specific program objectives before the presentation of the information. The measure of effectiveness needs to be defined before the program (Nakamoto and Verner, 1972; Knowles, 1973; Houle, 1975; Shearon, 1970).

3. Evaluation procedures need to be standardized to discover where the continuing education activities are nationally ranked with respect to effectiveness, content, and participation. Specific guidelines need to be constructed (American Council of Pharmaceutical Education, 1977).

Therefore, the professions must be concerned with program development through evaluation. Program effectiveness will help to improve competency levels in pharmacy. If the professionals are required to attend, they should demand programs that will assist them professionally (Houle, 1975).
CHAPTER 3

METHODOLOGY OF THE STUDY

This chapter describes the design of the study, the sample selection and setting, and the method of data collection and analysis.

**Design of the Study**

This study was designed to measure the knowledge gain and retention by participants in a continuing pharmacy educational activity. The methodology was viewed as a means of program evaluation. The study, as a secondary purpose, determined the education and continuing education requirements, continuing education method preference, drug information sources, professional association participation, and practice setting of the participants.

**Limitations of the Design**

This study was limited to a self-selecting sample of registered pharmacists. Only those pharmacists participating in the activity were used to evaluate the program content. The pharmacists were not required to participate in the evaluation procedure; therefore, the resultant size of the sample was small.
The pretesting was limited to approximately half of the registrants. As the pharmacists registered for the activity, their names were placed on a consecutively numbered registration list. Participants with an odd-numbered registration number received the pretest with their handout. When they received their materials they were encouraged to take the test before the lectures began. The even-numbered registrants did not receive a pretest.

The Sample and Setting

The sample consisted of registered pharmacists who were attending the University of Arizona's Spring Series for pharmacy continuing education. The program topic was Cardiovascular Diseases. It was presented during April of 1977 at the auditorium in the Health Sciences Center in Tucson, Arizona, and St. Joseph's Hospital auditorium in Phoenix, Arizona. The description of the course can be found in Appendix A.

The retail and hospital pharmacists represent the majority of registered pharmacists in Arizona (Arizona State Board of Pharmacy, 1977). Retail practitioners comprise 71 percent of all registered pharmacists in Arizona. Hospital practitioners represent 15 percent. The retail work environment includes prescription filling, collecting money, purchasing, marketing, and some patient contact. The
larger the business operation, the more concerned the pharmacist generally becomes with production. The concern is rarely with drug interactions, education, or therapy. Hospital pharmacists practice a variety of skills. The work includes patient profile monitoring for drug interactions and therapy, aseptically compounding intravenous preparations, in-service education for other professionals and peers, and patient education in various programs. The functions of the pharmacists in the various practice settings result from the demand of the environment. Therefore, the series that was presented could have been better received by the hospital pharmacist due to the higher level of clinical experience.

Only those participants who voluntarily completed all requested testing and the additional demographic questions were included in the study.

Method of Data Collection

Approval to conduct this study was obtained from the College of Pharmacy of The University of Arizona. Written information explained the study to the participant and implied consent was obtained from test completion. Anonymity was assured by asking the respondents not to put their name, but their assigned registration number, on the answer sheet. This number would be used on each test in order to match results, and a name was not identified with it.
The pretest was given during the time the person arrived for the activity and the beginning of the lecture. A brief announcement was made to encourage those who had the pretest to complete the form and turn them in. They were not told about the posttest and post-posttest.

The posttest was given to all participants at the conclusion of the third two-hour lecture. There was a brief explanation assuring anonymity and encouraging everyone to complete the questions. This final test completed the three-week cardiovascular series.

The post-posttest was mailed to all the participants who had registered for the series in April. Three mailings were required in order to receive more than a 50-percent return. The collection period for the post-posttest was during November and December, 1977—six months after the formal program was completed (see Figure 1). All the tests were computer graded.

Construction of the Evaluation Instrument

Seven faculty members of the University of Arizona College of Pharmacy participated in the activity by giving lectures. Each individual determined their lecture objectives and behavioral outcomes. These were to be in accordance with the program objectives. From the lecture objectives and personal consultations, a single test was
Agenda presented with Program Objectives

Construction of Instrument

Series of Lectures

\[ \begin{array}{cccccccccc}
1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 & 11 \\
\end{array} \]

\[ \begin{array}{cccccccccc}
24 & 25 & 26 & 27 & 28 & 29 & 30 & 31 \\
\end{array} \]

Figure 1. Model of Testing and Lecture Series
designed (see Appendix B). Two or three questions concerning each topic were used to construct a test of reasonable length. The entire test was reviewed by the seven faculty members for correctness and to determine if the test items consistently measured what they intended to measure.

The posttest included additional educational and practice related questions to determine the demographic characteristics of the sample (see Appendix C).

Method of Data Analysis

Each test was analyzed to obtain the following data:

1. the range, mean, standard deviation, median and mode for each test;

2. the reliability of the posttest;

3. the significance in the change of mean score from the pretest to the posttest and from the pretest to the post, posttest by a matched pair t-test;

4. the nature and significance of the differences between mean test scores for hospital and retail pharmacists; and

5. the nature and significance of the differences between mean test scores of those pretested and those participants not pretested.

