The development of a baccalaureate degree program in medical imaging technology

Morris Hunter
THE DEVELOPMENT OF A BACCALAUREATE DEGREE PROGRAM IN MEDICAL IMAGING TECHNOLOGY

A Project
Presented to the
Faculty of
California State University,
San Bernardino

In Partial Fulfillment
of the Requirements for the degree
Master of Arts
In
Education: Vocational Education

by
Morris Hunter
June 1999
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ABSTRACT

This project was created to develop a Baccalaureate Degree Program in Medical Imaging Technology. The curriculum is developed specifically for Charles R. Drew University of Medicine and Science in Los Angeles, California.

The curriculum is designed to address the demand for technologists who are multi-skilled. The Bachelor of Science Degree Program builds upon an existing Associate of Science Degree Program in Radiography and certificate programs in Nuclear Medicine and Diagnostic Medical Sonography.
ACKNOWLEDGMENTS

First, I give thanks to my Lord and Savior, Jesus Christ, who blessed me with the peace of mind needed to complete this project.

My beautiful wife of twenty-nine years, Mae, and my lovely daughters, Inedra and La Tricia, thank you for all of your encouragement and support.
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CHAPTER ONE

Background

Introduction

In chapter one, the need for a Bachelor of Science Degree in Medical Imaging Technology is addressed. The project is significant for purposes of designing a baccalaureate degree program in Medical Imaging. Limitations and delimitations that apply to this project are reviewed, followed by a definition of terms.

Context of the Problem

As we enter into the twenty-first century there is a need for Medical Imaging Technologists who are multi-skilled to keep pace with the rapid changes and technological advances in Radiological Science. Being multi-skilled and multi-credentialed technologists with degrees above the associate level will be equipped to keep pace with the technological changes and be in a better position for upward mobility.

Purpose of the Project

The purpose of this project is to establish a baccalaureate degree program in Medical Imaging that is community based, culturally sensitive, and provides multi-options for admission by building upon the Associate Degree Program in Radiography and the certificate programs in Nuclear Medicine and Diagnostic Medical Sonography currently in place.

Significance of the Project

The American Society of Radiologic Technologists (ASRT) Commissioned Research & Polling, Inc. to launch a validation research project named “Trends in
Education,” to assess the perceptions of ASRT members with respect to future educational requirements for Radiologic Technologists, as well satisfaction with their own training.

This project was developed in response to the growing need for multi-skilled technologist at the baccalaureate level. The current number of universities offering baccalaureate degrees in Medical Imaging Technology is not sufficient to meet the needs of students and technologists in Los Angeles County. This curriculum will provide advanced degrees for medical imaging technologists who have less than a baccalaureate degree and desire one, or who need courses in administration and other areas of specialization for employment and promotion.

Limitations and Delimitation

There were several limitations and delimitations that became apparent during the development of this project.

Limitations. The following limitations apply to this project.

1. The project is limited to the lack of sufficient amounts of reference materials available.

2. The project is further limited to the reluctance of program directors to share information.

3. The scope is further limited to the resources available to program directors.

Delimitation. The following delimitation apply to this project:

1. This project is designed specifically for Charles R. Drew University of Medicine and Science located in Los Angeles, California.
Definitions of Terms

The following terms are defined as they apply to this project.

American Society of Radiologic Technologist (ASRT) -- Scientific and professional society of radiographers (Bushong, 1997).

Artifact -- Unintended optical density on a radiograph or other film-type image receptor (Bushong, 1997).

Attenuation -- Reduction in radiation intensity as a result of absorption and scattering (Bushong, 1997).

Bremsstrahlung x-ray -- X-rays resulting from interaction of the projectile electron with a target nucleus; braking radiation (Bushong, 1997).

Collimator -- Device to restrict x-ray beam size (Bushong, 1997).

Conversion Coefficient -- Rate at which x-ray energy is transformed into light in an intensifying screen (Bushong, 1997).

Coolidge Tube -- This type of vacuum tube in use today allows x-ray intensity and energy to be separately and accurately selected (Bushong, 1997).

Diagnostic Medical Sonography -- Diagnostic Medical Sonography is an imaging modality which utilizes high frequency sound waves to demonstrate body parts and assist the physician in the diagnosis of medical abnormalities (Gurley, 1986).

