The Education System and Curriculum for Radiology Technologists in Taiwan

Yung-Liang Wan, M.D.
Department and Postgraduate Institute of Medical Imaging and Radiological Sciences
College of Medicine, Chang Gung University
Taoyuan, Taiwan
Outline

1. Introduction
2. Universities and college in Taiwan
3. Education goal and core competencies
4. Curriculum
5. Qualification examination
6. Instructing students
7. Research
8. Students’ career after graduation
Introduction

• Radiology technologists (RTs) are playing an increasingly critical role in modern health care and health sciences.
• Radiological technology is an interdisciplinary field that consists of physics, mathematics, chemistry, engineering, biology, computer technology, biomedical imaging technology, and clinical imaging technology.
Introduction

10 institutes in Taiwan that have a department related to medical imaging and radiological sciences, which provide the education and training for medical RTs.
### Nine Universities and One College

<table>
<thead>
<tr>
<th>Central Taiwan University of Science and Technology</th>
<th>Kaosiung Medical University</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chang Gung University</td>
<td>National Yang-Ming University</td>
</tr>
<tr>
<td>China Medical University</td>
<td>Shu-Zen College of Medicine and Management</td>
</tr>
<tr>
<td>Chung Shan University</td>
<td>Tzu Chi University</td>
</tr>
<tr>
<td>I-Shou University</td>
<td>Yuanpei University</td>
</tr>
</tbody>
</table>

A total of approximately 600 students (35 to 120 students to each institute) are enrolled each year.
Goal, Core Competencies and Curriculum Design for Undergraduate Education

Education Goal

1. Provide education for development of radiological profession in medicine.
2. Provide basic knowledge for research in medical imaging and radiological sciences.

Core Competencies

1. General basic knowledge
2. Basic professional knowledge
3. Professional clinical skills and ethics
4. Information sharing, teamwork
5. Independent thinking
6. Self-growth and international outlook
Curriculum for RTs in Taiwan

Bachelor of Sciences program.

• 1st year: General education: physics, chemistry, biology, calculus, etc.

• 2nd year: Basic professional subjects

• 3rd year: Clinical professional courses.

• 4th year: Clinical rotational courses in the Department of:
  – Diagnostic Radiology ($\geq 12$ weeks),
  – Radiation Therapy ($\geq 4$ weeks)
  – Nuclear Medicine ($\geq 4$ weeks).
Courses in the 2nd Year

- Radiobiology
- Computer programming
- Radiological Physics
- Radiation safety
- Physiology
- Anatomy
- Diagnostic radiology instrumentation
- Radiation detection and measurement
Courses in the 3rd Year

- Ultrasonography
- MRI
- Pathology
- Imaging anatomy
- Medical ethics
- Quality assurance of radiologic technology
- Principle and technology of diagnostic radiology, nuclear medicine and radiotherapy
Curriculum Planning

Department Development & Direction

- Diag. Rad.
- Nuc. Med.
- Radiother.

Planning, Revision

Curriculum Design Reference
- North America
- CAMPEP

Course Review Mechanism
- Committee of curriculum
- Interaction among teachers & students
- Questionnaire survey
- Courses external review

Undergraduate: 142 credits
(Professional Required 103 credits
Professional Electives 9 credits
Liberal 30 credits)

Master: 31 credits
(Professional Required 10 credits
Professional Elective 15 credits
6 credits for thesis)

PhD: 33 credits
(Professional Required 15 credits
Professional Elective 12 credits
6 credits for thesis)

Biomedical Imaging
Medical Physics

PG Course
Qualification Exam. in Taiwan

- Students graduated are entitled to write the official qualification examination run by the government twice a year.
- Only qualified RTs are eligible to be employed in hospitals or healthcare organization.
- 6 parts in exam. 100 score for each part, more than 360 is required for the passing.
- Average pass rate: 30% in the past 5 years.
Six Parts in Qualification Examination

1. Basic medicine (Anatomy, physiology, pathology)
2. Medical physics and radiation safety
3. Instruments of radiology
4. Principles of technology of diagnostic radiology
5. Principles and technology of radiotherapy
6. Principles and technology of nuclear medicine.
Basic Medicine: Weak Part
1. Anatomy (45%)
2. Physiology (30%)
3. Pathology (25%).

