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## MEDICAL IMAGING

**Los Angeles and Orange Counties**

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**There will be over 1,800 new and replacement positions for medical imaging technologists and technicians in Los Angeles and Orange Counties during the coming five years.**

**— Source: EMSI, Fall 2008**

## **Executive Summary**

Medical Imaging is recognized as one of the fastest growing fields in the healthcare industry. This growth is a result of the increasing demand for imaging as a diagnostic tool and the rapid and continuous development of new equipment and processes. Technicians and technologists in medical imaging are generally educated at community colleges and earn above average salaries.

This study looks at supply and demand in four diagnostic imaging occupations (Radiologic Technology, Diagnostic Medical Sonography, Cardiovascular Technology, and Nuclear Medicine Technology) and one therapeutic medical imaging occupation (Radiation Therapy.) Radiologic Technology is the cornerstone of this group of occupations and the entry point to the field for many community college graduates.

Because of their geographic proximity, Los Angeles and Orange County medical imaging occupations and education/training programs were combined in this study. Using projected demand alone, it appears that there is an over-supply of graduates to meet the job needs in all of these occupations for the next five years. An employer survey, however, revealed a reluctance to hire graduates of private proprietary programs. When these graduates are removed from the pool of job candidates, supply and demand appear to be more balanced and only Cardiovascular Technologists fall short of the graduates needed to fill new and replacement jobs.

Employers who were surveyed reported problems finding qualified candidates for Diagnostic Medical Sonography jobs and for specialized jobs like pediatric radiology or catheterization lab cardiovascular technologists. Job candidates who could function in multiple modalities or sub-specialties, like mammography and CT, were in greater demand and more likely to earn higher salaries.

Recommendations to the Los Angeles and Orange County community colleges are to: Expand their Radiologic Technology programs only in partnership with the larger hospital chains and organizations that can ensure employment for their graduates; include certification in multiple modalities as part of their Radiologic Technology programs; and, consider development of new programs in Diagnostic Medical Sonography and Cardiovascular Technology. Both potential programs should be located in Los Angeles County since the other existing community college programs are currently in Orange County.

Medical imaging is a rapidly changing and growing field. It is recommended that a follow-up study be conducted in five years to assess how changes in the industry may have affected employment opportunities and college programs. It is also recommended that other studies be conducted throughout the state to examine the needs of each region, since most of the educational programs are clustered in the two major metropolitan centers.

## Introduction

A 2008 Center of Excellence study of projected demand in allied health occupations in Los Angeles brought attention to the growing importance of the medical imaging field. With numerous Los Angeles and Orange County community colleges already offering radiologic technology programs, this study is designed to inform the direction and size of those existing programs as well as the potential for development of new programs in other medical imaging occupations. The California Community Colleges System has charged the Economic & Workforce Development (EWD) Network to conduct studies like this to identify industries and occupations with unmet employee development needs and to introduce partnering potential for the colleges' programs.

## Industry Overview

The growing demand for healthcare services and the rapid development of medical imaging equipment and processes are driving occupational change and growth in the medical imaging field, which is commonly known as diagnostic medical imaging. As a discipline, medical imaging can be considered part of a broader imaging science field including other modalities as varied as remote sensing (taking images by aerial reconnaissance) and electronic printing.<sup>1</sup> The development of imaging devices capable of displaying objects and structures not previously visible has created new challenges with the problems of formation, acquisition, compression, transmission, and analysis of images.<sup>2</sup> Two other major developments in the medical imaging field are: The ability to produce three dimensional images instead of the two dimensional "slices" traditionally produced by CT, MRI and ultrasound technologies; and the new digital nature of the field, including electronic storage and transmission of images.<sup>3</sup>

Medical imaging occupations use techniques and processes to create images of the human body (or parts of the body) for clinical or medical purposes. The field also encompasses measurement and recording techniques that don't produce images, but instead produce maps containing positional information (i.e. electroencephalography (EEG) and magneto-encephalography). In clinical settings, medical imaging is most often diagnostic. In lab settings, the application and interpretation of medical images becomes an integral part of medical research.<sup>4</sup>

