A COMPARATIVE STUDY OF THE RETENTION OF COGNITIVE LEARNING BY BACCALAUREATE STUDENTS INSTRUCTED BY TWO ALTERNATE METHODS

By

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CHAPTER I

INTRODUCTION

Scientific advances have made many changes in our society and we can no longer rely on past knowledge and technology. Today our society is demanding better health care delivery systems. The ultimate goal of nursing education is improved health care delivery to all members of our society (Abdellah, Beland, Martin, & Metheney, 1973).

In order to be better qualified to meet societies health care needs, nursing is extending its role into many areas of specialization. Prior to assuming these additional responsibilities, students of nursing require knowledge of basic nursing content. Because advanced knowledge is built on basic nursing content, it must be thoroughly learned to facilitate retention. The current challenge of nursing education revolves around the question, how can students of nursing be educated so that basic nursing content is retained?

Some complicating problems that are present in the process of educating nurses are increasing enrollments and the varied educational

and experiential backgrounds of students. It has been recognized by educators that students do not 1) achieve at the same rate, 2) use the same study techniques, 3) solve problems in the same way, 4) possess the same repertoire of behaviors, 5) have the same capacity to learn, 6) become motivated to the same degree, and 7) do not have the same readiness for learning. Because of the increased enrollment and varied background of students, it becomes increasingly difficult to individualize instruction. It is further recognized that traditional learning situations do not allow flexibility (Postlethwait, Novak, & Murray, 1966). These authors demonstrated, after many years of experience, that well informed students lose interest when placed together in a rigid program of study with less prepared students. The less prepared students were found to perceive the situation as frustrating, and likewise lost interest. Based on their studies, these researchers agreed that students must be given the opportunity to choose an approach to learning which is more useful for them.

Independent study by autotutorial methods has been developed to provide flexibility, increased student participation and frequent feedback for reinforcement and progress evaluation by student and teacher. Autotutorial instruction in nursing education is being utilized to meet the demands of individual students with varying backgrounds. The question is raised which method of instruction, autotutorial or lecture, will be most effective in aiding more students

with differing backgrounds to retain knowledge of basic nursing content.

The Statement of the Problem

Does individualized instruction by autotutorial learning methods produce an improvement in the learning and retention of cognitive information over the conventional lecture method in nursing education?

Significance of Problem

Walla Walla College School of Nursing is currently implementing, on a limited basis, individualized instructional methods. The Faculty of this school believe that teaching methods which can be adapted readily to the individual student needs could enhance learning and retention. The researcher is employed by this school and interested in evaluating two methods of instruction. Research findings will be used to assist faculty members to make decisions regarding instructional methodology.

Definition of Terms

Retention: any measurable degree of persistence of the changes in performance which constitute learning (McGeoch, 1946). For this study, retention is defined as the ability to recall cognitive learning as measured by the posttest and

delayed test given four weeks after instruction.

Retention interval: the amount of time that passes between the time when content is presented and the posttest is administered (English & English, 1958).

Immediate retention: recall of learning as measured by a posttest immediately following instruction (English & English, 1958). In this study immediate retention was measured by a posttest given within 48 hours after completion of instruction.

Delayed retention: recall of learning as measured by a posttest given after a specific period of time has passed following instruction (English & English, 1958). In this study delayed retention was measured by a posttest given four weeks after completion of instructional units.

Lecture method: the presentation of information by exposition and visual aids to a group of persons (Good, 1959). In this study, four sequential units of information by exposition were given to a group of students. The visual aids used were a 16 mm film on shock and a chalk board.

Autotutorial instruction: a method of instruction in which the student can proceed by independent study to fulfill specific behavioral objectives while using teacher-designated instructional materials. These include audiotapes,

slides, specific tangible items, and workbook materials (Postlethwait, Novak, & Murray, 1966). In this study the media used for autotutorial instruction was four sequential audio-slide units. The students viewed these on an individual basis in a learning carrel.

Purpose of the Study

The purpose of this study was to compare the results of two methods of instruction, the conventional lecture, and autotutorial instruction. Each method was evaluated for cognitive learning and retention by students. This study was addressed to the following problems:

1. What are the mean achievement scores of two groups of students taught by alternate methods, based on the scores from pretest and posttest?
2. Is there a significant difference in the test scores achieved by two groups as measured by a posttest repeated four weeks after unit completion?
3. Which method of instruction requires the greatest expenditure of time by students to complete the tests and instructional units?
4. Is there a significant correlation between the achievement levels of a group of students in cognitive and psychomotor skills performance?

Review of Literature

Retention

The process of reproducing or recalling what has been learned is essential for students when confronted with situations that require critical judgement in the clinical area of nursing. Retention of knowledge is enhanced by the following; 1) feedback regarding achievement (Kippel, 1975), 2) programmed classroom reviews (Gibson, 1965), 3) trials distributed with feedback (Knight, 1975), 4) and similarity of stimulus conditions from trial to trial (Glasser, 1969). According to Lavach (1973) high emotional arousal, as measured by galvanic skin response, when material is presented increases long-term retention. This arousal is most likely to be achieved by the multisensory approach to learning. Stephens (cited in Bigge, 1964) states that the most important principle governing retention of knowledge is that the material must have meaning to the learner.

Methods of Instruction

Lecture

The lecture method is regarded by some as an excellent means for giving clearly organized explanations and of presenting the information to large groups of students (Brown & Thornton, 1963,

Weston, 1963). However in a study by Simpson and Brown (cited in Brown and Thornton, 1963) students gave lecture classes the lowest rating for effectiveness. Research reported by Bloom demonstrated minimal level of attentiveness with little active thinking being done during lecture. The greatest advantage of lecture instruction is the efficiency in which information is communicated to groups. The major disadvantage of this method is the lack of effectiveness in providing individuals with the basis for critical thinking (Bloom, 1954).

Autotutorial

Postlethwait, Novak and Murray (1966) developed that type of independent study called autotutorial instruction for the purpose of meeting individual student's learning needs. They found after extensive experience at Purdue University beginning in 1961, that autotutorial instruction improved learning and allowed for more extensive coverage of course content.

According to Zeckhauser (1972), Lucas (1971), and Dressel (1966), the multimedia approach to individualized learning increased student interest in the content and gave the student the opportunity to learn at his own rate. Carroll (1963) created a model for learning which indicates that if the teaching methods used are appropriate for the student's abilities, and if each student is allowed enough time

to learn at his own rate, the student can attain as high a level of learning as an "A" student. Autotutorial instructional methods allow each student the time that he needs to learn.

Benefits to be derived from the independent study method as reported by Mackie (1973) and Koch (1975) include 1) higher degree of student satisfaction with course outcome, 2) student can study and make use of audio-visual aids as he wishes, 3) rapid learner finishes sooner and slow learner is allowed to repeat the material as necessary, and 4) keeps all students stimulated by active responding. Teacher benefits to be derived from the independent learning method include the following; 1) the method relieves the teacher from repetitive teaching, 2) teacher has more time to interact with students, 3) provides for standardization of content, 4) increases the probability that students will learn what is being taught, and 5) increases the number of students that can be effectively taught by one instructor (Koch, 1975, Coye, 1969, Griffin et al., 1965). In a study conducted by Stein, Steele, Fuller and Langhoff (1972) the opposite result was found. The number of students taught by each teacher could not be increased with autotutorial instruction.

Comparison of Instructional Methods

The teacher must choose the method of instruction that best

lends itself to the retention of knowledge by students. Research findings reported by Atherton (1972), Stewart (1965), Murphy and Gross (1966), McCue (1973), and Dubin and Taveggia (1968) found no significant differences in student achievement or retention of knowledge between those taught by traditional lecture method and those taught by individualized autotutorial methods.

Beland (1973) encouraged nurse educators to develop new instructional methods using a variety of technologies and to develop research technique for evaluation. "Only time and sound evaluation will determine the fate of each" (p. 424). Researchers Thompson, De Boer, Quiring, Stein et al., (1972) Dearden and Anderson, (1969) Griffin et al., (1966) and Seedor, (1963) in the field of nursing education compared autotutorial and lecture methods and found no significant difference in cognitive achievement and retention as demonstrated by test score results of students. The above research studies have not delineated a preference for one method of instruction.