Differences were considered to be significant at a level less than .05.
The responses for the demographic section of the posttest were summarized to obtain the following data:

1. the frequency for the number of years required to obtain a pharmacy degree;

2. the frequency for the number of professional associations that an individual joined;

3. the frequency and preferential ranking for drug information sources for the pharmacists;

4. the frequency and preferential ranking of education presentation methods; and

5. the frequency for those having to fulfill mandatory continuing education credit for another state license.
CHAPTER 4

PRESENTATION AND ANALYSIS OF DATA

The following data are presented in order to describe the characteristics and knowledge changes of the sample. The objective of this research was to measure knowledge gain and retention by determining the following: (1) the effect of the pretest (T₁) and practice setting upon the participants' scores for the posttest (T₂) and post, posttest (T₃); (2) the changes for the pretest, posttest, and post, posttest scores; and (3) the relationship of the practice setting to the score changes.

Characteristics of the Sample

Initial enrollment for the cardiovascular series was 101 pharmacists, representing approximately 6 percent of the pharmacists in Arizona (Arizona State Board of Pharmacy, 1977). This continuing education activity was sponsored by The University of Arizona, and was one of the three programs presented yearly. During the six-month data collection period, eighty pharmacists participated in taking one or more of the tests.

The demographic information was collected from the posttest (T₂) given after the final lecture. There were
thirty-seven respondents to this test, but only thirty-five completed the information questions presented after the posttest (approximately 44 percent of total registrants). Thirty-one (88 percent) of the respondents had completed 4 to 6 years of education for their degree in pharmacy. The question did not specify whether the number of years was for an undergraduate or graduate degree. Thirty-two (91 percent) of the respondents felt their professional associations were important to them. Twenty-three (68 percent) were active in one or two associations. Five (15 percent) stated they were not involved, and six (17 percent) indicated they were active in only one association. Arndt et al. (1975) and Blank et al. (1975) determined that the years of education and professional activity participation had a positive relationship with the desire to learn and improve professional skills. Therefore, these participants would be expected to have knowledge gain and retention. It could be extrapolated in the hope that their professional skills would improve from this series.

Presently Arizona does not have mandatory continuing education for pharmacy. Twenty-two (63 percent) pharmacists responded that they were required by another state to obtain continuing education credits in pharmacy in order to maintain that state's license. Thirty-two (91 percent) claimed that their mandated participation was not their only reason for attending the program series. The participation
appeared to be initiated by requirements from other state licensing bodies.

Eleven (31 percent) of the respondents practiced hospital pharmacy; twenty-three (69 percent) practiced in a retail setting; and one individual indicated "other" as a work setting. The scores of the thirty-four participants that indicated a hospital or retail practice setting were evaluated.

**Drug Information Sources**

Table 1 shows the respondents' primary and secondary sources of drug information. The primary information sources were journals (54 percent) and continuing educational activities (26 percent). The journals are easily accessible from the various organizations, and they do expose the

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<th>Sources</th>
<th>Primary Information Source (%)</th>
<th>Secondary Information Source (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuing Education Programs</td>
<td>25.7</td>
<td>45.7</td>
</tr>
<tr>
<td>Journals</td>
<td>54.3</td>
<td>28.6</td>
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<tr>
<td>PDR</td>
<td>-</td>
<td>2.7</td>
</tr>
<tr>
<td>Personal or Department Library</td>
<td>8.6</td>
<td>3.7</td>
</tr>
<tr>
<td>Other Professionals</td>
<td>11.4</td>
<td>14.3</td>
</tr>
<tr>
<td>No Answer</td>
<td>-</td>
<td>5.0</td>
</tr>
</tbody>
</table>
professional to an abundance of drug information in the form of advertisements and scientific articles. Journals perform the function of keeping the professional aware of new products, dosage, dosage forms, indications and cost. Educational activities can provide peer exchange of information. Four pharmacists (11 percent) indicated other professionals as their primary source of drug information. Three pharmacists (8 percent) utilized their personal or employer's library for their drug information. Lack of interest in extensive information and no need for the information provided by the more in depth type of sources can be confirmed by the emphasis upon production and processing of prescriptions for the majority of work environments.

**Continuing Education Presentation Methods**

The respondents were asked to preferentially rank a list of the various types of continuing educational activity formats. Nineteen (54 percent) indicated lecture or seminar formats were the most favored. The least preferred method (8 percent) was self-directed correspondence programs. At the time of this activity, there were a limited number of formats available for accredited continuing education. As alternatives, the pharmacists expressed an interest in audio-visual, regionally determined, presentations and regional presentations from the professional associations in
conjunction with the University. This format is similar to lectures and seminars, although it could be more flexible for individual participation and influence program content. Literature has indicated that the least information retention results from lecture format (Knowles, 1973). Self directed study and learning participation does require discipline and motivation but there is more information retention (Arndt et al., 1975; Knowles, 1973). Figure 2 compares the ranking of each type of presentation method listed on the questionnaire.

Test Results

The design of the study was time series testing. A single test consisting of multiple choice questions was constructed and administered all three times. The pretest was given to participants selected before the first lecture. A posttest was given to the entire pharmacist sample attending the final lecture. A post, posttest was mailed to all 101 registrants six months after the last lecture and posttest. The methodology attempted to allow for determining the knowledge change from program content, the effect of the pretest on the learning process, the knowledge retention from the series and the possible utilization of the information by maintaining or improving the test score mean.
Figure 2. Preferential Ranking of the Presentation Methods
The reliability of the test was calculated for the posttest to determine how accurately the test measured the information learned from the Cardiovascular Disease Series, 1977. The Kuder-Richardson 20 was calculated which assumes that each item is of the same degree of difficulty and that all persons attempted to answer each question. A reliability estimation of greater than .800 is desirable for testing. The posttest KR-20 was .732. This is below the accepted reliability standard score, but for an educator-constructed test it is not unreasonable and was considered acceptable.