Medical Imaging Technology -- Medical Imaging Technology is a term used to describe components of radiology including Nuclear Medicine, Diagnostic Medical Sonography and Radiography (Gurley, 1986).

Nuclear Medicine -- Nuclear Medicine is an imaging modality in which nuclides or
radioactive materials injected into the body are used to produce images. The radioactive material concentrates in the area of interest and emits radiation. The radiation is then monitored and computerized into an image (Gurley, 1986).

Radiography—Radiography is the art and science of using x-rays to produce images of the body on receptors such as x-ray film to study bones and organs (Gurley, 1986).

Organization of the Project

This project is divided into four chapters. The introduction to the context of the problem and the purpose of the project is provided in chapter one. In addition, Chapter One provides the significance of the project, limitations and delimitation, and definition of terms. Chapter Two presents a review of the literature. The population to be served and the project design is outlined in Chapter Three. Chapter Four consists of the conclusions and recommendations. The project and references follow Chapter Four.
CHAPTER TWO

Review of the Literature

Introduction

Chapter Two consists of a discussion of relevant literature, specifically, the trends in educational needs of Radiologic Technologists. Review of literature revealed that the curricula for development of bachelor degree programs in Medical Imaging Technology are very limited. As we enter into the twenty-first century issues pertaining to the educational needs of Radiologist should be addressed.

Expansion of the Medical Imaging Technology Program

Crossing the bridge to the twenty-first century for Medical Imaging Technology means looking not only at the number of technologists that will be needed to address the growing mandate of health care needs, but also at the level of educational and clinical preparation needed to keep pace with the rapid changes and technological advances in Medical Imaging Technology.

The profession can be credited for not having its head in the proverbial sand on these issues. After the 1995 National Education Consensus Conference in the Radiologic Sciences, the American Society of Radiologic Technologists (ASRT) commissioned Research & Polling, Inc. to launch a validation research project, named "Trends in Education", to assess the perceptions of ASRT members with respect to future educational requirements for Radiologic technologists as well as satisfaction with one's own training. The study, as reported in the ASRT publication, Radiography the Second Century (Jan. 1996) documents the above premise related to the need for educational and
technological excellence. When asked to respond to the question, “what do you think will be changing in the next three years in the education of radiologic technology?” fifty-four percent (54%) of the 401 members responding cited, “a push toward multi-skill and baccalaureate degree requirement,” as being the most important change that will occur over the next three years. The findings further assert that seventy-one percent (71%) of today’s radiologic technologists perceive their profession as moving toward greater multi-skill and twenty-one percent (21%) toward baccalaureate level of education.

While a significant number of respondents in the study did not agree that a baccalaureate degree was necessary, the majority did agree that more advanced and diverse skills are needed for clinical excellence. Half of the ASRT members reporting stated that they have plans to further their education in the coming two years. Also, half of those responding with either a certificate or an associate degree say that they would return to school to earn a baccalaureate degree were it to become a requirement for entry-level positions. (American Society of Radiologic Technologists, 1996, p. 68).

Armed with information such as the above findings and other similar formal or informal studies on the future educational needs of Medical Imaging Technologists in the rapidly changing Medical Imaging Technological explosion, those responsible for educating Medical Imaging Technologists must decide whether they will continue with the current band aid approach of adding specialized certificate program to basic programs in Radiology or begin to look at a more comprehensive and lasting approach such as developing advanced degree programs which have multiple options opened to the Medical Imaging Technologist prepared at either certificate or Associate of Science
degree level.

The debate to elevate entry-level education requirements to a baccalaureate degree for radiographers has fostered renewed interest in expanded functions. The requirements for radiographers in the United Kingdom have been elevated to a baccalaureate degree. Discussions of the “skill mix” or role of the radiographer are in progress. The expanded functions are being explored in the clinical and academic settings (Jordan, 1994).

A system was developed in 1981 by Quentin C. Field-Boden and Neil Cheyne in Middlesex, England which radiographers places a red dot on any pathologic abnormality identified by the radiographer prior to viewing by the referring physicians. A study to validate the system was reported in the British Medical Journal (Berman, 1985).

Radiographers who worked in emergency rooms were surveyed using a simple response open-ended instrument. The major concerns were (1) Medical legal, (2) radiographer experience level, and (3) impact on emergency room physician diagnosis.

The radiographers' pattern recognition accuracy was 90% for true positive and negative findings, with only 10% false positive and negative findings.