The application of modern technology to the medical imaging field has resulted in highly specialized applications such as: electron microscopy (used in anatomic pathology), fluoroscopy (uses x-rays to produce real-time images of internal structures), magnetic resonance imaging (MRI) which uses magnets to create images, nuclear medicine (using images from gamma cameras to detect regions of biological activity associated with disease), photo acoustic imaging (a hybrid biomedical modality based on the photo acoustic effect), positron emission tomography (PET) which is similar to nuclear medicine using an isotope to measure glucose uptake in tumors, projection radiography (uses barium with x-ray), tomography (including linear

<sup>1</sup> Fowler, Elizabeth M, "Careers: Vast Growth In Imaging Is Forecast," New York Times, January 8, 1991 found online at <http://query.nytimes.com/gst/fullpage.html?res=9D0CE7DA1538F93BA35752C0A967958260>

<sup>2</sup> Siam Conference Theme, May 15-17, 2006, online at <http://www.siam.org/meetings/is06/>

<sup>3</sup> Hemrick, Wayne, "A Little More on the Rapidly Growing Field of Medical Imaging." December 2, 2008.

EzineArticles.com, found online at <http://ezinearticles.com/?A-little-More-on-the-Rapidly-Growing-Field-of-Medical-Imaging&id=1751275>

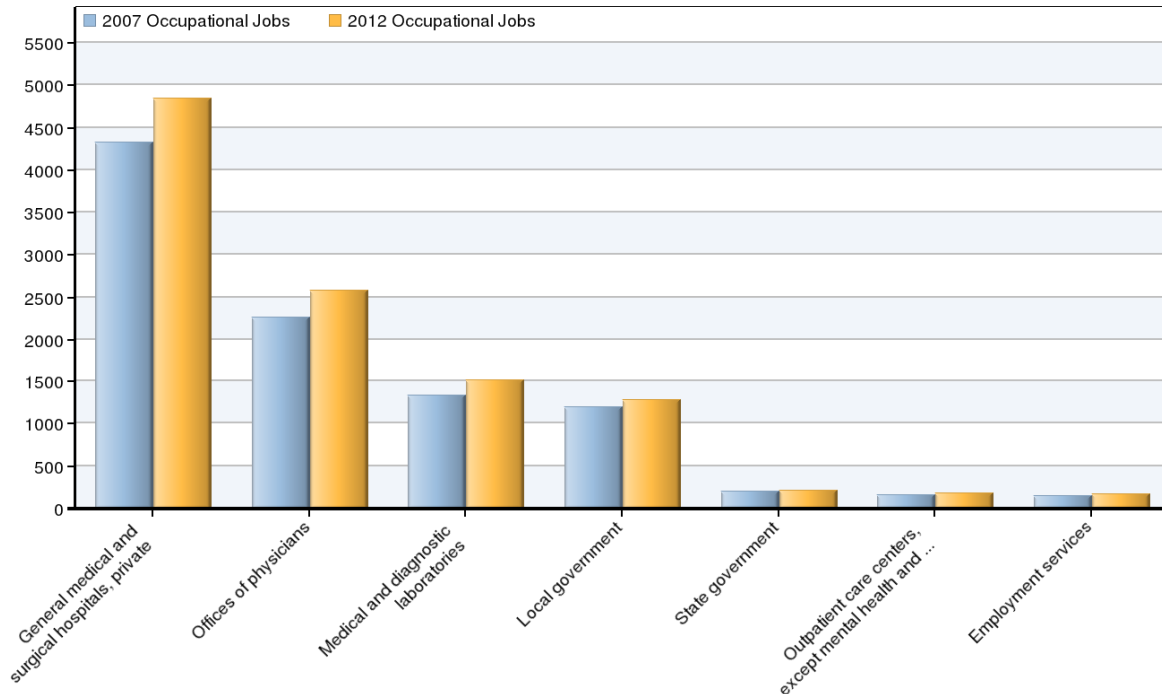
<sup>4</sup> Wikipedia, "Medical Imaging," online at [http://en.wikipedia.org/wiki/Imaging\\_studies](http://en.wikipedia.org/wiki/Imaging_studies)

tomography, poly tomography, zonography, orthopantomography, and the most commonly known computed tomography (CT), and ultrasound (using high frequency sound waves).<sup>5</sup>

### Employers

Nearly half of all medical imaging employees in the region work in hospital settings.