Test Statistics

The mean scores for each subsequent test increased. Nine individuals participated in all three tests; twenty-one individuals participated in taking the posttest ($T^2$) and post, posttest ($T^3$); fifteen individuals participated in the pretest ($T^1$) and posttest ($T^2$).

Dependent Variables

The first test performed was a matched pair t-test of the tests' scores. The $T^1$ and $T^2$, $T^1$ and $T^3$ and $T^2$ and $T^3$ scores were evaluated. The $T^1$ mean was 44 percent ($SD = 21$ percent, $N = 15$) and the $T^2$ was 59 percent ($SD = 20$ percent, $N = 15$). There was a significant difference between the mean scores for $T^1$ and $T^2$ ($t = -2.46$, $df = 14$, $p = .027$)
indicating a knowledge gain for those individuals participating in the pretest and posttest from the lectures' content as determined by the test. The mean scores for the twenty-one registrants taking $T_1$ and $T_3$ were 37 percent ($SD = 20$) for the pretest and 63 percent ($SD = 25$) for the post, posttest. There was a statistically significant difference in $T_1$ and $T_3$ mean scores ($t = -7.37, df = 20, p = .001$); suggesting that from the beginning of the series to six months after the series the participants gained and retained the information presented. Twenty-one registrants completed the posttest and the post, posttest. The mean scores for these participants were 55 percent ($SD = 19$) for the posttest and 66 percent ($SD = 21$) for the post, posttest. Again, there was a statistically significant gain in mean scores of $T_2$ and $T_3$ ($t = -2.68, df = 20, p = .014$). All of the results indicate a knowledge gain and retention from the series content. The gain from the posttest and the post, posttest could indicate continued self-learning and/or increased application of the information. This component is important when one becomes concerned with the behavioral outcomes of an activity.

**Independent Variables**

Independent variables were evaluated for each test with a group Student's $t$-test. Group 1 consisted of the retail pharmacists and Group 2 was the hospital pharmacists.
(see Table 2). For the pretest, the mean score for the retail pharmacists (N = 8) was 39 percent (SD = 22 percent) and the mean score for the hospital pharmacists (N = 6) was 43 percent (SD = 15 percent). The t-test did not indicate a statistically significant difference (t = -0.39, df = 12, p > 0.05) between these two groups. The posttest (T2) mean for Group 1 (N = 23) was 50 percent (SD = 18) and Group 2 (N = 11) was 70 percent. There was a significant difference in posttest performance between the two groups (t = -3.21, df = 32, p = .003). The post, posttest (T3) mean score for the retail pharmacists (N = 15) was 60 percent (SD = 21 percent) and the mean score for the hospital pharmacists (N = 5) was 78 percent (SD = 8 percent). There was not a significant relationship between the T3 performance and practice setting (t = -1.76, df = 18, p > .050).

Two-Way Analysis of Variance

A two-way analysis of variance was performed to determine the relationship of the pretest and practice setting with T2 and T3 scores (see Table 3). There was not a significant difference for those who took the pretest on the participants' posttest scores (F = .710, df = 1, 33, p = .406); however, there was a significant main effect with the practice setting on the posttest scores (F = 9.43, df = 1, 33, p = .005). The hospital pharmacists achieved higher scores for the posttest. There was no interaction between the variables.
### Table 2

**Group Practice Setting Comparison for Each Test**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number</th>
<th>SD</th>
<th>Mean</th>
<th>t</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pretest (T₁)</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Retail</td>
<td>8</td>
<td>22</td>
<td>40</td>
<td>- .39</td>
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<td>.701</td>
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<tr>
<td>Hospital</td>
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<td>15</td>
<td>43</td>
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<tr>
<td><strong>Posttest (T₂)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retail</td>
<td>23</td>
<td>18</td>
<td>50</td>
<td>-3.21</td>
<td>32</td>
<td>.003</td>
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<tr>
<td>Hospital</td>
<td>11</td>
<td>14</td>
<td>70</td>
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<tr>
<td><strong>Post, Posttest (T₃)</strong></td>
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<td></td>
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<tr>
<td>Retail</td>
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<td>8</td>
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### Table 3

**Main Effects of the Posttest Scores**

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<th>Main Effect</th>
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<th>Mean</th>
<th>F</th>
<th>df</th>
<th>p</th>
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<tbody>
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<td>Practice Setting</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retail</td>
<td>23</td>
<td>18</td>
<td>50</td>
<td>9.43</td>
<td>1, 33</td>
<td>.005</td>
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</tr>
<tr>
<td>Pretest</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Not Pretested</td>
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<td>19</td>
<td>53</td>
<td>.710</td>
<td>1, 33</td>
<td>.406</td>
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<tr>
<td>Pretested</td>
<td>14</td>
<td>18</td>
<td>61</td>
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</table>
A two-way analysis of variance was also planned for the $T_3$ scores. However, it was not possible to determine because only one test score was available for one category.

**Repeated Measures**

A repeated measures, mixed design, was done to evaluate the performance on a series of tests for hospital and retail pharmacists and to determine whether the average performance for the tests is the same for the two groups. There were nine persons completing all three tests. In order to perform the test, each group must have the same number of scores. One individual's test scores were randomly dropped to achieve an $N = 4$ for each group. The scores were converted to $Z$ scores in order to reduce the variability (Myers, 1972).