The current study was done to provide a basis for making decisions regarding proposed changes in teaching methodology. The study included such control measures as randomization of subjects, validation of test items based on content of units, and the determination of entry level performance by pretesting.

CHAPTER II

METHODOLOGY

Design

This study was conducted so as to identify the effects of two methods of instruction on cognitive learning and retention as demonstrated by scores received on the pretest, posttest and delayed test taken four weeks after instruction. The two methods of instruction were individualized autotutorial and the conventional lecture. See Figure I below.

	Method of Presentation	
Test of Retention	Autotutorial Group I	Lecture Group II
Pretest	x	x
Immediate	x	x
Delayed	x	x

Figure I

Four sequential units of instruction were prepared for audio-slide presentation by the researcher and a colleague on the subject of hypovolemic shock. Unit I covered "Shock-Definitions, Classifications and Etiological Factors." Unit II dealt with "The

Pathophysiology of Shock." Unit III was "Shock: Prophylactic and Therapeutic Intervention." Unit IV covered "Complications of Shock." (Appendix A).

The Evaluation Instrument

The evaluation instrument designed for this study was a 45 point examination made up of open ended questions which required the students to supply short answers and essay replies. (Appendix B). A panel of three nursing instructors was selected to validate the evaluation instrument. The examination was also administered as a pretest and posttest to 30 junior students of nursing. The instructors and students were in complete agreement that the items of the evaluation instrument had tested for the material as presented without ambiguity.

The Setting

The study was conducted on the Portland campus of Walla Walla College School of Nursing. This Seventh-Day-Adventist operated school has a present enrollment of approximately 400 students in their baccalaureate nursing program. Liberal arts and basic science courses are taught on the main college campus at College Place, Washington during the first two years following enrollment in the program. The upper division nursing major is taught in clinical facilities located in Portland, Oregon. For this reason the choice

was made to conduct the study on the Portland campus. The Dean of the selected school was contacted, and permission to conduct the study was obtained. (Appendix C).

Subjects and Procedure

The population consisted of 62 second quarter junior students of nursing in one baccalaureate school of nursing. From this group a sample of 22 students was randomly selected and assigned to two groups. A table of random numbers was used for both the selection and assignment of students to groups. Two students withdrew from the program, leaving a total of 20 students in the study with 10 students in each group. The sample was enrolled in one class with a total enrollment of 40 students. Although there were only 20 second quarter students included as subjects in the study, all 40 members of the class were divided into two groups, received instruction by either lecture or autotutorial method, and were tested the same as the sample.

The 20 students in the class who were not included in the sample composed the control group in this study. An explanation of group assignments, methods of instruction, testing procedures and an estimation of time required was given to all 40 students and their instructors. There was no disclosure made as to which students were included as subjects in the study.

The pretest was given immediately before instructional units were presented to both the lecture and autotutorial groups. All students in both groups were given the same objectives, reading assignment and study outlines and viewed a 16 mm film on the subject of shock. (Appendix D). Both instructional methods were evaluated for expenditure of time by students. The time required for each student to complete the pretest, instructional unit, posttest and delayed posttest was recorded as total time. The time required for each student to complete the instructional units was recorded as instructional time.

Group I received instruction by autotutorial methods. An orientation period demonstrating the use of the instructional materials was given to the students in this group immediately before they started the instructional units. An opportunity for return demonstration was provided. Students were instructed at this time to contact the researchers if they had unanswered questions after viewing the slide presentation.

The audioslide units were placed on reserve in the library to insure that only those in Group I would have access to these materials. The librarian was given a list of the students in Group I, and was asked that only this group be allowed to use the audiovisual materials. The instructional units were checked out of the library, taken to the learning carrel for viewing, and returned to the library after each

study session. The autotutorial instruction was completed in a period of two weeks and the posttest was given within two days of the completion date.

Group II attended regularly scheduled class lectures. Attendance record was taken at the beginning of each class period to assure that only those in Group II were present. The presentation of identical content to both Group I and Group II was accomplished by the instructors in the lecture group reading or closely following the script that was used for the audio-slide presentation. The only visual aids used during the lectures was a chalk board. No time was allowed for discussion of the subject material presented and questions were answered by referring to the script content. A posttest was given within two days after completion of the lectures.

An unannounced delayed test was given to both Group I and Group II four weeks after completion of instruction. Prior to the final testing period, two students withdrew from the program leaving a total of 18 students in the sample. The test scores from the pretest, posttest and delayed test were used to evaluate the cognitive mean achievement of the groups. A simultaneous study was conducted by a fellow researcher, Rawson, testing students' psychomotor skill performance. Both studies used the same sample, group assignments and instructional methodology.

The sequencing of events that occurred with both studies was as follows:

1. Psychomotor pretest from Rawson's study.
2. Cognitive pretest from present study.
3. Instruction by either autotutorial method for Group 1 or Lecture method for Group II.
4. Psychomotor posttest from Rawson's study.
5. Immediate cognitive posttest from present study.
6. Delayed cognitive posttest given four weeks after completion of instruction from present study.

Data from both studies were used to determine the correlation between student achievement in psychomotor and cognitive skills.

CHAPTER III

RESULTS AND DATA ANALYSIS

The data obtained from the pretest, posttest and delayed test from both groups of students were summarized. Raw data for the two groups are presented in Appendix E.

A t-test using the .05 level of significance was done to answer the stated questions posed for this study. (See Table I).

Table I

Results of T-Test and Statistical Level of Significance for Levels of Achievement Between Groups and Total Time Expenditure Between Groups

	Groups		Degrees of Freedom	t-value	Significance Level
Immediate Achievement Levels	Sample Group I	Sample Group II	18	1.540	N.S.
	Control Group I	Control Group II	20	.080	N.S.
Delayed	Sample Group I	Sample Group II	12	.903	N.S.
Total Time	Sample Group I	Sample Group II	8	1.479	N.S.
	Control Group I	Control Group II	8	*2.346	.05
Instructional Time	Sample Group I	Sample Group II	18	*2.847	.05
	Control Group I	Control Group II	8	*2.346	.05

* .05 significance level

1. What are the mean achievement scores of two groups of students taught by alternate methods, based on the scores from pretest and posttest?

   The mean achievement scores were:

   Group I (autotutorial) 24.1

   Group II (lecture) 29.2

   The t-test value of 1.54 was not significant ($p > .05$).

   The question can therefore be answered that there is no significant difference in mean achievement scores of the two groups.

   The results from the control group further substantiated the fact that there was no significant difference in the mean achievement between groups. The control group consisted of members of the class not included in the sample.

   The mean achievement for the control were:

   Group I (autotutorial) 22.0

   Group II (lecture) 26.5

   The t-test value of .08 was not significant ($p > .05$).

2. Is there a significant difference in the delayed scores between groups as measured by the same posttest repeated four weeks after unit completion?

The mean delayed achievement scores were:

Group I (autotutorial) 24.8

Group II (lecture) 18.0

The t-test value of .903 was not significant ($p > .05$).

There was found to be no significant difference in delayed retention between groups.

3. Which method of instruction requires the greatest expenditure of time by students to complete the tests and instructional units?

The mean total times were:

Group I (autotutorial) 382.7 minutes

Group II (lecture) 320 minutes

The t-test value of 1.48 was not significant ($p > .05$).

There was found to be no significant difference in total time between groups. The mean instructional times were:

Group I (autotutorial) 246 minutes

Group II (lecture) 320 minutes

The t-test value of 2.85 was found to be significant ($p < .05$).

Group I expended significantly less instructional time than Group II.

This was also found to be true for the control group.

The mean instructional time for the control were:

Control autotutorial 277 minutes

Control lecture 320 minutes

The t-test value of 2.35 was significant ($p < .05$).

Table II

Summary Table of Analysis of Variance for Cognitive Gain Scores of Second Quarter, First and Third Quarter Nursing Students Taught by Autotutorial or Lecture Methods of Instruction

Source	Sum of Squares	Degrees of Freedom	Mean squares	F	Significant Level .05	.01
A Time in program	60.025	1	60.025	1.195	4.11 NS	7.39
B Method of instruction	53.379	1	53.379	1.063	NS	
AB	76.961	1	76.961	1.532	NS	
Error	1807.409	36	50.205			

A two way analysis of variance (see Table II) was computed to determine if there was any significant interaction between length of time students were in the program and the method of instruction. All cognitive test gain scores of second quarter, first and third quarter students instructed by either autotutorial or lecture method were included. No significant interaction was found between length of time in program and method of instruction.