As hospital based Medical Imaging Programs close, the responsibility is now being placed on colleges and universities across the country to meet the challenge or answer the mandate for comprehensive advanced education for the Medical Imaging Technologist.

Currently, there are only approximately eighteen baccalaureate programs in the country, six in California and four in Southern California. None are located in the areas from
which the Charles R. Drew University student population is drawn.

In other Bachelor Degree Programs the student must complete the four-year bachelor curriculum before being eligible to take their board examination. The Charles R. Drew 2+2 model meets the needs of the underserved community. Students need to enter the workforce as soon as possible. Our students may enter the program, attend for two years and take the national and state board examinations to become registered and certified Radiologic Technologist. This offers them an opportunity to work as a technologist while completing the remaining two years for completion of their bachelor degree.

Summary

The literature important to this project was presented in Chapter Two. Specifically, the growing mandate of health care needs for expanding Medical Imaging Technology Programs. In order to prepare technologists for the twenty-first century MIT should include advanced degrees beyond the Associate of Science level which have multiple skill options for Medical Imaging Technologist.
CHAPTER THREE

Methodology

Introduction

Chapter Three details the steps used in developing the project. Specifically, the population served is discussed followed by the curriculum development, program administration/management, faculty, and the Medical Imaging Technology (MIT) program as currently being offered at Charles R. Drew University of Medicine and Science. The Chapter concludes with a summary.

Population Served

This program was developed for the Medical Imaging Technology Department of Charles R. Drew University of Medicine and Science located in South Central Los Angeles. The Mission of the University is to conduct medical education and research in the context of service to a defined population so as to train persons to provide care with competence and compassion to this and other underserved populations.

It is developed within the guidelines of the University and standards of the Joint Review Committee on Education in Radiologic Technology and Nuclear Medicine.

Curriculum Development

The curriculum for the Bachelor of Science Degree in Medical Imaging Technology builds on the Associate Degree in Radiography and the Specialized Certificate programs in Nuclear Medicine and Diagnostic Medical Sonography, which forms the core for the advanced degree in Medical Imaging Technology.
**Curriculum Structure.** The curriculum for the Bachelor of Science Degree in Medical Imaging Technology builds on the Associate Degree in Radiography and the Specialized Certificate programs in Nuclear Medicine and Diagnostic Medical Imaging which forms the core for the advanced degree in Medical Imaging Technology. Selected courses (up to 12 units) from the Health Services Administration major at the University will add the necessary breadth to equip students with basic managerial skills and knowledge of management science as it relates to Health Care Administration.

There will be three integrated concepts or “Curriculum threads,” which will hold the curriculum together, so that at every level there is a recurrent theme related to cultural diversity and sensitivity, community based practice and critical thinking.

The curriculum will be offered over a four-year period including summers. Upper and lower division general education requirements will be spread out over the length of the program. Those courses which serve as a prerequisite for Option II (the 2+2 program) will be offered during the first year, to allow for transfer between tracks should a student so desire. The proposed course of study for Option I (Basic BS Degree in Medical Imaging Technology) is as follows:

**Option 1:** Bachelor of Science Degree in Medical Imaging Technology with concentrations in Radiography / Diagnostic Medical Sonography dual Credentials.

First Year:

Fall Semester: 14 Units

- **AH 113** Medical Terminology (3)
- **CLS 060** College Learning Skills (2)
MTH 126  College Algebra (3)
ENG 111  English Composition (3)
AP 120  Anatomy & Physiology (3)

Spring Semester: 12 Units

COM 111  Public Speaking (3)
POL 141  US Government (3)
RT 100  Intro to Radiologic Technology (1)
RT 101  Principles of Darkroom Techniques (2)
RT 102  Medical Legal Aspects (3)

Summer Semester: 9 Units

HUM 233  Critical Diversity Literature (3)
PSYCH 141  Principles of Argumentation
            General Psychology (3)
AH 251  Community Service (1)
RT 105  Methods of Patient Care (2)

Second Year:

Fall Semester: 14 Units

RT 120  Clinical Practicum I (2)
RT 104A  Radiographic Positioning I (2)
AH 125  Introduction to Computers (3)
AH 252  Community Service (1)
AH 131  Health and Creative Arts (3)
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<tr>
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<tbody>
<tr>
<td>HSA 300</td>
<td>Introduction to U.S. Health Care System (3)</td>
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**Spring Semester: 18 Units**