The pretest, posttest, and post, posttest mean scores for the hospital pharmacists were 52 percent, 75 percent, and 78 percent respectively; whereas, the $T_1$, $T_2$ and $T_3$ mean scores for the retail pharmacists were 45 percent, 58 percent, and 84 percent. The repeated measures, analysis of variance, was not significant for these test scores; although the scores improved with each test for each group. The results may not be significant for the difference between practice setting and test performance because there were only eight individuals whose scores could be evaluated.
The repeated measures test did determine a statistically significant difference between the hospital and retail pharmacists \((F = 3.36, \text{df} = 3, 23, p < .05)\). There was no interaction or significant differences between tests. The results show that overall the hospital pharmacists consistently scored higher on the tests with a gain in test mean with each succeeding test. The retail pharmacists scored lower but did make a large gain between post-test and post, posttest (58 percent to 84 percent). One of the four scores reported was a 100 percent which would contribute to a biased picture of the actual test scores. The posttest and post, posttest mean scores of the hospital pharmacists increased from 75 percent to 78 percent.

The general outcome did indicate information and knowledge gain and retention from the cardiovascular series for hospital and retail pharmacists. In general, the hospital pharmacists did have better test scores throughout the testing. The results also indicated that the pharmacists did not seem to forget the information (see Appendix D).
CHAPTER 5

DISCUSSION AND CONCLUSIONS

This chapter discusses the results presented in Chapter 4 as they related to the research problem, that is, an attempt to determine (1) the effect from the pretest and/or the practice setting on the knowledge change and retention, and (2) the knowledge change and retention from the continuing education series.

The results of this investigation are also discussed in relation to the review of literature.

The Population

The small number of respondents in this study may limit the conclusions which can be drawn from the results. This sample may not be representative of the state's registered pharmacist population; therefore, the results can only be extended to the sample participating in this specific program. The data can suggest possible patterns which need further research and a methodology for evaluation of such research.

From the 1976-1977 annual report for registered pharmacists, the Arizona State Board of Pharmacy identified
There were 224 licenses (15 percent) in hospital pharmacy, 1,025 (71 percent) in retail pharmacy, 20 (1 percent) associated with wholesalers or manufacturing firms, and 171 (12 percent) in teaching or government work. The tested sample had 31 percent hospital pharmacists and 69 percent retail pharmacists.

The Participants

The "typical" participant had completed four to six years of school to receive a professional degree, felt his/her professional association was important, and was actively involved in one or two professional associations. The participant usually preferred journals, continuing education seminars or formal lectures as sources for drug information. He/she was usually required by another state to attend a specified number of hours per year for continuing professional education in order to maintain his/her pharmacy license; although this was claimed not to be the only reason for attending the Cardiovascular Series.

Educational Influences

The participants represent a variety of training and experience. The four-year graduate has less undergraduate experience in clinical pharmacy which is becoming the state-of-the-art in today's practice of pharmacy, while
the six-year graduate has usually experienced a program emphasizing clinical skills. The five-year graduate could be well versed in either dispensing or clinical areas depending upon the college attended and its educational philosophy. But, the four-, five-, and six-year curricula all include the same emphasis upon the basic sciences. Therefore, the presumed first barrier for the continuing education programs is the educational diversity of the participants. This sample did not have a great diversity of educational experience for the basic sciences. It could be assumed that the increase mean scores occurred because of the basic educational homogeneity of the population.

Work Environment

Employers do not have the quantity of jobs that can completely utilize the clinical knowledge. The public is skeptical of the entire health profession and its rising costs. Therefore, the public will patronize the stores with the lower costs and fewer extra professional services. Hence, a majority of the time, the pharmacists with lower costs are the preferred professionals.

Cost containment has discriminated against non-productive, non-revenue generating services in hospital pharmacy. Emphasis has been placed upon cost control and attention has been directed to the skyrocketing patient
charges within the health care system. Therefore, it is the administrators' task to reduce production cost to maintain a standard of practice without increasing patient rates. The pharmacy has been required to increase production in the midst of increased personnel, equipment, and administrative costs. This process eliminates programs determined as not needed or required.

Retail pharmacists question why they are required to attend the clinically oriented programs if there is little opportunity to use the information in their practice. A majority of the retail organizations do not require extensive use of drug information. There is greater emphasis on merchandising and public relations. Yet, the retail pharmacist is involved directly with the ambulatory patients, patients with chronic problems, and advising in the use of over-the-counter medications. This would seem to indicate a need for information.

Hospital pharmacists are encouraged to learn new drugs and investigational drug information for chronic and acute disorders in order to answer drug information questions concerning therapy and availability, identify drug interactions, to problem solve with other professionals, to participate in providing in-service education and patient education. Continual reading and drug information is more often required to remain current with peers and job demands.
As stated in the introduction, this program appeared to be more applicable for hospital pharmacy practices than for retail. The test results did demonstrate that for all three tests the hospital pharmacists had higher mean scores. Although the program was assumed to be more hospital oriented, the retail pharmacists' mean scores improved with each succeeding test indicating knowledge gain and continued learning.

Program Preference

The pharmacists, by preferring lectures or seminars for the educational programs, exhibit their desire for less participation, less risk in publicly exhibiting knowledge and skill levels, and less individual work in obtaining information. Lectures are a traditional method of teaching and learning which can help to avoid fear of the unknown and reduce that educational barrier. The next preferred form of continuing education was audio-visual; regionally defined programs which are very similar to the lecture or seminar format. The lowest ranked method of continuing education was self-directed correspondence which requires individual reading, writing, and research. Time and work are necessary in order to learn. The pharmacists do not exhibit a desire or readiness to give to the question of how to actively pursue education in order to improve practice competency. Answering questions and being confronted with
admitting "not knowing the answer" creates embarrassment rather than an opportunity to learn. Less educational responsibility is required to go to a classroom, listen, and return home until the next session. The instructor does the work. The pharmacists will not define the problem. Most practitioners are quiet about their preferences, and hope continuing education will go away. This educational value appears to be a very weak link in the chain between undergraduate studies, work environment, and continuous learning. In order to have more effective programs, and consequently improved professional attitudes and competency levels, it is necessary to have practitioner participation.