Medical Physics and Radiation Safety
1. Basic radiation physics (15%)
2. Radiation physics in radiotherapy, nuclear medicine and diagnostic radiology (20%)
3. Sonography and MRI (15%)
4. Radiation dose and dosimetry (20%)
5. Radiation protection and regulation (30%)
Instruments of Radiology (Medical Imaging)

1. Radiography and CT (30%)
2. Sonography (10%)
3. MRI (20%)
4. Radiotherapy (20%)
5. Nuclear medicine (20%)
Principle and Technology of Diagnostic Radiology

1. General and special examination (35%)
2. CT (15%)
3. MRI (15%)
4. Ultrasonography (15%)
5. Digital image processing (10%)
6. Quality assurance and safety in diagnostic radiology (10%)
Principle and Technology of Diagnostic Radiotherapy

1. Radiobiology (10%)
2. Teletherapy (30%)
3. Brachytherapy (10%)
4. Radiotherapy planning (20%)
5. Simulation and immobilization device (15%)
6. Quality assurance and safety in radiotherapy (15%)
Principle and Technology of Nuclear Medicine

1. Radiopharmacy (15%)
2. SPECT and PET (50%)
3. Radio-immunoassay (10%)
4. Radionuclide therapy (10%)
5. Quality assurance and safety in nuclear medicine (15%)
Mechanisms in Guiding Students

- Teacher office hours
- Mentor system - Dual Tutor - Department tutors
- Family group instructors
- Regular teachers and students forum
- Assessment and election of good instructors
- Department teaching committee
- Department instructor committee
Curricular Activities for Students

• Encourage students to participate in community activities
• Student Association Activities
• School Activities
  - Speeches
  - Arts activities
  - Sport
• Volunteer in affiliated hospitals
• Honours Records
## Research Projects in 5 years (2009 to 2012)

<table>
<thead>
<tr>
<th>Institutes</th>
<th>No.</th>
<th>Grant (USD million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Own institute</td>
<td>31</td>
<td>.85</td>
</tr>
<tr>
<td>NSC, NHI, NRI, AEC (government)</td>
<td>60</td>
<td>2.38</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>91</td>
<td>3.23</td>
</tr>
</tbody>
</table>
## Faculty Academic Performance and Scientific Publication

<table>
<thead>
<tr>
<th>Year</th>
<th>First and Corresponding Author#</th>
<th>Co-author</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>28</td>
<td>37</td>
<td>65</td>
</tr>
<tr>
<td>2009</td>
<td>35</td>
<td>56</td>
<td>91</td>
</tr>
<tr>
<td>2010</td>
<td>45</td>
<td>42</td>
<td>87</td>
</tr>
<tr>
<td>2011</td>
<td>40</td>
<td>45</td>
<td>85</td>
</tr>
<tr>
<td>2012</td>
<td>53</td>
<td>45</td>
<td>98</td>
</tr>
<tr>
<td>Total</td>
<td>201</td>
<td>225</td>
<td>426</td>
</tr>
</tbody>
</table>

Each paper was counted only once (not including EI papers)

# First or corresponding author: an average of > 2 per person per year
Career after Graduation

**BSc**
- Professional job: 46%
- Further study: 30%
- Unemployed: 12%
- Military service: 12%

**MSc**
- Professional job: 73%
- Further study: 13%
- Unemployed: 7%
- Military service: 7%
Professional Income Per Month in US Dollar

- > $ 2,031: 67%
- $ 1,350 – 1,690: 14%
- $ 1,691 – 2,030: 17%
- < $ 1,350: 2%
Thank You for Your Time and Attention
Item 1
Goal 、Core Competencies and Curriculum Design
Item VI: Overall self-improvement mechanism