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<tbody>
<tr>
<td>RT 104B</td>
<td>Radiographic Positioning III w/lab (3)</td>
</tr>
<tr>
<td>RT 130</td>
<td>Clinical Practicum II (6)</td>
</tr>
<tr>
<td>RT 212A</td>
<td>Principles Exposure I (3)</td>
</tr>
<tr>
<td>HIST 141</td>
<td>U.S. History (3)</td>
</tr>
<tr>
<td>AH 350</td>
<td>Community Health Services Issues (3)</td>
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**Summer Semester: 15 Units**

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<td>RT 140</td>
<td>Clinical Practicum III (6)</td>
</tr>
<tr>
<td>AH 143</td>
<td>Survey of Allied Health (Elective) (3)</td>
</tr>
<tr>
<td>AH 233</td>
<td>Medical Spanish I (3)</td>
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</table>

**Third Year:**

**Fall Semester: 16 Units**

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<tr>
<td>RT 104D</td>
<td>Radiographic Positioning IV w/lab (3)</td>
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<tr>
<td>RT 207</td>
<td>Radiation Physics I (4)</td>
</tr>
<tr>
<td>RT 212B</td>
<td>Principles of Radiation Exposure II (3)</td>
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<tr>
<td>RT 220</td>
<td>Clinical Practicum IV (6)</td>
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**Spring Semester: 16 Units**

<table>
<thead>
<tr>
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<th>Course Title</th>
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<tr>
<td>RT 208</td>
<td>Radiation Physics II (4)</td>
</tr>
</tbody>
</table>
RT 230       Clinical Practicum V (6)  
RT 211       Advanced Imaging Modality (3)  
MTA 302       Fundamentals of Management (3)  

Summer Semester: 12 Units  
BT 240       Clinical Practicum VI (6)  
HAS 301       Research Methods (3)  
ANTH 142    Cultural Anthropology (3)  

Fourth Year:  
Fall Semester: 15.5 Units  
DMS 301       Physics of DMS I (1.5)  
DMS 302       Patient Care and Department Organization (3)  
DMS 320       Clinical Practicum I (6)  
DMS 300       Sectional Anatomy (2)  

Spring Semester: 16.5 Units  
DMS 304       Physics of DMS II (1.5)  
DMS 303       Diagnostic Medical Sonography I (4)  
DMS 305       Diagnostic Medical Sonography II (4)  
DMS 330       Clinical Practicum II (6)  
AH 252       Community Service (1)  

Summer Semester: 12 Units  
DMS 306       Diagnostic Medical Sonography III (4)
Option II. Associate Degree plus Advanced Degree Specialization

This option builds on the Associate Degree Program. Students will take Upper Division GE courses along with the specialization for dual credentials.

Option III. Specialization

The curriculum for Option III is the Nuclear Medicine and Diagnostic Medical Sonography Specialization as described plus appropriate General Education Courses.

Clinical

The Clinical experience necessary for mastery in Medical Imaging will be scheduled concurrently with the theory portion of the course, so there is correlation and immediate application of theoretical knowledge to clinical practice. The primary facility for clinical practice is King/Drew Medical Center, Department of Radiology. Students who are enrolled the program receives clinical training in the medical center's Radiology Department.

The Radiology Department

The Radiology Department is comprised of seven sections as follows:

- Main Diagnostic
- Emergency Radiology
- Nuclear Medicine
- Diagnostic Medical Sonography
- Computed Tomography
- Magnetic Resonance Imaging
- Mammography

The department has over 50 pieces of imaging equipment. Students are trained on equipment that represents the latest in medical imaging technology as well as older imaging systems. Students also have access to a broad range of image processing technologies and learn to use conventional, daylight and laser imaging processing methods.

Community sites currently being used are: King/Drew Medical Center, Los Angeles, Hubert Humphrey Comprehensive Health Center Los Angeles and Gallaton Medical Group, Downey, CA. Future sites will be Kaiser Bellflower, Anaheim and Whittier Inter-Community Hospitals. These are full service Medical Imaging Departments with a patient load sufficient for student practicum requirements. These sites will primarily be used for Option III students.

Program Administration/Management

The Medical Imaging Technology Program is administered and managed by the Program Director who has over 24 years of experience as an educator and medical imaging clinician. An experienced curriculum and clinical coordinator and other educational and clinical faculty members assist him.