A multiple correlation was computed using the data from the psychomotor pretest and posttest of Rawson's study and the cognitive pretest, posttest and delayed test from the present study. There was found to be a significant correlation between cognitive and psychomotor posttest scores. The computed value for r was .573. This is significant for 17 degrees of freedom at the .05 alpha level.

Significance was found between cognitive gain scores and psychomotor gain scores. Computation of r was .481 with 17 degrees of freedom. Therefore, the question is there a significant correlation between the achievement levels of a group of students in cognitive and psychomotor skills performance was answered. (Correlation Matrix, Appendix F).

Discussion

The results supported Atherton (1972) findings that no significant differences were found in student achievement or retention of knowledge between those taught by traditional lecture method and those taught by individualized autotutorial method of instruction.

Negative attitudes toward a change in instructional methodology were exhibited by a number of the students during the study. If the problems associated with these negative feelings could have been identified prior to the study and plans for helping students cope with them initiated, it might have influenced the findings. While no conclusions were made regarding attitudes, some of the reactions of the participants can be shared in this report. For example four students expressed frustration at the rapid rate of presentation on the audiotapes. Another student from the autotutorial group found it difficult to receive clarification of instructional material without teacher intervention. Two students from the lecture group stated

they were "so happy to be in this group where we can discuss presented material." On the basis of these students' reactions, it would have been beneficial to have an instructor available in the Learning Center during the time that the autotutorial group was using the audioslide presentations. Postlethwait (1966) found it valuable to have a teacher available at all times in the Learning Center.

A few of the comments expressed by some students following their participation in this project have been given. These reactions were not included to generalize nor to form conclusive statements regarding the attitudes of students in either group. They were included as a sampling of the attitudes expressed, and as one possible reason for the lack of significant difference between groups.

Another reason could have been the students resistance to change. They had been accustomed to the lecture or modified lecture method of learning and seemed to view autotutorial learning as a completely new methodology of instruction. Resistance to multimedia instruction was substantiated by the negative remarks of the majority of students in the autotutorial group. Thompson (1972) found similar initial responses from students to autotutorial instruction. In this study, it can be assumed that the negative feeling of students toward the autotutorial method could have been reduced if there had been a longer, well-formulated orientation to this new methodology.

The lecture method of instruction required the greatest expenditure of total time by students in order to complete the tests and instructional units. Although there was no significant statistical difference found between groups based on the t-test for total time, there was a significant difference in the amount of time used for instruction. The t value for instructional time between groups was computed as 2.85. This is significant at the .05 alpha level. The autotutorial group used less time, but achieved comparable scores. The data supports the conclusion that less time was spent on the units of autotutorial instruction than in the same units of instruction by lecture presentation. The researchers did not find that the multimedia approach to learning increased student interest as was reported by Zeckhauser (1971) and Dressel (1966). Students expressed dissatisfaction with autotutorial learning two quarters after completion of the instruction.

For some students who were accustomed to multiple-choice questions, the testing experience with the use of essay questions was anxiety producing. Depending on the degree of anxiety, this factor could have been influential in decreasing the achievement levels of individual students.

A two way analysis of variance was computed on the gain scores to determine if there was any significant interaction between length of time in program and method of instruction. No interaction was

found between instructional methods and length of time in program. Thus the variables of length of time in program and instructional method have been reported independently.

A multiple correlation was done to determine if there was a significant correlation between achievement levels of a group of students in cognitive and psychomotor skills performance. A significant positive correlation was found. This finding is important for nursing education because basic nursing content includes not only the ability to retain cognitive knowledge, but also the ability to utilize this information in actual practice of skilled performance. Dunn (1970) indicated that there is little relation between cognitive achievement and psychomotor performance. However the findings in this study agreed with Quiring (1972) that high critical thinking ability correlated positively with psychomotor performance.

CHAPTER IV

SUMMARY AND CONCLUSIONS

Summary

The purpose of the study was to compare the results of two methods of instruction, the conventional lecture and autotutorial instruction on retention of cognitive learning.

Data were collected on 18 junior students in a baccalaureate nursing program. Each student was given a pretest, posttest and delayed test four weeks after completion of the instructional unit.

The findings revealed no significant difference between groups based on scores from the pretest, posttest or delayed test. There was also no significant difference between groups on total time expenditure.

No statistically significant difference was found in the mean total time between groups. The autotutorial mean time was 382.7 minutes and the lecture mean time was 430.4 minutes. Significance was found between groups in the amount of time used for instruction. The autotutorial group used less time and achieved similar scores.

Significant correlation was found between achievement levels on cognitive and psychomotor skill performance.

Conclusions

The findings suggest such conclusions as;

1. There was no significant difference in cognitive retention between students who used autotutorial independent study and those taught by lecture.
2. Less time is required for some students to learn by autotutorial method than by lecture. The mean time expenditure was 47.7 minutes less for the autotutorial than for the lecture group.
3. The study revealed that nursing content can be learned using autotutorial methods as well as lecture.
4. A positive correlation between cognitive learning and psychomotor performance was demonstrated.

On the basis of this study done with 18 nursing students certain questions have been raised. 1) Would the same results be obtained using a larger sample? 2) How much does student attitudes toward instructional methodology influence achievement? This could be determined by an attitudinal study done prior to the replication of the present study. 3) Will biases be eliminated if students are given a period of time to adapt to new methodology before conducting a comparative study?

Important information gained from this study is that the autotutorial method, as designed, was no more effective than the

traditional lecture method. This finding should provide an impetus to determine individual student learning capabilities and to test other modifications of teaching methods which meet the learning needs of students of nursing.

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APPENDICES

APPENDIX A

Script Narrative of One of the

Four Sequential Units of Instruction

THE AUTOTUTORIAL INSTRUCTIONAL UNITS

The instructional units you are about to see are on the subject of shock. Upon completion of these units you will be able to fulfill the objectives of each unit.

Please take as much time as you need. You may stop the projector any time you are having trouble keeping up with the program. You may repeat any or all of the units as often as you desire. If you have further questions regarding the material in these units please see your instructors. It will be helpful for you to follow the study guide outlines as you view the units.

AUTOTUTORIAL UNIT II

PATHOPHYSIOLOGY OF SHOCK

NARRATIVE	SLIDES
Pathophysiology of shock.	1. Picture of patient in shock.
Stage I Alarm Reaction There is decreasing blood volume, or heart failure, or vasodilatation during the first stage of shock.	2. Word slide. Stage I Alarm Reaction
Stage II Stage of Resistance. This stage demonstrates the body's efforts to adapt to decreased blood volume by compensatory mechanisms. The primary functions of the body's compensatory mechanisms are to maintain near homeostasis and to provide adequate blood perfusion to the vital organs. Stage III Stage of Exhaustion There is collapse, with failure of compensatory mechanisms. Shock, results, and if untreated, death follows.	3. Word slide. Stage II Stage of resistance.
Compensatory mechanisms that occur as a result of generalized hypoperfusion.	

I Sympathoadrenal and cardiovascular compensatory mechanisms.

When there is decreased blood volume, the arterial pressure begins to fall causing a decreased venous return to the heart, which leads to a diminished stroke volume with resultant lowered cardiac output.

4. Word slide.
Loss of blood → ↓ blood to heart

Within 30-60 seconds after the initiation of hemorrhage, baroreceptors sensitive to pressure changes located in the carotid sinus and aortic arch stimulates the sympathetic nervous system.

5. Word slide.
↓B P → ↓ Baroreceptor activity → ↑ SNS activity.

The sympathetic nervous system activates the adrenal glands to secrete epinephrine and norepinephrine. The influence of these hormones with the sympathetic nervous system causes an increased heart and respiratory rate. Epinephrine and norepinephrine act directly on the smooth muscle layer of periph-arterioles causing constriction.

6. Word slide.
SNS activity and adrenal medullary hormones → ↑ vasomotor activity → ↑ venous tone and venous return → ↑ ventricular filling → ↑ systemic arterial B P.

Peripheral vasoconstriction places an increased resistance to blood flow, thus aiding in prevention of hypotension. It causes shunting of blood from the skin and splanchnic visera to the heart and brain.