**Exhibit 1 – Medical Imaging Employees by Setting**



**Table 1 – Medical Imaging Employment by Setting**

NAICS Code	Type of Organization	2007 Jobs	2012 Jobs	Change	% Change
622100	General medical and surgical hospitals, private	4,330	4,846	516	12%
621100	Offices of physicians	2,262	2,585	323	14%
621500	Medical and diagnostic laboratories	1,332	1,508	176	13%
930000	State government	202	210	8	4%
6214XX	Outpatient care centers	158	183	25	16%
561300	Employment Services	145	173	28	19%
		<b>8,429</b>	<b>9,505</b>	<b>1,076</b>	<b>13%</b>

Source: EMSI Covered Employment, Fall 2008

<sup>5</sup> Ibid

## Demand Overview

A statewide examination of the labor shortage affecting allied health occupations identified medical imaging as the top group facing critical shortages of workers, ranking them even higher than registered nurses.<sup>6</sup> Five factors drive the increased demand for medical imaging workers:

- The population is aging and the need for imaging services is growing proportionally.
- The aging population includes an aging workforce and increased retirements of baby-boomer generation workers are expected in the imaging field.
- An explosion of technological developments is resulting in the development of new jobs and specialties.
- The number of people going into the profession (as measured by first-time applicants taking certification exams) has declined steadily in the past few years, aggravating the gap between the number of jobs and qualified candidates. There has been a concurrent drop in the number of accredited schools and programs in radiology technology.<sup>7</sup>
- The health care industry is somewhat “recession proof” and is not expected to experience significant job losses due to the economy.<sup>8</sup>

## Occupational Overview

Radiography (x-ray), the original form of medical imaging, is divided into *diagnostic* radiography and *therapeutic* radiography (radiation therapy). Radiography or radiologic technology is the largest medical imaging discipline and the entry point to the field.

The five occupations studied in this report were selected from the allied health field because they are the core occupations of the medical imaging field that require an AA-degree or community college certificate-level education for entry. The occupations are: radiological technologists and technicians, diagnostic medical sonographers, cardiovascular technologists and technicians, nuclear medicine technologists, and radiation therapists.<sup>9</sup>

<sup>6</sup> Health Workforce Solutions, “Closing the Health Workforce Gap in California: An Education Imperative, November 5, 2007, The Campaign for College Opportunity, San Francisco, available online at

[http://www.collegecampaign.org/assets/docs/hcwfs/cco\\_alliedhealth\\_report\\_10-30-07\\_final.pdf](http://www.collegecampaign.org/assets/docs/hcwfs/cco_alliedhealth_report_10-30-07_final.pdf), p. 17

<sup>7</sup> “The Personal Crunch: A Crisis in the Radiologic Technology Workforce,” an iPaper found online at

<http://www.scribd.com/doc/3634107/A-Crisis-in-the-Radiologic-Technology-Work-Force>

<sup>8</sup> Altman, Alex, “A Few Bright Spots Amidst Rising Unemployment,” TIME, November 7, 2008, found online at

<http://www.time.com/time/business/article/0,8599,1857411,00.html>

<sup>9</sup> Bates, Timothy and Chapman, Susan A. , Tracking the Supply of Health Professions Education Programs in California, California,” April 2007, Health Workforce Tracking Collaborative, UCSF Center for the Health Professions, found online at

[http://www.cpec.ca.gov/CompleteReports/ExternalDocuments/HWTC\\_Tracking\\_the\\_Supply\\_4-16-07.pdf](http://www.cpec.ca.gov/CompleteReports/ExternalDocuments/HWTC_Tracking_the_Supply_4-16-07.pdf)

**Table 2 – Medical Imaging Occupations and Sub-Specialties Licensed by the American Registry of Radiologic Technologists (ARRT)**