Faculty

The combined faculty for all options in the program is 8.0 or 5.0 full time
equivalent which represent over 100 years of experience in Radiography, Nuclear Medicine and in Diagnostic Medical Sonography.

Faculty Needed to Implement New Program

Two additional faculty members will be needed to fully implement the program as designed. The following recruitment strategies will be initiated to fill the needed position. A Faculty Pool consisting of qualified persons from other programs, which have either closed or downsized, will be identified as a possible source of recruitment. In addition the Drew program will create its own faculty pool by identifying graduates who have Bachelors degrees and who are interested in teaching and pursuing a Masters degree for teaching purposes and placed in a faculty education mentor/preceptorship program.

Existing Programs

Radiography Program

The Radiography program is designed to prepare the student for employment as a radiographer. The radiographer’s primary role is to operate imaging equipment and perform technical procedures to produce x-ray studies for the diagnosis and treatment of injury and disease. Radiographers provide patient services using imaging equipment as directed by physicians. Professional competence requires that radiographers apply knowledge of anatomy, physiology, positioning, radiographic technique and radiation protection to produce images of the body.

The program prepares Radiographers to exercise independent judgment in the performance of imaging procedures and be able to communicate effectively with patients, other health professionals and the public. Duties include positioning the
patients determining safe technical factors, maintaining patient records, film processing, assisting the radiologist in the performance of procedures and initiating basic life support techniques as necessary. The Associate Degree Radiography Program operates under the academic and organizational umbrella of the Charles R. Drew University of Medicine and Science as an offering through the College of Allied Health. King/Drew Medical Center serves as the primary clinical affiliate for the Radiography Program. The radiology department therefore provides the primary site for the Radiography Program's supervised clinical education.

Supplemental Admissions Criteria: Potential local applicants are required to attend a group informational (career counseling) session, which briefly explains the profession of radiography, training programs, career ladders, current socioeconomic factors, related technologies, procedural information on prerequisite verification and application procedures. The session is usually held two to three times per month and the current schedule may be obtained through the Radiography Program office by telephone or mail inquiry.

Prerequisites and Preparatory Course Work: Prior to admission, students in the Radiography Program are required to have completed the prerequisites listed below:

1. High school diploma or equivalency certificate.
2. Satisfactory completion (minimum grade of C) of college credit courses in reading and composition, elementary algebra, anatomy and physiology.

This pre-program phase is designed to help assure the student's success in the program by setting a minimum tool skill level. The program is basically a math/science curriculum
and the prospective student's knowledge base for the curriculum is enhanced by these preparatory courses.

The first (fall) semester of the program provides introductory knowledge and skills relative to Allied Health in general and an inside functioning look at Radiography. The second, third, fourth and fifth semesters of the program embody the development of the Radiographer as a competent health care practitioner. The last (summer) semester is the springboard to the profession. The previously learned knowledge and skills are refined to those of an entry-level staff radiographer. Supervision in the clinical practicum changes from direct to indirect, allowing the student to take a greater participatory responsibility for the radiographic examination. The student is assisted in preparing for professional certification exams, employment search and career enhancement.

Professional Curriculum: The curriculum of the 24-month AS degree program assumes that students will transfer a minimum of 21 units of required general education courses.

First Year:

Fall Semester: 18 Units

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<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>RT 101</td>
<td>Survey of Radiography</td>
<td>2</td>
</tr>
<tr>
<td>RT 105</td>
<td>Methods of Patient Care</td>
<td>2</td>
</tr>
<tr>
<td>RT 120</td>
<td>Radiographic Technology</td>
<td>2</td>
</tr>
<tr>
<td>RT 104A</td>
<td>Radiographic Positioning I</td>
<td>2</td>
</tr>
<tr>
<td>AH 133</td>
<td>Medical Terminology</td>
<td>4</td>
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<tr>
<td>AH 233A</td>
<td>Medical Spanish</td>
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<tr>
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<tr>
<td>AH 251</td>
<td>Community Service</td>
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<tr>
<td>AH 143</td>
<td>Survey of Health Professions</td>
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**Spring Semester: 18 units**

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<td>Radiographic Positioning II</td>
<td>3</td>
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<tr>
<td>RT 130</td>
<td>Clinical Practicum II w/Lab</td>
<td>8</td>
</tr>
<tr>
<td>RT 212A</td>
<td>Principles of Radiographic Exposure I</td>
<td>3</td>
</tr>
<tr>
<td>AH 125</td>
<td>Introduction to Computers</td>
<td>3</td>
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<td>AH 251</td>
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**Summer Semester: 9 Units**