7. Picture of shunting of blood away from capillary.

Normally the brain, heart, and liver utilize over one-half of the body's oxygen supply. When cardiac output falls, these organs are preserved as top priority, and may receive nearly all of the cardiac output.	
The lowest priority is the skin. Shock may be detected by pallor and cold skin.	8. Picture of a pale, diaphoretic patient.
The fall in blood pressure due to decreased blood volume and cardiac output leads to capillary hydrostatic pressure lower than colloid osmotic pressure resulting in autotransfusion of fluids from extravascular to intravascular compartments.	9. Picture of the word Autotransfusion.
Veins are a reservoir for blood. Norepinephrine causes constriction of these vessels resulting in a large increase of blood to the heart. Constriction of the venous system can increase venous return to the heart by two and one half times normal. However, the reserve supply is soon depleted.	10. Schematic diagram of the circulation demonstrating vasoconstriction of veins.
These mechanisms help to maintain the blood pressure within normal	11. Word slide. Normal Blood Pressure

range, despite a decrease in volume.

However, the diastolic blood pressure measures the resistance of vessels. A rise in the diastolic blood pressure above the patient's normal reading indicates increased peripheral resistance and vasoconstriction.

12. A schematic diagram of vasoconstriction of the systemic circulation.

II Respiratory Compensatory Mechanisms.

The amount of oxygen and carbon dioxide that can be transported by the blood is directly proportional to the number of red blood cells in the blood stream, and to the amount of hemoglobin in the red blood cells,

13. Picture of red blood cells in blood vessels.

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and is inversely proportional to the distance of membrane area over which the gases must diffuse.

14. Picture of the alveolar membrane and blood vessels of a section of lung.

When hemorrhage occurs there is a decrease in both the number of red blood cells and the amount of hemoglobin.

15. Picture of blood vessels with very few red blood cells.

With decreased blood volume there is less fluid available to transport carbon dioxide to the lungs for

16. Picture of blue blood vessels in arm denoting an increase

for respiratory exchange. Carbon dioxide increases throughout the body.		of carbon dioxide.
Increased carbon dioxide stimulates the respiratory center, resulting in an increased respiratory rate.	17.	Word slide. CO_2 stimulation of respiratory center ↑ respiratory rate.
Metabolic acidosis, secondary to anaerobic metabolism, produces excess hydrogen ions that also stimulate the respiratory center.	18.	Picture of the respiratory center in the brain.
Hyperventilation resulting from the stimulation of the respiratory center	19.	Word slide. Hyperventilation
helps the body to compensate for excess acid. This accounts for the shallow, rapid breathing seen in early shock. Initially hyperventilation helps to prevent acidosis.	20.	Picture of lungs labeled with various pO_2 and pCO_2 values seen in acidosis.
In a study reported from Viet Nam 30% of profound shock patients had normal pH or were alkalotic.	21.	Picture of injured soldier on the battle-field, being cared for by a nurse.
When evaluating blood gases a low pCO_2 in the presence of a low or near normal pH and low Bicarbonate level indicates that the respiratory system is compensating for the acidosis.	22.	Word slide. Metabolic Acidosis Compensated by the Respiratory System Low pCO_2

		Low or near normal pH Low HCO_3
A rising pCO_2 with a low pH and low Bicarbonate level is indicative of failure of the respiratory compensatory mechanism.	23.	Word slide. Failure of Respiratory Compensation Rising pCO_2 Low pH Low HCO_3
III Kidney Compensatory Mechanisms Lowered arterial pressure and vasoconstriction in renal arterioles leads to decreased glomerular filtration, thus resulting in decreased urine output. With renal vasoconstriction there is reduced perfusion of the juxaglomerular apparatus which results in an increased production of renin. Renin activates the angiotension system causing further vasoconstriction and stimulation of the adrenal cortex results in an increased tubular reabsorption of sodium.	24.	Schematic diagram of circulation to the nephron, and the renin-angiotension system.
Increased extracellular fluid osmolarity to the hypothalamus produces nervous stimulation to the posterior pituitary leading to an increased secretion of antidiuretic hormone. An increased renal tubular	25.	Schematic diagram of the hypothalamus, posterior pituitary, and nephron showing the effects of ADH on the kidney tubules.

reabsorption of water results from the influence of antidiuretic hormone. Conservation of body fluids helps to increase total blood volume.	
The kidney compensates for metabolic acidosis by excreting hydrogen ions and reabsorbing bicarbonate ions.	26. Schematic drawing of the regulation of acid-base balance by the kidney.
Erythropoietin, an erythropoiesis stimulating hormone, is secreted by the kidney in response to hypoxia. This hormone stimulates the bone marrow to increase the production of red blood cells.	27. A picture of the kidney, blood vessel, bone marrow of femur, showing the stimulation of red blood cell production under the influence of erythropoietin.
IV Reticuloendothelial Compensatory Mechanisms	
Red bone marrow is further stimulated by hypoxia to produce and release more red blood cells into the circulation.	28. Picture of blood vessel with hypoxia and red bone marrow of femur showing formation of red blood cells.
Rapid formation of red blood cells causes immature cells to pass into the blood stream. Immature cells contain less hemoglobin, thus	29. Picture of immature red blood cells.

diminish the oxygen carrying capacity of the blood.	
Red blood cells are released from the storage areas of the liver and spleen, further increasing the number of circulating red blood cells.	30. Picture of normal red blood cells.
V Adrenocortical Compensatory Mechanisms In order to maintain nutrition to vital tissues the adrenal cortex secretes glucocorticoids. The function of the glucocorticoids is tomobilize energy stores. Carbohydrate stores are rapidly depleted following the initial injury, consequently, protein and fat stores are mobilized to meet the energy requirement.	31. Picture depicting glucocorticoid influence on muscle, liver, bone matrix, pancreas, and GI
PATHOPHYSIOLOGY OF SHOCK Shock, produces cellular hypoperfusion of first non-vital tissues of the gastrointestinal tract, muscle, connective tissue, and skin. Subsequently, hypoperfusion occurs in the vital tissues of the kidney, liver, lung, heart, and brain. The result is starvation and anoxia of the tissues with a build up of waste products.	32. Schematic drawing of circulation showing shunting of blood away from the capillaries.

In order for life to be sustained metabolism changes from aerobic to anaerobic.	33.	Word slide Anaerobic Metabolism
Anaerobic metabolism can be defined as the production of energy from the available nutrients without the simultaneous utilization of oxygen.	34.	Picture diagram of glycolysis and breakdown of pyruvic acid by aerobic metabolism to the end products of CO_2 and water, and by anaerobic metabolism to the end product of lactic acid.
Anaerobic metabolism or anaerobic glycolysis, is less effective than aerobic oxidation, resulting in the production of lactic acid which can not be converted to energy.	35.	Word slide. Anaerobic glycolysis ↓ lactic acid production ↓ no production of energy.
With a decrease in energy production the integrity of the cell membrane cannot be maintained.	36.	Cartoon picture of a cell with holes in its membrane.
The increased permeability of the membrane allows sodium to enter the cell. Sodium draws water with it. The cell becomes swollen, and edematous.	37.	Cartoon of a swollen cell.
Potassium and intracellular enzymes, such as LDH and SGOT, leave the cell through the damaged membrane.	38.	Cartoon of cell with enzymes and K^+ leaving through the membrane.

Cell functions of protein and enzyme synthesis fail.	39. Cartoon of cell with sign "out of order."
The injured anoxic cell may liberate histamine or other similar substances that produce constriction of the smooth muscles of the bronchioles leading to obstruction of the airway. Histamine also counteracts the effects of catacholimines causing pooling of blood by vasodilatation.	40. Cartoon picture of a cell with histamine being released.
Intracellular acidosis occurs when hydrogen ions enter the cell. Acidosis leads to rupture of the cell lysosomes with release of catalases	41. Cartoon of cell with H^+ dancing over ruptured lysosomes.
which digest all cell components. Complete destruction of the cell occurs.	42. Word slide. phagocytosis.
In hypoperfusion which leads to shock there are three salient and interdependent factors influencing electrolytes: 1.) fluid loss, 2.) sodium loss, and 3.) potassium liberation. Individually, each of these factors can be detrimental, their concerted action is fatal.	43. Word slide. I Fluid loss. II Sodium loss. III Potassium liberation.