Students' Overall Learning Effectiveness Evaluation Mechanism

➢ From 2011, core competencies have been included in basic course outline in order to assess students’ overall learning.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSA01</td>
<td>General basics knowledge</td>
</tr>
<tr>
<td>RSA02</td>
<td>Professional knowledge</td>
</tr>
<tr>
<td>RSA03</td>
<td>Professional clinical skills and ethics</td>
</tr>
<tr>
<td>RSA04</td>
<td>Information sharing, teamwork</td>
</tr>
<tr>
<td>RSA05</td>
<td>Independent thinking</td>
</tr>
<tr>
<td>RSA06</td>
<td>Self-growth and international outlook</td>
</tr>
</tbody>
</table>

Students to be graduated in 2013 had the core competence of 84%.
Participation in international academic activities and international cooperation

- **Europe and the U.S.A.**
  - U Chicago, NIH, UT MD Anderson Cancer Center, SUNY at Stony Brook, U Florida, U Pennsylvania, Albert Einstein College of Medicine, Columbia U Medical Center, Mass General Hospital, Montefiore Medical Center, Presbyterian Intercommunity Hospital, Fox Chase Cancer Center, University College London

- **Asia**
  - University of Hong Kong, Hong Kong Polytechnic University, South China Normal University, China Tsinghua University, Beijing, China Beijing Normal University, Nagaoka University of Technology (Japan), Hyogo Ion Beam Medical Center (Japan)
Studies and Employment Performance of Graduates (Undergraduate)
Studies and Employment Performance of Graduates (Post-graduate)
Item V: Performance of graduates

Graduates salary income

- 39% (6萬以上)
- 30% (5-6萬)
- 26% (4-5萬)
- 4% (4萬以下)
Post-graduates

1. Professional medical physicists’ development education.
2. Providing development training and to be a cutting-edge scientist imaging researchers.

Core Competencies

1. Professional skills (medical physics processes, biomedical imaging process)
2. Advanced Medical Imaging and Radiological Science Knowledge
3. Biomedical research capacity
4. Communication and the ability to participate in teamwork
5. Independent thinking, analysis and problem-solving skills
6. Personal growth, lifelong learning
7. International outlook and international competitiveness
### Education Goal

Training medical physics, medical imaging and radiation sciences independent research talent.

### Core Competencies

1. Medical Physics academic research and application capabilities
2. Imaging Science academic research and application capabilities
3. Biomedical research and application capabilities
4. Independent research, analysis and problem-solving skills
5. Communication and the ability to participate in team research
6. Personal growth, lifelong learning
7. International outlook and international competitiveness
Mechanisms in Guiding Students

- The establishment of multi-channel warning system
- Teaching Resource Center - remedial teaching program
- Office of Student Affairs - Counseling Guidance Section
- Provide scholarships
- Grants students participate in international conferences
- Regular Teachers and students forum
Student Life Counseling

- Mentor system is established
  - Guide Tutor
  - Guide Meeting
- Family mentors guide meeting
- Dorm visits
- Neat game
- Promote peaceful bedroom
- Student Affairs Office of Student Assistance and Counseling Guidance Section
Item III: Student Counselling and Learning Resources

**Student Career Counseling**

- Career planning seminars
- Hospital Apprentice Training
- Senior internship
- Ministry of Education
- Xuehai Dream Project
- Regular Teachers and students forum
- Regular guide Tan
## Studies and Employment Performance of Graduates

<table>
<thead>
<tr>
<th></th>
<th>Undergraduate</th>
<th>Postgraduate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Involve in work force</td>
<td>46%</td>
<td>73%</td>
</tr>
<tr>
<td>Continue Study</td>
<td>30%</td>
<td>13%</td>
</tr>
<tr>
<td>Military service</td>
<td>12%</td>
<td>7%</td>
</tr>
<tr>
<td>Unemployed</td>
<td>12%</td>
<td>7%</td>
</tr>
</tbody>
</table>