Test Results

The data indicated knowledge gain from the course and it appeared to be retained within the participants' environments. Each test held problems for the respondents. This was not anticipated until after the series was completed.

The Pretest

The test was given in adverse conditions. The participants were not mentally prepared for a test and time had not been allocated in the agenda for a test. The pharmacists may have felt uneasy with the situation because they did not know if they were being graded, the noise level
in the auditorium was high, and it was new to the program's procedure.

The Posttest

The test was given after the third lecture which had taken longer than expected. The tests were given to everyone, but participation was not required. Only thirty-seven pharmacists responded to the test questions, and thirty-four completed the questions concerning demographic statistics. There was no time designated for the test, no provision to reduce distractions, and it was an out-of-the-ordinary procedure.

The pretested and non-pretested mean scores were not significantly different. In this series the pretest did not appear to be a significant learning tool or a contributor to the learning process. The results indicated the pretested, retail pharmacists had a posttest mean of 58 percent (N = 8, SD = 19 percent) versus the non-pretested retail pharmacists having a posttest mean of 46 percent (N = 15, SD = 17 percent). The non-pretested hospital pharmacists had a posttest mean of 74 percent (N = 5, SD = 5 percent) and the pretested hospital pharmacists had a mean of 66 percent (N = 6, SD = 18 percent). The non-pretested pharmacists higher mean score could have been due to the small number. The inconsistent scores and large standard deviations may have resulted from the nature of the
lectures, difficult test questions, and/or a small number of participants. The pretest did help in guiding the learning for those not familiar with the information as suggested by the higher posttest mean score for the pretested retail pharmacists. As stated in the review of literature, testing and discussion could have contributed to a more effective learning experience and higher means.

The Post, Posttest

The post, posttest was mailed to the participant pharmacists' homes. Testing conditions may have been more acceptable and comfortable within their familiar environment. The post, posttest could be completed with minimal distractions, when the person was prepared to concentrate. Also, it could be assumed that more time was available.

The results for the post, posttest were not significantly different among participants when compared for practice setting. The hospital pharmacists had overall higher scores than retail pharmacists.

The results may indicate that the pharmacists continued to learn after the series, applied the knowledge, are more motivated, and/or have less business emphasis in their practice settings. Practice setting did positively affect information retention from the series. The retail pharmacists could have studied more diligently due to unfamiliar content. There were three perfect scores for the
post, posttest for the retail pharmacists. This had not occurred with the other tests. The hospital pharmacists' mean scores for the posttest and post, posttest essentially did not change. This could indicate use of the knowledge but minimal continued learning.

Effects from the Environment

It would seem logical that the professional's environment would affect his/her educational process. If the information given at an activity is new but can be grouped with previous knowledge, yet not overwhelming in nature, the person will learn and retain that information. The post, posttest score means increased indicating that the environment did contribute to information retention concerning the series. A decrease in the mean would have indicated the possibility that the information was not relevant to the pharmacists' professional practice and, therefore, quickly forgotten. Expanded knowledge concerning the information may have been achieved during this time period, but the test did not attempt to measure this.

Summary

From this study it was discovered that (1) the practice setting and program compatibility can influence the learning process, (2) the lecture series showed test scores improvement, and (3) the pretest could be a learning tool
for information gain and retention for those unfamiliar with the information initially, but this was not shown statistically significant.

The pretest can be a learning tool, but it also can create a problem. As in this situation, all three tests were identical; therefore, memorizing the answers could have occurred. Even if there were genuine information retention, the percentage scores for the tests were below average or average if compared to the College of Pharmacy, University of Arizona, grading guidelines.

Hospital pharmacists did have higher test scores as a group which would be consistent with the nature of the information. Overall there was no difference in knowledge retention for the two groups. The higher scores could also indicate that only those pharmacists familiar with the information took the tests.

The lecture format did show test improvement or knowledge gain. The posttest mean was 56 percent. Knowing 56 percent of the information does not indicate mastery or skill in a subject. This finding would be consistent with the literature in that this method lacks depth and cannot accomplish all the program objectives because of time and participation constraints. The method did fulfill short-term goals of information dissemination, revenue generation, and continuing education credit. Retention from lectures has been suggested to be about 10 percent, whereas retention
from experiential learning can be as high as 90 percent (Parent Effectiveness Training Seminar, 1978). The scores indicate information remembered, but may have been only the information relevant to practice or consistent with previous knowledge. It would not seem correct to deduce that knowing less than 60 percent of the information would not contribute to professional competency. The test reliability was not low enough to indicate that the test outcomes may not be valid. Low reliability can indicate questions not consistent with the population taking the test or questions that are too difficult. The below average mean indicated that the material could have been too vast and difficult, therefore the results were guesswork.