Occupations	Description	Licensing and Certification Requirements
<b>Radiologic Technologist</b> <ul style="list-style-type: none"> <li>• <b>Computed Tomography (CT)</b></li> <li>• <b>Magnetic Resonance Imaging (MRI)</b></li> <li>• <b>Mammography</b></li> <li>• <b>Limited License X-ray Technician (this specialty is not licensed by ARRT)</b></li> </ul>	Produce x-ray films (radiographs) of parts of the human body for use in diagnosing medical problems, prepare patients for examinations and position patients so that the parts of the body can be appropriately radiographed. Radiographers position radiographic equipment and set controls on the machine. They also develop film and keep patient records. <sup>10</sup>	Basic license required as foundation for other medical imaging licenses and/or eligibility to sit for some other certification examinations. Applicants who hold an ARRT certificate for Radiography can automatically apply and receive California licenses in Diagnostic Radiology. Applicants who do not have AART certification must provide a copy of a graduation diploma from a Department of Health approved school in diagnostic radiologic technology and sit for the California examination. The California Department of Public Health (CDPH) also approves schools for radiologic technologists. Current standards will be revised in 2011. At this time, schools that have JRCERT accreditation meet the requirement. <sup>11</sup>
<b>Registered Radiologic Assistant</b>	As a radiologist extender in the diagnostic imaging environment, Radiologist Assistants have three major areas of responsibility. First, they take a leading role in patient management and assessment. Second, the radiologist assistant performs selected radiology examinations and procedures under the supervision of a radiologist. And third, the radiologist assistant may be responsible for evaluating image quality, making initial image observations, and forwarding those observations to the supervising radiologist. <sup>12</sup>	<ol style="list-style-type: none"> <li>1. Be ARRT certified and registered in radiography;</li> <li>2. Have one year of acceptable clinical experience;</li> <li>3. Complete a radiologist assistant educational program recognized by ARRT;</li> <li>4. Have earned a baccalaureate degree;</li> <li>5. Be in compliance with the ARRT ethics requirements;</li> <li>6. Complete didactic coursework addressing the topics listed in the ARRT Content Specifications for the Registered Radiologist Assistant Examination. These topics should be covered as a part of a nationally recognized curriculum such as the one published by the ASRT;</li> <li>7. Complete the ARRT clinical requirements.<sup>13</sup></li> </ol>
<b>Radiation Therapist</b>	Radiation therapists function as part of a team, alongside a physician specializing in radiation oncology and a medical dosimetrist that delivers radiation-based medical treatment. The radiation therapist uses x-rays and computerized tomography to help locate cancerous growths in a patient and project high intensity radiation at targeted cancer cells. <sup>14</sup>	Radiation therapists are required to have Certification in Therapeutic Radiologic Technology issued by the State of California, Department of Health Services. Applicants who hold an ARRT certificate for Radiation Therapy can automatically apply and receive California licenses in Diagnostic Radiology. <sup>15</sup>

<sup>10</sup> Bureau of Labor Statistics, U.S. Department of Labor, Occupational Outlook Handbook, 2008-09 Edition, Radiologic Technologists and Technicians, on the Internet at <http://www.bls.gov/oco/ocos105.htm>

<sup>11</sup> California Department of Public Health, Memo regarding Approved California Radiologic Technologist (RA) Schools, August 29, 2007, found online at <http://ww2.cdph.ca.gov/pubsforms/forms/Documents/RadHealth/cdph8200.pdf>

<sup>12</sup> Association of Registered Radiologic Technologists, "Registered Radiologic Assistant Role Delineation, January 2005," found online at <http://www.rrrt.org/radasst/finalraroledelineation.pdf>

<sup>13</sup> Association of Registered Radiologic Technologists, "Checklist for Certification as Radiologic Assistant," found online at <http://www.rrrt.org/radasst/finalraroledelineation.pdf>

<sup>14</sup> Bates, Timothy and Chapman, Susan A. , Tracking the Supply of Health Professions Education Programs in California, California," April 2007, Health Workforce Tracking Collaborative, UCSF Center for the Health Professions, found online at [http://www.cpec.ca.gov/CompleteReports/ExternalDocuments/HWTC\\_Tracking\\_the\\_Supply\\_4-16-07.pdf](http://www.cpec.ca.gov/CompleteReports/ExternalDocuments/HWTC_Tracking_the_Supply_4-16-07.pdf)