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<tr>
<td>RT 104C</td>
<td>Radiographic Positioning III</td>
<td>3</td>
</tr>
<tr>
<td>RT 140</td>
<td>Clinical Practicum III w/Lab</td>
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**Second Year:**

**Fall Semester: 19 Units**

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<tr>
<td>RT 207</td>
<td>Radiation Physics I</td>
<td>4</td>
</tr>
<tr>
<td>RT 211</td>
<td>Advanced Imaging Modalities</td>
<td>3</td>
</tr>
<tr>
<td>RT 212B</td>
<td>Principles of Radiographic Exposure II</td>
<td>3</td>
</tr>
<tr>
<td>RT 220</td>
<td>Clinical Practicum IV w/Lab</td>
<td>5</td>
</tr>
<tr>
<td>AH 252</td>
<td>Community Service</td>
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</table>

**Spring Semester: 16 Units**
Graduation Requirements: In addition to the courses listed above, students must also satisfy general education course requirements for the Associate of Science degree.

Nuclear Medicine Technology Program

This program is designed to prepare students for careers as Nuclear Medicine Technologists who, with knowledge in radiation physics and radiation safety, are skilled in preparing and administering radiopharmaceutical, and in using radiation detection devices to conduct in vivo and in vitro procedures. The examinations that these technologists perform may be either diagnostic or therapeutic and are in response to a request from a patient's physician.

The twelve-month program enables the student to successfully earn a certificate of completion from the University and become eligible for state certification as a Certified Nuclear Medicine Technologist, and for national certifications as a registered Nuclear Medicine technologist.

Admissions Requirements: As part of the application to the program, applicants must submit verification that they have completed the following prerequisites:
1. High school diploma or high school equivalency certificate.

2. Professional qualification in one of the following fields: Radiographer, Medical Technologist, and Registered Nurse.

3. Bachelor of Science Degree in Biology, Chemistry, or Physics.

Nuclear Medicine Curriculum: Students in the Nuclear Medicine Program take the following classes during their twelve-month course of study.

Fall Semester: 14.5 Units

AH 251 Community Service (1)
NMT 301A Physics of Nuclear Medicine I (2)
NMT 302A Nuclear Instrumentation I (1.5)
NMT 303 Patient Care & Dept. Organization (3)
NMT 304A Clinical Nuclear Medicine I (1)
NMT 320 Clinical Practicum I (6)

Spring Semester: 17.5 units

NMT 302B Nuclear Instrumentation II (1.5)
NMT 304B Clinical Nuclear Medicine II (1)
NMT 306 Nuclear Medicine in Vivo
     Procedures (3)
NMT 307 Radioimmunoassay (2)
NMT 308 Radiopharmacy and
     Radiopharmacology I & II (4)
NMT 330 Clinical Practicum II (6)
Summer Semester: 12 Units

NMT 304C  Clinical Nuclear Medicine III (1)
NMT 310   Biology (2)
NMT 311   Radiation Therapy and Technical Applications (3)
NMT 340   Clinical Practicum III (6)

Program Total: 44

Diagnostic Medical Sonography Program

The Diagnostic Medical Sonography Program is designed to prepare students to function as competent members of the health care team and to alleviate the shortage of health care professionals in this field. The goals of the program are directed toward preparing students to successfully earn certification by the American Registry of Diagnostic Medical Sonographers.

The individual selecting this career must be able to exercise skills, judgment, and capability in gathering data for physician utilization in the interpretation of ultrasound procedures. Professional capabilities include reviewing and recording pertinent patient history and supporting clinical data, performing sonographic procedures (recording of high energy and inaudible sound wave reflections) and recording anatomical (structural) changes, pathological (disease) changes, physiological (functional) data and pertinent observations during procedures.

The program is fourteen months in length. Students are accepted annually. Upon completion of this program, the students are awarded a certificate.
Admission Requirements: High School diploma or High School equivalency certificate and qualification in one of the following:

1. Radiologic Technologist, RT
2. Medical Technologist, MT
3. Registered Nurse, RN
4. Bachelor of Science degree in Biology, Chemistry or Physics

Verification of prerequisites must be submitted with application. An interview process for applicants shall be an integral part of the admission requirement.