The topic was too comprehensive for the participants. There was conservative program support from the pharmacists. Continuing education can be a time to listen and/or socialize. The respondents claimed that the mandated attendance was not the only reason for attending; but the responsibility for individual decision in learning and continued competence had been removed from the pharmacists. The majority of the participants were there for continuing education credit. Arizona does not have mandatory continuing professional education; therefore, it would seem that the majority of the participants would not have had that requirement if the program was of professional educational need and necessary for practice in Arizona.
Mandated attendance removes learner-defined educational motivation. Attendance becomes an activity due to obligation. Thus, obligation overshadows the desire to learn, and learning may be by accident. Learning by accident can be of value, but if competency and improved professional attitudes are to occur, then those involved in the adult educational process should have a contribution in setting objectives for the programs. The programs can be developed for the objectives in learning as defined by the employers, educators, and practitioners. Competency for the profession must be defined, possibly by practice setting, and a mechanism for evaluating the practitioners will occur. If the pharmacists know at what levels they are to practice, then they will seek to reduce the dissonance or improve the standard. In extension of this concept in order to receive mandated attendance credit, a score of 80 percent or better must be obtained on the posttest. Again, a standard is set and it is the participants who reduce the dissonance, if there is any, between the information presented and their comprehension of it.

Recommendations

This research has presented a method of evaluating program content by determining knowledge gain and retention from a Cardiovascular Disease Series. The pre- and posttest change can determine effectiveness of the program as it
occurs. Did the program fulfill the objective? The posttest and post, posttest change can indicate which areas need to be made clearer in the program. There would be constant re-evaluation for information additions or deletions. The methodology could be developed to assess utilization of information in the various practice settings in pharmacy. Program improvement through examination can show how the information is being used.

A more sophisticated extension of this research should be done. If it were repeated, the areas to improve would be:

1. Test a larger sample.

2. Require pretesting and posttesting participation for granting of continuing education credit. The posttest score should be above 80 percent.

3. Receive the demographic statistics with the first test and limit the number of questions concerning this area.

4. Allow for discussion of the test questions after the pretest or within each discussion period after the topic presentation.

5. Include additional questions in the post, posttest that concern the topic but may be more practical in nature. This may eliminate memorizing the test questions.

As a general goal for program evaluation, it would be valuable to be able to develop activities specific for
different areas in pharmacy practice. Utilization of the information could commit the knowledge to memory and eventually contribute to improved professional competency and desired behavioral change. Presently, pre- and posttesting is included in the continuing educational activities presented by the American College of Pharmaceutical Education providers. In addition to the lecture series, cassette and correspondence courses are being offered to the practitioner by The University of Arizona. Many accredited providers have emerged offering a greater variety of programs, in addition to the professional association sponsored presentations. Progress has been made concerning program content and presentation. Evaluation methods have contributed to the improvement. Now, to have utilization of the information, the practitioners must actively participate whether it is setting program objectives or in the learning process. The professionals need to be responsible for the information and the method in which they can learn and retain the greatest amount of knowledge.
APPENDIX A

CARDIOVASCULAR DISEASES AGENDA
**Cardiovascular Diseases**

**Location:** Phoenix - St. Joseph's Hospital, Auditorium  
Phoenix - St. Joseph's Hospital, Auditorium  
Tucson - Arizona Medical Center, Main Auditorium  
**Time:** 7:30-9:30 p.m.

**PART II (1977 SPRING SERIES)**

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<thead>
<tr>
<th>Phoenix</th>
<th>Tucson</th>
<th>Topic</th>
<th>Speaker</th>
</tr>
</thead>
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<td>April 7</td>
<td>CONGESTIVE HEART FAILURE</td>
<td>Anthony Silvagni, Pharm.D.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Case Study Discussion Leaders</td>
<td>Alan Barreuther, Pharm.D.</td>
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<td>Robert Dorr, B.S.</td>
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<td>Mickey Hammel, B.S.</td>
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<td>James Paxinos, B.S.</td>
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<td>April 12</td>
<td>April 14</td>
<td>ARRHYTHMIAS</td>
<td>Alan Barreuther, Pharm.D.</td>
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<td>Pathophysiology of Arrhythmias</td>
<td>Lincoln Chin, Ph.D.</td>
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<td>Pharmacology of Antiarrhythmic Agents</td>
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<td>Clinical Dosing Application and Toxicology</td>
<td>William Fritz, B.S.</td>
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<td>April 19</td>
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<td>THROMBOEMBOLIC DISORDERS</td>
<td>Carl Trinca, M.S.</td>
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<td>Hemostasis and Thrombosis</td>
<td>Jacqueline Womble, B.S.</td>
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<td>Therapy of Red Thrombosis</td>
<td>Maria Gardner, Pharm.D.</td>
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<td></td>
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<td>Therapy of White Thrombosis</td>
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</tbody>
</table>

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Objectives: This seminar will provide the health professional with a working knowledge of essential information concerning common cardiovascular disorders and their treatment. The presentations will emphasize the drug application, dosing and toxicology with background information on the pathophysiology of the disease and the pharmacology of the drugs that are used for the disease state. After each presentation, there will be time for group discussion.

Continuing Education: Credit for 6.0 hours (2.0 per session) to meet continuing education requirements is being applied for to those states which have mandatory requirements.

Materials: Each registrant will be provided with a set of notes consisting of lecture outlines, diagrams, illustrations and tables, case histories, self-assessment quizzes, and references. Preregistration will insure that you receive reference materials at first seminar presentation.