The energy component of the cell, ATP, is lost due to lack of oxygen and nutrition. Without energy there is functional impairment of the sodium-potassium pump leading to the cellular edema of energy depletion.	44. Diagram of the Sodium-Potassium pump.
Sodium and water are allowed to enter the cell.	45. Cartoon picture of cell with sodium and water entering.
The role of potassium in shock is fundamental. With failure of the sodium-potassium pump, potassium is lost from the intracellular compartment to the extracellular compartment. Furthermore, metabolic acidemia supports hyperkalemia of extracellular fluid. Hydrogen ions are admitted to the cell causing potassium to leave.	46. Cartoon picture of cell with potassium leaving and H^+ entering it.
Increased extracellular potassium concentration can be fatal, directly influencing the development of cardiac arrest in patients with shock.	47. Electrocardiogram tracing showing hyperkalemia.
Summary: Oxygen and nutrition deficit to cells results in increased cell membrane premeability, with	48. Cartoon picture of a swollen cell.

sodium and water entering the cell causing swelling, and forcing potassium into the blood. An acid condition resulting from anaerobic metabolism causes complete destruction of the cell.		
Hypoperfusion inhibits the removal of waste products leading to metabolic acidosis. Serum pH will decrease below 7.34.	49.	Picture of arm with blue vessels, labeled pH 7.30-7.25.
Metabolic acidosis is caused by two factors: 1.) the build up of lactic acid from anaerobic glycolysis and 2.) ketone and acetone bodies resulting from the metabolic degeneration of fats that are utilized to produce energy. The patient with metabolic acidosis may manifest the following signs and symptoms: hyperpnea, twitching, convulsions, stupor, and coma.	50.	Word slide. Causes of metabolic acidosis I lactic acid accumulation II ketone and acetone body formation
EFFECTS OF ANAEROBIC METABOLISM ON THE GASTROINTESTINAL TRACT	51.	Picture of circulation to the villi of the G I tract.
Decreased cardiac output and severe vasoconstriction of the splanchnic vessels limits the flow of blood to the gastrointestinal tract	52.	Picture of hemorrhage in the G I tract.

causing ulcerations or hemorrhagic necrosis.

These factors reduce the effectiveness of the intestinal mucosa as a barrier between bacteria and toxins in the intestinal lumen and blood stream.

53. Picture of massive ulceration of the G I tract.

Shock is potentiated by the presence of these bacteria and toxins in the intravascular compartment.

54. Picture of micro-organisms.

EFFECTS OF ANAEROBIC METABOLISM ON THE RETICULOENDOTHELIAL SYSTEM

The capacity of the reticuloendothelial system to remove bacteria and the constantly forming endotoxins from the blood stream is greatly reduced during shock. The disturbances in the blood proper are partially due to tissue anoxia, as well as to the impairment of the monitoring activities of this system.

Stasis, sludging, tendency to venular thrombosis, impaired capillary permeability, and subnormal vascular reactivity that occur during shock can all be traced back to dysfunction of the reticuloendothelial system.

55. Picture of blood clot in vessel.

The impaired ability of the system to ward off toxic agents is critical.

The reduced blood flow through the intestines during shock impairs the vitality of intestinal tissues so extensively that bacterial products from the intestine gain access to the blood stream. To further compound the problem, the individual in a state of shock is more susceptible than normal to bacterial products, particularly bacterial endotoxins, since interference with the reticulo-endothelial system leads to a reduced capacity to withstand stress.

56. Schematic diagram of the circulation of the G I tract.

EFFECTS OF ANAEROBIC METABOLISM ON THE LUNG.

Circulating toxin and humoral agents such as histamine and brady-kinins resulting from cell anoxia are influential in the development of pulmonary

57. Picture of bronchioles and alveoli of the lung showing bronchospasm and pulmonary edema.

congestion of intra-alveolar
edema, interstitial edema,
and hyaline membrane formation.
These factors increase the distance
of the membrane through which
gases must diffuse between
lung and blood stream.

Surfactant, a lipoprotein,
that reduces surface tension within
the alveoli may be destroyed or
produced in inadequate quantities
during shock. This causes an
increase in surface tension in the
alveoli and atelectasis results.

Slowing of circulation
through the lung leads to clumping
of platelets and red blood cells
which block the alveoli, thus
destroying the aerating surface
of the lung.

58. Picture of atelectasis of the lung.

EFFECTS OF ANAEROBIC
METABOLISM ON THE KIDNEY.

The kidney is a unique organ
in maintaining the composition of

59. Picture of the kidney.

the internal environment within narrow limits.

During normal metabolism a glomerular filtration rate of approximately 30 ml per minute filters sufficient plasma to maintain normal fluid composition including blood urea and creatinine. Any decrease below this level results in an accumulation of metabolic products in the blood.

60. Schematic diagram showing excretion of urea and creatinine.

Hypovolemia produces decreased cardiac output with compensatory changes in renal vascular resistance. The renin-angiotension system is stimulated to cause the eventual retention of sodium under the influence of aldosterone. An increase in blood pressure occurs because of vasoconstriction effected by angiotension II.

61. Schematic diagram of the renin-angiotension system and its influence on blood pressure.

The renin-angiotension system potentiates the progression of renal damage by causing constriction of afferent arterioles especially in the cortex, causing a further drop in the glomerular filtration rate.

62. Renin-angiotension chain diagram.

The reduction of distal tubular volume further increases renin secretion, thus producing a positive feedback mechanism.

Shock produces the following adverse effects in the kidney: 1.) decreased cortical blood flow, 2.) consequential inhibited glomerular filtration, 3.) decreased medullary blood flow which blocks the supply of nutrients to tubular cells,

63. Graphs showing circulatory and functional disturbances in the cause of acute renal failure.

4.) increased sodium reabsorption with decreased volume and sodium content of the distal tubular filtrate, 5.) increased concentration of toxic agents in the filtered fluid 6.) causes rupture of the basement of tubular cells leading to necrosis. 7.) casts are formed within the tubules and are prominent in urine.

64. Diagram of the effects of vasoconstriction on nephron that produces acute renal failure.

EFFECTS OF ANAEROBIC METABOLISM ON THE LIVER.

Initially in shock red blood cells and venous blood are returned to the heart to improve cardiac output. As shock progresses pooling of blood in the liver and portal

65. Picture of a cross section of the liver.

beds may be caused by plugging of large numbers of small hepatic vessels and sinusoids with masses of agglutinated blood.	
The liver plays an important role in the metabolism of carbohydrates, protein, and fat. The albumin lost in hemorrhage or plasma loss is replaced by synthesis of new protein by the liver. Shock interferes with the livers ability to synthesize protein.	66. Word slide. Liver Metabolism
The liver is a major detoxifying organ. Under normal circumstances the liver is believed to protectively trap and dispose of toxic bacterial enzymatic products.	67. Word slide. Detoxification
Shock enhances bacterial invasion of the liver from the intestine. The anoxic liver develops metabolic deficiencies and impaired ability to detoxify.	68. Picture of circulation to the liver from the portal vessels.
The liver may develop fatty changes beginning in the centers of the lobules and extending to affect the entire lobule. Parenchymal tissue is replaced by fat, thus leaving a minimal functioning area of the liver.	69. Picture of a fatty liver.

EFFECTS OF ANAEROBIC METABOLISM ON THE CARDIOVASCULAR SYSTEM The force of the contraction of the myocardium depends on an adequate blood flow. Inadequate blood volume causes a decreased venous return to the heart resulting in a decreased cardiac output leading to an increased heart rate.	70. Picture diagram of the mechanisms of heart adjustment to body-perfusion requirements.
Tachycardia decreases diastole causing myocardial tissue ischemia and starvation. With impairment of heart muscle nutrition, force of cardiac contraction becomes ineffective and	71. Picture of effects of myocardial ischemia on the patient.
toxins are released from cells. These toxins cause increased capillary permeability	72. Cartoon picture of cells with toxins being released.
predisposing to intravascular clotting and depression of the myocardial and vascular responses to catecholamines.	73. Picture of clot in a vessel.
During shock veno-arterial shunting occurs, causing blood to flow directly from the arterioles to venules without nourishing the cells or removing waste products.	74. Schematic diagram demonstrating shunting in the circulation.