Sonography Curriculum: Students in the Medical Sonography Program take the following classes during their twelve-month course of study.

Fall Semester: 17 Units
- DMS 301 Physics of DMS (1.5)
- DMS 302A DMS Instrumentation (1.5)
- DMS 303 Patient Care (3)
- DMS 304A Diagnostic Sonography I (5)
- DMS 320 Clinical Practicum I (6)

Spring Semester: 17 Units
- DMS 302B DMS Instrumentation II (1.5)
- DMS 304B Diagnostic Sonography II (6)
- DMS 305 DMS Abdominal Scanning (1.5)
- DMS 306 Advanced Anatomy and Physiology (3)
The implementing objective is to establish a theoretically and clinically sound community based, culturally sensitive, multi-option, bachelors degree program in Medical Imaging Technology by building on the Associate Degree Program in Radiography and the Certificate Programs in Nuclear Medicine and Diagnostic Medical Sonography currently in place. The following are implementation activities for the first year:

- Develop course syllabus for all new courses added for the bachelors degree.
- Work closely with the Health Care Administration Program to fully integrate selected health care administration courses into the program.
- Hire appropriate faculty and staff
- Prepare self study for Joint Review Committee
- Have all new courses approved for credit and offering first by the Program’s Curriculum Committee and then the College of Allied Health curriculum.
Summary

Chapter Three began with an introduction followed by discussion of the population served. Steps used in developing the project were discussed in detail including the curriculum development process. The curriculum for Radiography, Nuclear Medicine and Diagnostic Medical Sonography may be integrated into the next Medical Imaging Technology Bachelor Degree Program. Charles R. Drew University of Medicine and Science will be one of the few universities offering a Bachelor of Science degree in Medical Imaging Technology with concentrations in Nuclear Medicine and Diagnostic Medical Sonography. The chapter concluded with a summary.
CHAPTER FOUR

Conclusions and Recommendations

Introduction

Included in Chapter Four is a presentation of the conclusions gleamed as a result of completing this project. Further, the recommendations extracted from this project are presented. The chapter concludes with a summary.

Conclusions

The following conclusions were made as a result of developing this project:

- The current curriculum may be integrated into the new program.
- Charles R. Drew will be one of the few universities in the nation offering a bachelor degree in Medical Imaging Technology.
- Loma Linda University and California State University, Northridge are the nearest competitors.

Recommendations

The following recommendations are made for successful implementation of this project.

- Additional adjunct faculty be added to teach new courses
- Lease or purchase an Ultrasound Simulator for the laboratory
- The curriculum be reviewed and updated annually

Summary

Conclusions derived and recommendations extracted from this project were
reviewed in chapter four. Chapter four presents the conclusions gleaned from completing this project. Lastly, the recommendations extracted from this project were presented.
APPENDIX A

Course of Study

Diagnostic Medical Sonography

Bachelor of Science Degree

General Education: 44 Units

Category A: Communication in the English Language and Critical Thinking (9 units)

ENG 111 English Composition (3)
   (Written Communication)
COM 111 Public Speaking (3)
COM 210 Principles of Augmentation (3)

Category B: Physical Universal and Mathematical Concepts (11 Units)

AP 120 Anatomy and Physiology (4)
BIO 124 General Biology (4)
CHM 122 General Chemistry (5)
PHY 126 Introductory Physics (4)
MTH 126 College algebra (3)

Category C: Humanities and the Arts (9 Units)

AH 131 Health and Creative Arts (3)
HUM 231 Humanities 1 (3)
HUM 232 Humanities 11 (3)
HUM 233 Cultural Diversity in Literature (3)
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<td>HUM 232</td>
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<td>HUM 233</td>
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<td><strong>Category D: Social and Behavioral Science (3 Units)</strong></td>
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<td>U.S. History</td>
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<td>(U.S. Citizenship)</td>
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<td><strong>Category E: Integrated Bio-psychosocial Being (3 Units)</strong></td>
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<td>AH 350</td>
<td>Community Health Issues</td>
<td>3</td>
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<tr>
<td>AH 351</td>
<td>Human Development</td>
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<td>AH 352</td>
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<td>AH 450</td>
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<td>AH 125</td>
<td>Intro to Computers</td>
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<td><strong>Unrestricted Electives: 9 Units (6 units must be upper division)</strong></td>
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MIT Core Curriculum: 12 Units