* * * * * *

This seminar series is presented in conjunction with the Arizona Nurses Association and in cooperation with:

Arizona Pharmaceutical Association
Arizona Society of Hospital Pharmacists
Maricopa County Pharmaceutical Association
Southern Arizona Society of Hospital Pharmacists
Tucson Academy of Pharmacists
APPENDIX B

PRETEST \((T_1)\) AND POST, POSTTEST \((T_3)\) FOR CARDIOVASCULAR DISEASES SERIES
Dear Continuing Education Participant:

Last Spring the College of Pharmacy, The University of Arizona, presented the Continuing Education Spring Series Cardiovascular Diseases II. During the sessions we had you participate in an evaluation of the program. We would appreciate your participation in another evaluation by answering a few follow-up questions concerning the material that was presented in the series. The questions should not require more than fifteen minutes. Please do not use other resources. Write your answers on the back of this sheet which should be returned in the stamped envelope provided. Your cooperation in returning the answers by October 15, 1977 will be appreciated.

Our objectives for the programs are to satisfy the practitioners educational needs and interests. Your participation in the evaluations will assist us in effectively designing future continuing education programs. Please help us and yourself in answering the questions and returning them to the College by October 15, 1977.

Thank you very much.

Sincerely,

Anne Freyer Smith, R.Ph.
Graduate Student
Hospital Pharmacy

Jack R. Arndt, Ph.D.
Director
Post Evaluation of Cardiovascular Disease Seminar
Spring 1977

Mark clearly your answer with a pencil in the blank square next to the question number. Place an "0" in the square if you don't understand or are unable to answer a question. Proceed to the next question as quickly as possible.

1. Precipitating cause(s) of the failure of the left side of the heart include:
   1. Hypertension
   2. Pulmonary Emboli
   3. Coronary Artery disease
   4. All of the above
   5. 1 and 3
   0. Don't know

2. Digitalization provides therapy that will help control heart failure. The major objective(s) to achieve with therapy is (are):
   1. To reduce the cardiac work
   2. To enhance cardiac muscle contractility
   3. To control excess fluid
   4. All of the above
   5. None of the above
   0. Don't know

3. A patient presenting with digitalis toxicity could demonstrate:
   1. G.I., neurological, visual and cardiac manifestations such as arrhythmias
   2. Cardiac symptoms only
   3. Renal failure
   4. Nothing detectable clinically
   0. Don't know

4-5. Match the correct word definition for the appropriate portion of the graph of automatic cardiac electrophysiology as indicated by the numbers 4 and 5:
1. Resting membrane potential
2. Threshold potential
0. Don't know

6. Examples of arrhythmias caused by decremental conduction include:

1. Ventricular bigeminy and ventricular tachycardia
2. Atrial fibrillation and/or AV Block
3. Bundle branch block
4. All the above
5. 1 and 2 only
0. Don't know

7. A man enters the Emergency Room with a low blood pressure reading and a reduced cardiac output. The ECG showed asystole. He has received antiarrhythmic drugs for 5 years. What is a possible diagnosis?

1. Procainamide (Pronestyl\textsuperscript{R}) toxicity
2. Quinidine toxicity
3. Propranolol (Inderal\textsuperscript{R}) toxicity
4. All of the above
5. None of the above
0. Don't know

8. This person is admitted and placed in CCU. Treatment with Lidocaine is indicated and is initiated with IV bolus followed by an IV drip. What signs and symptoms should you monitor for?

1. Hearing difficulty
2. Convulsions
3. Respiratory arrest
4. Heart block
5. 1, 2, and 3
0. Don't know
9. The body reaction to injury to the wall of a blood vessel is constriction, exposure of collagen, and the presence of tissue thromboplastin. This results in:

1. Thrombosis
2. Hemostasis
3. Fibrinolysis
4. All of the above
5. None of the above
0. Don't know

10. The etiology of thrombosis is associated with:

1. From changes in the endothelial lining
2. From changes in the blood flow
3. From changes in the blood constituents
4. All of the above
5. None of the above
0. Don't know

11. The therapeutic action of warfarin is dependent on an interaction with Vitamin K resulting in decreased

1. Factors IX and X only
2. Factors II, VII, IX, and X
3. Fibrin
4. None of the above
0. Don't know

12. The extrinsic pathway of the clotting mechanism is mediated by:

1. Tissue thromboplastin
2. Factors XII, XI, IX, VIII, and X
3. Vitamin K
4. All of the above
5. None of the above
0. Don't know

13. If an immediate anticoagulant response is indicated:

1. A loading dose of warfarin is begun
2. Heparin is initiated
3. Maintenance dosing of warfarin is begun
4. Streptokinase is started
5. All of the above
0. Don't know
14. A decrease response to warfarin therapy could be related to:

1. A diet of beans, spinach, rice, pork, fish and some cheeses
2. Myxedema
3. Alcoholism
4. Affinity for Vitamin K
5. All of the above
0. Don't know

15. After heparin therapy for 5 days a dose of 5000 u every 6 hours, a patient accidentally received a 50,000 unit dose. Complications occur. What can be done?

1. Replace volume loss with albumin
2. Replace clotting factors with fresh frozen plasma or fresh whole blood
3. Administer Protamine long enough to reverse the heparin overdose
4. All of the above
5. 2 and 3 and heparin therapy is discontinued

16. Antiplatelet drugs include:

1. ASA
2. Dipyridamole (Persantine®)
3. Clofibrate (Atromid-S®), Sulfinpyrazone (Anturane®), and Hydroxychloroquin (Plaquenil®)
4. All of the above
5. None of the above
0. Don't know

17. Antiplatelet drugs are used clinically for:

1. Cardiovascular Disease and Venous Thromboembolic Disease
2. Coronary Artery Disease
3. Prosthetic Heart Valves
4. Peripheral Arterial Vascular Disease
5. Renal Disease and organ transplants
6. All of the above
0. Don't know
18. Streptokinase and Urokinase are active:

1. In preventing clot formation
2. In increasing blood flow
3. In dissolving emboli and thrombi by digesting their supporting fibrin framework
4. In increasing fibrinolysin
5. None of the above
0. Don't know

Below are the answers to the test questions. Use them for your own learning experience. Please do not change the answers that you have already entered on your answer sheet. Thank you for your time and consideration.