The condition is further compounded when shunting occurs in the lung causing unoxygenated blood entering the lung to mix with oxygenated blood leaving the lung.	
Blood flow decreases and stasis of blood develops with an increased tendency of the blood to clot. Thrombosis within the capillaries further inhibits the flow of blood. The end result is disseminated intravascular clotting.	75. Picture of clot in blood vessel.
EFFECTS OF ANAEROBIC METABOLISM ON THE BRAIN Early signs of acute hypoxia include restlessness and apprehension, impairment of judgment, motor in-coordination, and a clinical picture that resembles acute alcoholism. Later signs include listlessness and apathy progressing to loss of consciousness, and depression of reflex responses.	76. Picture of an apprehensive, anxious, patient.
Degenerative changes seen in the brain resulting from hypoperfusion may be manifested by a a permanent lack of nervous control of the vascular system and vascular	77. Word Slide. Degenerative changes due to hypoperfusion of the brain: Loss of function of

collapse. Paralysis of one or more parts of the body, or hyperpyrexia may occur, prior to death.	vasomotor center Vascular collapse Loss of function of motor cortex Partial paralysis Loss of function of hypothalamus Hyperpyrexia.
ASSESSMENT	
The need for assessment is paramount. Assessment includes both the process of observation and the more complex process of interpreting data in a manner that provides a basis for intelligent and thorough nursing care. The degree to which one can observe and perceive a subject is usually proportionate to his/her knowledge and understanding of, and experience with the subject. The nurse must know what to look for, and what is likely to be found.	78. Word slide. Assessment → observation → critical judgment → effective nursing care.
Some parameters for assessment to detect and monitor shock should be observed almost constantly, others at less frequent intervals. The physician's orders are a guide, but they represent maximum intervals between evaluation.	79. Physician's order sheet with the order Vital signs q 30 min. J. Brown M. D.

In order to evaluate the perfusion of brain tissue, assessment of the following is essential:	80. Picture of circulation of the brain.
1.) check level of consciousness, mental alertness, 2.) presence of tingling, or numbness of extremities, 3.) pupillary reflexes, presence of blurred vision, 4.) presence of dizziness, co-ordination of movement, 5.) emotional status, Is there restlessness, apprehension? or is the patient listless and apathetic? 6.) Is there presence of fatigue?	81. Word slide. Level of consciousness Pupillary reflexes Coordination Emotional state
Assessment of perfusion of body tissues is necessary in order to determine adequate venous return, cardiac output, nutrition and oxygenation of cells and removal of cellular wastes.	82. Picture of a patient in shock.
Circulatory status should be assessed at least every ten to fifteen minutes. Changes in the adequacy of tissue perfusion can be noted by the following variations: 1.) in heart sounds, 2.) in blood pressure readings from the patient's normal values, 3.) in radial pulse rate and quality of apical beat, 4.) in cantral venous pressure	83. Word slide. Check vital signs every ten minutes.

readings from the patient's normal values, 5.) in skin color, moisture, temperature, and capillary filling, 6.) in urinary output and specific gravity of urine,	
7.) in actual identification of fluid or blood losses, and 8.) in temperature readings.	84. Picture of bleeding wound.
Assessment of respiration is paramount for the patient in shock. This should include careful observation for 1.) patent airway, 2.) rate and quality of respirations, and 3.) the presence or absence of dyspnea, cough, ronchi, and rales.	85. Picture showing resuscitation of a patient in emergency room by the health team.
Assessment of the general appearance in order to identify any evidence of verbal and nonverbal distress. Some things included in this area would be: 1.) appearance of an ill person, 2.) restlessness and apprehension, 3.) possible abdomenal distention,	86. Picture of a patient in distress, showing anxiety.
4.) verbal complaints of thirst, dizziness, fatigue, pain, and an uncomfortable feeling of coldness. When monitoring the patient's condition, notation of the direction and degree of change from the	87. Word slide. thirst dizziness fatigue pain cold

initial and subsequent readings should be carefully evaluated.		
Early signs and symptoms of shock are: pallor, peripheral cyanosis, cold, clammy extremities, slight apprehension and restlessness, increased pulse rate, increased respiratory rate, blood pressure with narrowing pulse pressure, mild hypotension, generalized pale, moist skin, dry mouth, thirst, and oliguria.	88.	Word slide. A list of all the early signs and symptoms of shock.
(pause)	89.	Table summarizing the effects of early degree of shock on blood volume, hemoglobin, hematocrit, and plasma protein.
Progressing signs and symptoms of shock are generalized cold skin, ashen gray color, frank cyanosis with mottling, weak, thready, rapid pulse, venous collapse with digital pressure,	90.	Word slide. Listing progressing signs and symptoms of shock.
rapid shallow respirations, urinary output decreased to the point of anuria, weakness, dulled sensorium, confusion, semi-consciousness leading	91.	Word slide. Listing of the progressing signs and symptoms of shock

to coma, dilated pupils.	continued.
(pause)	92. Table summarizing the effects of progressing shock on blood volume hemoglobin, hematocrit, and plasma protein.
PATIENT SITUATION	
The following example is given in order to demonstrate the assessment, reporting of pertinent observations, and treatment of a patient susceptible to the development of shock. Mrs. Harriet Samuelson, age 45 years, was admitted to the surgical unit for a vaginal hysterectomy. Her normal vital signs are temperature 98.4, pulse 70, respirations 16, and blood pressure 130/80.	93. Picture of the admissions sheet of the patient's record.
The next morning, she was returned to her room by 10:30 following surgery and a short stay in the recovery room. Her vital signs had stablized at 1:00 p.m. The readings were pulse 76, respirations 16, blood pressure 128/78.	94. Picture of the nurse's notes showing the time, vital signs and patient's condition when she was returned to her room.

After change of shift at 3:30 p.m. the nurse enters the room and finds Mrs. Samuelson pale. Her vital signs are pulse 82, respirations 22, blood pressure 120/96. A vaginal packing is in place, there is no discharge noted on the perineal pads. Sixty cc's of urine have accumulated in the urine drainage bag since change of shift. Mrs. Samuelson's I. V. is infusing well. At 3:40 p.m. the nurse aid reported that Mrs. Samuelson's vital signs were pulse 86, respirations 22, and blood pressure 120/96. There was a small amount of dark red drainage on the perineal pad. The nurse, not wishing to abdicate the responsibility of patient observation to non-trained personnel, rechecked the patient's condition. Mrs. Samuelson was restless, and complaining of cramping pain in the low abdomen.	95. Picture of the nurse's notes continued.
Question? What nursing intervention would be appropriate for Mrs. Samuelson at this time?	96. Word slide. What nursing intervention would be appropriate at this time?

(pause)		
Answer: Give Demerol 100 mg intramuscularly for pain. Recheck vital signs in fifteen minutes.	97.	Picture of medicine tray with medicine card, vial of Demerol, syringe, and alcohol wipes.
At 4:05 p.m. her vital sign readings were pulse 96, respirations 26, blood pressure 110/92. Mrs. Samuelson is apprehensive. Her skin is pale, cool and moist. The perineal pad is moderately saturated with bright red drainage.	98.	Picture of charting on nurses notes.
Question? What nursing action would be appropriate for this situation?	99.	Word slide. What nursing intervention would be appropriate at this time?
(pause)		
Answer: 1. Turn her to the side in order to assess the amount of bleeding more accurately.	100.	Picture of patient turned on the side with a large amount of blood on the chux.
2. Check the I.V. and increase the rate of infusion. 3. Place the patient in shock position.	101.	Picture of nurse increasing rate of I.V. fluid.

4. Call the physician and report the increased pulse rate, increased respiratory rate, decreased blood pressure, patient's apprehension, condition of skin, and the amount and color of drainage.	102.	Picture of a nurse talking on the telephone.
At 4:15 p.m. the physician gives these orders over the telephone: 1.) Continue to watch the patient closely, 2.) Increase the intravenous rate to 60 drops a minute, 3.) Type and cross-match for three units of blood, 4.) Notify the physician within the next hour regarding any progressing signs of shock.	103.	Picture of Doctor's orders as written on the Physician's order sheet.
At 4:30 p.m. Mrs. Samuelson's vital signs have changed to the following values: pulse 110, respirations 30, blood pressure 90/70. She is pale, diaphoretic, and listless. There is a large amount of bright red vaginal drainage. Urinary output is 15 cc's for the last hour.	104.	Picture of charting on the Nurses Notes.
Question? What nursing intervention would be appropriate for Mrs. Samuelson at this time?	105.	Word slide. What nursing intervention would be appropriate at this time?