MITA 300  Intro to U.S. Health Care System (3)
MITA 302  Fundamentals of Management (3)
MITA 301  Research Methods (3)
MITA 303  Medical Legal Aspects (3)

Electives: 12 Units

MITA 306  Organization and Management
         Of Health Care System (3)
MITA 405  Critical Health Issues (3)
MITA 406  Long Term Care Administration (3)
MITA 410  Introduction to Managed Care (3)

Professional Curriculum - Nuclear Medicine

Fall Semester: 16 units

NMT 301A  Physics Instrumentation of Nuclear
           Medicine (2)
NMT 302A  Nuclear Instrumentation I (1)
NMT 303  Patient Care /Department Organization (3)
NMT 304A  Clinical Nuclear Medicine I (1)
NMT 308A  Radiopharmacology I (2)
NMT 320  Clinical Practicum I (6)
AH 251  Community Service: Independent Study (1)
Spring Semester: 15 Units

NMT 304b  Clinical Nuclear Medicine (1)
NMT 305  Nuclear Instrumentation II
          Statistics & Computer Applications (3)
NMT 306  Nuclear Medicine In-Vivo
          Procedures (3)
NMT308b  Radiopharmacology II (2)
NMT 330  Clinical Practicum II (6)

Summer Semester: 13 Units

NMT 304 C  Clinical Nuclear Medicine II (1)
NMT 310  Radiation Protection /Biology (2)
NMT 311  Radiation Therapy Applications (3)
NMT 340  Clinical Practicum III (6)
AH 252  Community Service (1)
APPENDIX B

Course of Study

Diagnostic Medical Sonography

Bachelor of Science Degree

General Education

Total General Education units required: 44

Category A: Communication in the English Language and Critical Thinking (9 units)

    EMG 111 English composition (3)
        (Written Communication)
    COM 111 Public Speaking (3)
        (Oral Communication
        Public Speaking or Interpersonal
        Communication)
    COM 210 Principles of Argumentation (3)

Category B: Physical Universal and Mathematical Concepts (11 units)

    AP 120 Anatomy and Physiology (4)
    BIO 124 General Biology (4)
        (Natural or Physical Science:
        Anatomy & Physiology, Biology, etc.)
    CHM 122 General Chemistry (5)
    PHY 126 Introductory Physics (4)
MTH 126 College Algebra (3)

Category C: Humanities and the Arts (9 units required)

AH 131 Health and Creative Arts (3)
HUM 231 Humanities I (3)
HUM 232 Humanities II (3)
HUM 233 Cultural Diversity in Literature (3)
HUM 131 Health and Creative Arts (3)

Category D: Social and Behavioral Science (3 units required)

HIST 141 U.S. History (3)
POLS 141 U.S. Government (3)

Category E: Integration Bio-psychosocial Being (3 units required)

AH 350 Community Health Issues (3)
AH 351 Human Development (3)
AH 352 Health Dynamics (3)

Core Curriculum: 11 units

AH 233A Medical Spanish I (2)
AH 233B Medical Spanish II (2)
AH 251 Community Service (1)
AH 252 Community Service (1)
AH 355 Community Service (1)
AH 450 Senior Seminar (1)
AH 125 Introduction to Computers (3)
Unrestrictive Electives: 9 units (6 units must be upper division)

Total Required Units for General Education and Core: 61

MIT Core Curriculum: 12 Units

MITA 300 Intro to U.S. Health Care System (3)
MITA 302 Fundamentals of Management (3)
MITA 301 Research Methods (3)
MITA 303 Medical Legal Aspects (3)

Electives: 12 Units

MITA 306 Organization and Management
   Of Health Care System (3)
MITA 405 Critical Health Issues (3)
MITA 406 Long Term Care Administration (3)
MITA 410 Introduction to Managed Care (3)

Professional Curriculum

Fall Semester: 16.5 units

DMS 301 DMS Physics I (1.5)
DMS 302 Patient Care (3)
DMS 303 Diagnostic Medical Sonography I (4)
DMS 320 Clinical Practicum I (6)
DMS321 Sectional Anatomy (2)

Spring Semester: 11.5 Units

DMS 304 DMS Physics II (1.5)
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**Summer Semester: 9 Units**

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<td>DMS 340</td>
<td>OB/GYN Scanning</td>
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REFERENCES