1. 5
2. 4
3. 1
4. 2
5. 1
6. 4
7. 4
8. 5
9. 2
10. 4
11. 2
12. 1
13. 2
14. 5
15. 5
16. 4
17. 6
18. 3
APPENDIX C

COVER LETTER AND POSTTEST ($T_2$) FOR CARDIOVASCULAR DISEASES SERIES
The following questions will help the Continuing Education Program faculty evaluate its effectiveness in the CVD program. The tests will not be identified with names. The only identification will be by the number assigned to your registration folder. Please enter this number in the first squares of the I.D. number area at the top of the answer sheet. Enter the assigned number before answering the questions. It is important to use a No. 2 pencil and to print the numbers correctly. There are examples of the correct way to enter the numbers in the upper right hand corner of the answer sheets. The answer number is to be entered in the small, blank square next to the question number. There will be faculty to help you if there are questions concerning the procedure.

Thank you for your help and cooperation. Continuing Education is for you, the practitioner. Your evaluation helps us in understanding your needs. There will be no grading assigned to the evaluations.
Mark clearly your answer with a pencil in the blank square next to the question number. Place an "0" in the square if you don't understand or are unable to answer a question. Proceed to the next question as quickly as possible.

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4. In increasing fibrinolysin
5. None of the above
0. Don't know

19. What is your professional registration and practice status?
1. Practicing Registered Nurse or Licensed Practical Nurse
2. In non-practicing areas of nursing but certified
3. Practicing Registered Pharmacists or intern
4. In non-practicing areas or pharmacy but certified
5. Not in practice currently

20. How many years of education have you completed to obtain your degree?
1. 0-1
2. 2-3
3. 4-5
4. 5-6
5. 7 or above

21. Is your Professional Association important to you?
1. yes
2. no

22. How many organizations are you active in?
1. 0
2. 1-2
3. 3-4
4. more than 5

23. From what source do you find most of your drug information?
1. Continuing Education programs
2. Journals
3. PDR
4. Personal or Department Library
5. Other professionals or medical representatives
6. None
24. In reference to the preceding question, what would be your second most used source?

1. Continuing Education programs
2. Journals
3. PDR
4. Personal or Department Library
5. Other professionals
6. None

25. What is your practice setting?

1. Hospital primarily
2. Doctor's office
3. Retail store primarily
4. Retired
5. Education
6. Other related areas (i.e., manufacturing, medical representatives)
7. Other

26. Are you required for your recertification to complete a certain number of Continuing Education units per year?

1. yes
2. no

27. Is the only reason you participate in Continuing Education programs because you are required by law?

1. yes
2. no

28-32. For the next five numbers (28-32) rank in order from first preference to last preference the Continuing Education programs that are most meaningful to you.

1. Lecture, seminar
2. Audiovisual, regional location
3. Self-directed study by correspondence
4. Regional and mutual programs coordinated by the Professional Organization, The College of Pharmacy and Hospital
5. Journal reading and testing

33-34. Indicate first (33) and second (34) preference from the following topics which would be most appealing to you for future Continuing Education programs:
1. Pharmacology
2. Nonprescription drugs, OTC
3. Patient records and patient consulting
4. Drug interaction
5. Legislation; medico-legal aspects
6. Illness behavior
7. Social concern; i.e., mental health, alcoholism, etc.
8. Undecided

Please return the answer sheet, pencil, and test to the center aisles for collection. Thank you for your help and cooperation.
Table D-1
Summary of Statistics for Entire Group
Taking the Posttest

<table>
<thead>
<tr>
<th>Item</th>
<th>Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Entire</td>
</tr>
<tr>
<td>Number of scores</td>
<td>37</td>
</tr>
<tr>
<td>Mean score</td>
<td>10.3</td>
</tr>
<tr>
<td>Median score</td>
<td>10.2</td>
</tr>
<tr>
<td>SD</td>
<td>3.3</td>
</tr>
<tr>
<td>Reliability (KR-20)</td>
<td>.732</td>
</tr>
<tr>
<td>Possible low score</td>
<td>0</td>
</tr>
<tr>
<td>Possible high score</td>
<td>18</td>
</tr>
<tr>
<td>Obtained low score</td>
<td>4</td>
</tr>
<tr>
<td>Obtained high score</td>
<td>16</td>
</tr>
</tbody>
</table>

Table D-2
Test Score Comparisons for Entire Group

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<tr>
<th>Item</th>
<th>Test Scores</th>
</tr>
</thead>
<tbody>
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<td>T_1</td>
</tr>
<tr>
<td>Number of scores</td>
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</tr>
<tr>
<td>Mean score (%)</td>
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</tr>
<tr>
<td>SD</td>
<td>20.3</td>
</tr>
<tr>
<td>Median</td>
<td>33.3</td>
</tr>
<tr>
<td>Mode</td>
<td>22.2</td>
</tr>
<tr>
<td>Possible low</td>
<td>0</td>
</tr>
<tr>
<td>Possible high</td>
<td>100.0</td>
</tr>
<tr>
<td>Obtained low</td>
<td>0</td>
</tr>
<tr>
<td>Obtained high</td>
<td>83</td>
</tr>
</tbody>
</table>
REFERENCES