(pause)		
Answer: Report to the physician immediately	106.	Picture of nurse talking on the telephone.
the increased pulse and respiratory rates, decreased blood pressure, patient's general condition, and the increased vaginal drainage.	107.	Picture of charting.
Mrs. Samuelson's treatment would be to return her to surgery for ligation of the bleeding vessel,	108.	Picture of patient being taken into surgery on a stretcher.
and replacement of whole blood that was lost in hemorrhage.	109.	Picture of a bag for transfusion.
It is the responsibility of the nurse to accurately record all vital signs taken, all nursing observations made, and all nursing interventions given on the patient's chart.	110.	Picture of charting.
This concludes Unit II The Pathophysiology of Shock.		

APPENDIX B

Examination Covering Shock

SHOCK PRETEST-POSTTEST

1. Shock can be defined as: (1 point)

2. Characteristic signs and symptoms indicating early shock are: (3 points)

   a. d.
   b. e.
   c. f.

3. Characteristic signs and symptoms indicating progressing shock are: (3 points)

   a. d.
   b. e.
   c. f.

4. Four predisposing factors to shock are: (2 points)

   a. c.
   b. d.

5. Based on the area of primary failure shock may be classified as: (3 points)

   a.
   b.
   c.

6. What is the primary function of the body's compensatory mechanisms during shock? (1 point)

7. Select two compensatory mechanisms and discuss how each functions to maintain homeostasis during shock. (6 points)

8. Outline and give brief rationale for five nursing interventions that would support compensatory mechanisms. (5 points)

9. Describe the effects of anaerobic metabolism on the cell and the cell's function. (6 points)

SITUATION: Mrs. Harriet Samuelson, age 45 years, was admitted to the surgical unit for a vaginal hysterectomy. Her normal vital signs were T 98.4, P. 70, R. 16, B. P. 130/80. Six hours post-operatively, the nurse assessed Mrs. Samuelson's condition as; P. 82, R. 22, B. P.

120/96. Skin pale, no vaginal discharge, urinary output per foley catheter 300 cc, I. V. infusing well.

Questions # 10 to 14 refer to this situation.

10. What appropriate nursing interventions does Mrs. Samuelson require at this time? (2 points)

11. The next nurse's assessment of Mrs. Samuelson included: P. 86, R. 22, B. P. 120/96. Small amount of bright red vaginal drainage. Mrs. S. is complaining of cramping pain in the low abdomen and backache. What nursing care should she receive at this time? (2 points)

12. When next evaluating Mrs. Samuelson's condition the nurse noted: P. 96, R. 26, B. P. 110/92, pale color, skin cool and moist, moderate amount of bright red vaginal drainage. Mrs. Samuelson is apprehensive and restless. Your best nursing action would be? (4 points)

13. Next vital signs were P. 120, R. 30, B. P. 80/50. Mrs. Samuelson is diaphoretic, pale and listless. There was a large amount of bright red vaginal drainage, urinary output 15 cc the last hour. Appropriate nursing intervention would include: (4 points)

14. Mrs. Samuelson is vulnerable to specific complications resulting from shock. Identify three complications and list the signs and symptoms of each. (3 points)

October 10, 1975

Miss Wynelle Huff, Dean
Walla Walla College School of Nursing
6014 S. E. Yamhill
Portland, OR 97215

Dear Miss Huff:

In partial fulfillment of requirements for a Master of Nursing Degree at the University of Oregon School of Nursing, I am undertaking a research study. This study will involve the results of lecture and autotutorial methods of instruction on immediate and delayed retention of cognitive learning by junior nursing students.

In order to accomplish this study I need the cooperation of you and your staff since I plan to use Walla Walla College School of Nursing for my pilot and final study. Students will be randomly selected and assigned to the two treatment groups. The names of students or instructors will not be included in the study.

Upon completion of the study copies of the report will be placed in the libraries at the University of Oregon Medical School and Walla Walla College School of Nursing.

Thank you for your help with the implementation of this study.

Sincerely,

Rosalee Abrams

Mrs. Abrams is a regularly enrolled graduate student at the University of Oregon School of Nursing. Any assistance you can offer Mrs. Abrams will be greatly appreciated.

Research Adviser

October 13, 1975

Rosalee Abrams
16024 S. Swan Avenue
Oregon City, Oregon 97045

Dear Mrs. Abrams:

I will be happy to cooperate and assist in any possible way with your study on students' retention of cognitive learning. You will, of course, need to work cooperatively with the Level III (junior) staff in arranging to carry out your study.

I will be most interested in your study and its results.

Sincerely yours,

Wynelle J. Huff
Dean

WJH:lc

APPENDIX D

Study Guide Outlines and Objectives for the Four Sequential Units of Instruction on Shock

STUDY GUIDE OUTLINE

UNIT I

Shock: Definition, Classifications and Etiological Factors

1. Definition of shock

   1.1 Capillary perfusion is inadequate to sustain life.
   1.2 Cells lack oxygen and nutrients.
   1.3 Metabolic wastes are not removed.

2. Classifications of shock

   2.1 Based on area of primary failure.
      2.11 Pump failure--Cardiogenic shock.
      2.12 Fluid loss--Hypovolemic shock.
      2.13 Lack of peripheral resistance--
           Vasogenic and Neurogenic shock.

3. Definition of Hypovolemic shock

   3.1 A hemodynamic and metabolic disorder resulting from loss of body fluid volume leading to inadequate cellular perfusion.

4. Causes of Hypovolemic shock

   4.1 Loss of whole blood--hemorrhage.
   4.2 Loss of plasma fluid.
   4.3 Severe dehydration.

5. Assessment of the condition of the patient susceptible to Hypovolemic shock.

   5.1 Review the patient's record.
   5.2 Direct observation of the patient's condition.
   5.3 From the example delineate factors that predispose to shock.

6. Monitor the condition of the patient susceptible to Hypovolemic shock.

7. Report pertinent observations concerning the Patient's condition.

STUDY GUIDE OUTLINE

UNIT II

Pathophysiology of Shock

1. Shock

   1.1 Stage I

2. Shock

   2.1 Stage II
   - 2.11 Adaptation
   - 2.12 Compensation

3. Compensatory Mechanisms occur in

   3.1 Sympathoadrenal and endocrine system.
   3.2 Circulatory system
   3.3 Respiratory system
   3.4 Urinary system

4. Effects of hypoperfusion resulting in anaerobic metabolism on the patient in hypovolemic shock

   4.1 Effects on the cell.
   4.2 Effects on electrolyte balance.
   4.3 Effects on the pH.
   4.4 Effects on the gastrointestinal tract.
   4.5 Effects on the reticuloendothial system.
   4.6 Effects on the lung.
   4.7 Effects on the kidney.
   4.8 Effects on the liver.
   4.9 Effects on the heart and circulation.
   4.10 Effects on the brain.

5. Monitor data and interpret the condition of the patient with early or progressing signs and symptoms of hypovolemic shock.

   5.1 Assess perfusion of brain tissue.
   5.2 Check circulatory status.

5.3 Assess respiratory status.
5.4 Check general appearance.
5.5 Evaluate patient's complaints.

6. Early signs and symptoms of shock.

7. Progressing signs and symptoms of shock.

8. Report pertinent observations regarding early or progressing signs and symptoms of hypovolemic shock.

STUDY GUIDE OUTLINE

UNIT III

Shock: Prophylactic and Therapeutic Intervention

1. Assemble necessary equipment, supplies and medications that may be needed to treat the patient in hypovolemic shock.

2. Control of hemorrhage.

3. Replace lost volume.

4. Support the patient's compensatory mechanisms.

5. Continuous monitoring and observations of the patient.

6. Carry out treatments as prescribed by the physician.

7. Drugs

    7.1 Coagulating agents.
    7.2 Vasopressors.
    7.3 Buffers.
    7.4 Corticosteroids.

STUDY GUIDE OUTLINE

UNIT IV

Complications of Shock

1. Complications of shock

    1.1 Renal failure.
    1.2 Shock lung.
    1.3 Bacteriemia and infection.
    1.4 Disseminated intravascular clotting (DIC).
    1.5 Heart failure.
    1.6 Brain damage.
    1.7 Tissue necrosis.
    1.8 Death.

2. Explain the prevention and treatment of each complication.

BEHAVIORAL OBJECTIVES

UNIT I

Shock: Definition, Classification and Etiological Factors

Upon completion of this instructional unit the student will be able to:

1. Define shock.
2. Explain the mechanisms that may initiate shock.
3. Define hypovolemic shock.
4. Identify etiological factors predisposing to hypovolemic shock.
5. Assess the condition of the patient susceptible to hypovolemic shock.
6. Monitor the condition of the patient susceptible to hypovolemic shock.
7. Report pertinent observations concerning the patient.

Reading Assignment:

Beland, I. L., & Passos, J. Y. Clinical Nursing Pathophysiological and Psychosocial Approaches (3rd ed.). New York: Macmillan, 1975, pp. 799-817.

BEHAVIORAL OBJECTIVES

UNIT II

Pathophysiology of shock

Upon completion of this instructional unit the student will be able to:

1. Identify the compensatory mechanisms that occur with generalized hypoperfusion.

2. Describe the effects of hypoperfusion resulting in anaerobic metabolism on the patient in hypovolemic shock.

3. Monitor data and interpret the condition of the patient with early or progressing signs and symptoms of hypovolemic shock.

4. Report pertinent observations regarding early or progressing signs and symptoms of hypovolemic shock.

BEHAVIORAL OBJECTIVES

UNIT III

Shock: Prophylactic and Therapeutic Intervention

Upon completion of this instructional unit the student will be able to:

1. Describe appropriate intervention in a prophylactic and therapeutic approach to hypovolemic shock.

2. Initiate appropriate intervention in a prophylactic and therapeutic approach to hypovolemic shock.

BEHAVIORAL OBJECTIVES

UNIT IV

Complications of Shock

Upon completion of this instructional unit the student will be able to:

1. List the complications associated with hypovolemic shock.

2. Explain the prevention and treatment of complications by medical and nursing management.

3. Given a patient with complications of hypovolemic shock, the student will implement appropriate nursing interventions.

APPENDIX E

Raw Data of Time Expenditure Recordings and Cognitive Pre, Post and Delayed Test Scores for Both Groups

Raw Data of Time Expenditure Recordings and Cognitive Pre, Post and Delayed Test Scores for Both Groups

Sample Autotutorial Group

Subject Number	Pretest Score	Posttest Score	Score Diff.	Delayed Test Score	Score Diff. (Post & Del)	Inst. Time	Total Time
1	9	30	21	26	17	185"	317"
2	5	42	37	32	27	396"	533"
3	7	19	12	-	-	200"	-
4	3	34	31	18	15	310"	432"
5	5	37	32	24	19	152"	246"
6	7	34	27	24	17	260"	392"
7	8	28	20	19	11	260"	387"
8	7	30	23	-	-	138"	-
9	9	26	17	26	17	230"	325"
10	18	39	21	30	12	330"	430"
Means	7.8	31.9	-	24.8	-	246.1"	382.7"

Sample Lecture Group

1	15	44	29	36	16	320"	437"
2	7	37	30	25	18	320"	472"
3	6	44	38	35	29	320"	412"
4	8	38	30	15	7	320"	407"
5	5	19	14	22	17	320"	482"
6	9	41	32	27	18	320"	404"
7	6	41	35	29	23	320"	447"
8	13	39	26	29	16	320"	414"
9	7	40	33	28	21	320"	410"
10	7	32	25	22	15	320"	419"
Means	8.3	37.5	-	18.0	-	320"	430.1"

APPENDIX F

Correlation Matrix

CORRELATION OF TEST SCORES AND TIME RECORDINGS BETWEEN RAWSON'S AND THIS STUDY

	Cognitive Pretest Score	Cognitive Pretest Time	Instruction Time	Cognitive Posttest Score	Cognitive Posttest Time	Cognitive Gain Score	Cognitive Delayed Score	Cognitive Delayed Time	Cognitive Score Difference	Cognitive Total Time	Psychomotor Pretest Time	Psychomotor Pretest Score	Psychomotor Posttest Time	Psychomotor Posttest Score	Psychomotor Time Difference	Psychomotor Gain Score	Psychomotor Total Time
Cognitive					-*												
Pretest Score	1.00	.170	.090	.246	-.489	-.309	.412	.140	.114	-.026	.273	.166	-.092	.347	-.290	.178	.112
Cognitive					*				*			*			-*		
Pretest Time	.170	1.00	-.004	-.340	.620	-.427	.060	.437	.459	.281	.442	.583	-.194	.069	-.490	-.361	.035
Instruction										*				*			*
Time	.090	-.004	1.00	.389	.081	.332	.259	.118	-.204	.930	.352	.046	-.184	.503	-.405	.398	.992
Cognitive					-*	*	*		-*					*		*	
Posttest Score	.246	-.340	.389	1.00	-.586	.846	.583	-.017	-.606	.191	.073	-.136	-.136	.573	-.130	.590	.375
Cognitive	-*	*		-*				*								-*	
Posttest Time	-.489	.619	.081	-.586	1.00	-.306	-.277	.466	.418	.406	.107	.244	-.096	-.367	-.142	-.490	.084
Cognitive				*					-*							*	
Gain Score	-.309	-.427	.332	.846	-.306	1.00	.346	.060	-.657	.202	-.079	-.225	-.083	.372	.032	.481	.306
Cognitive				*													
Delayed Score	.412	.060	.259	.583	-.277	.346	1.00	.136	.293	.199	.253	.157	-.381	.353	-.408	.189	.256
Cognitive					*												
Delayed Time	-.140	.437	.178	-.017	.466	.060	.136	1.00	.153	.383	.074	-.055	-.304	-.005	-.209	.035	.104
Cognitive Score		*		-*		-*										-*	
Difference	.114	.458	-.204	-.606	.418	-.657	.293	.153	1.00	-.031	.163	.314	-.213	-.329	-.247	-.509	-.190
Cognitive			*												-*		
Total Time	-.029	.281	.930	.191	.406	.202	.199	.383	-.031	1.00	.391	.140	-.246	.380	-.468	.225	.920
Psychomotor												*		*	-*		*
Pretest Time	.273	.442	.352	.073	.107	-.079	.253	.074	.163	.391	1.00	.713	.043	.657	-.883	.049	.455
Psychomotor		*									*				-*	-*	
Pretest Score	.166	.583	.046	-.136	.244	-.245	.157	-.055	.314	.140	.713	1.00	-.247	.205	-.760	-.544	.110
Psychomotor																	
Posttest Time	-.092	-.194	-.184	-.136	-.096	-.083	-.381	-.304	-.213	-.246	.043	-.247	1.00	.066	.430	.237	-.114
Pyschomotor			*	*							*				-*	*	*
Posttest Score	.347	.069	.503	.573	-.367	.372	.353	-.005	-.330	.380	.657	.205	.066	1.00	-.562	.709	.563
Psychomotor		-*								-*	-*	-*		-*			-*
Time Difference	.290	-.490	-.405	-.130	-.142	.032	-.408	-.209	-.247	-.468	-.883	-.760	.430	-.562	1.00	.065	-.465
Psychomotor				*	-*	*			*			-*		*			
Gain Score	.178	-.361	.398	.590	-.490	.481	.189	.035	.509	.225	.049	-.544	.235	.709	.065	1.00	.403
Psychomotor			*								*			*	-*		
Total Time	.112	.035	.992	.375	.084	.306	.256	.104	-.190	.026	.455	.110	-.114	.563	-.465	.403	1.00

* Positive Correlation .05 level of significance. -* Negative Correlation .05 level of significance

AN ABSTRACT OF THE CLINICAL INVESTIGATION OF

ROSALEE MAY ABRAMS

For the MASTER OF NURSING

Date of Receiving this degree June 10, 1977

Title: A COMPARATIVE STUDY OF THE RETENTION OF COGNITIVE LEARNING BY BACCALAUREATE STUDENTS INSTRUCTED BY TWO ALTERNATE METHODS

APPROVED: _____
(Clinical Investigation Advisor)

2. Less time is required for some students to learn by autotutorial method than by lecture. The mean time expenditure was 47.7 minutes less for the autotutorial than for the lecture group.
3. The study revealed that nursing content can be learned using autotutorial methods as well as lecture.
4. A positive correlation between cognitive learning and psychomotor performance was demonstrated.