<sup>15</sup> California Department of Public Health, Memo regarding Approved California Radiologic Technologist (RA) Schools, August 29, 2007, found online at <http://ww2.cdph.ca.gov/pubsforms/forms/Documents/RadHealth/cdph8200.pdf>

Occupations	Description	Licensing and Certification Requirements
<p><b>Nuclear Medicine Technologist</b></p>	<p>Nuclear medicine technologists perform procedures using radiopharmaceuticals and specialized cameras to detect biological changes in the structure or function of human tissues and organs. These both prepare and administer radiopharmaceuticals, which emit signals that are then captured on film and are typically enhanced through digital processing techniques.<sup>16</sup></p>	<p>The state of California licenses individuals to use radiopharmaceuticals for therapeutic and medical purposes. To be licensed, individuals must have passed one of three national certification exams or take the California state examination. Completion of an accredited program with clinical experience or detailed documentation of specific clinical experience in numerous procedures is also necessary for licensure.<sup>17</sup></p>
<p><b>Cardiovascular Technologists and Technicians</b></p> <ul style="list-style-type: none"> <li>• <b>Invasive Cardiology (Cardiac-Interventional Radiography)</b></li> <li>• <b>Echocardiography</b></li> <li>• <b>Vascular-Interventional Radiography</b></li> </ul>	<p>Invasive Cardiology Technicians assist physicians with cardiac catheterization procedures in which a small tube, or catheter, is threaded through a patient's artery from a spot on the patient's groin to the heart. Technologists also may prepare and monitor patients during open-heart surgery and during the insertion of pacemakers and stents that open up blockages in arteries to the heart and major blood vessels.</p> <p>Echocardiography Technologists specialize in noninvasive tests that do not require the insertion of probes or other instruments into the patient's body. This area of practice includes giving electrocardiograms (EKGs) and sonograms of the heart. Cardiovascular technicians who specialize in EKGs, stress testing, and those who perform Holter monitor procedures are known as cardiographic or <i>electrocardiograph</i> (or <i>EKG</i>) technicians.</p>	<p>In California, one year of formal training is required to practice as a cardiovascular technologist or technician.<sup>18</sup> Certification is voluntary, though many employers prefer/hire only candidates who are certified by Cardiovascular Credentialing International (CCI) or the American Registry of Diagnostic Medical Sonographers (ARDMS). CCI offers four certifications—Certified Cardiographic Technician (CCT), Registered Cardiac Sonographer (RCS), Registered Vascular Specialist (RVS), and Registered Cardiovascular Invasive Specialist (RCIS). ARDMS offers Registered Diagnostic Cardiac Sonographer (RDMS) and Registered Vascular Technologist (RVT) credentials.<sup>19</sup></p>

<sup>16</sup> Bates, Timothy and Chapman, Susan A. , Tracking the Supply of Health Professions Education Programs in California,” April 2007, Health Workforce Tracking Collaborative, UCSF Center for the Health Professions, found online at

[http://www.cpec.ca.gov/CompleteReports/ExternalDocuments/HWTC\\_Tracking\\_the\\_Supply\\_4-16-07.pdf](http://www.cpec.ca.gov/CompleteReports/ExternalDocuments/HWTC_Tracking_the_Supply_4-16-07.pdf)

<sup>17</sup> California Department of Public Health, Memo regarding Approved California Radiologic Technologist (RA) Schools, August 29, 2007, found online at

<http://ww2.cdph.ca.gov/pubsforms/forms/Documents/RadHealth/cdph8200.pdf>

<sup>18</sup> Lindler, Vanessa, Woo, Lorraine, and Chapman, Susan , “Diagnostic Medical Imaging Professionals in California, USCF Center for the Health Professions, 2003, found online at

[http://www.futurehealth.ucsf.edu/pdf\\_files/Diagnos\\_Imaging\\_Brief2.pdf](http://www.futurehealth.ucsf.edu/pdf_files/Diagnos_Imaging_Brief2.pdf)

<sup>19</sup> Bureau of Labor Statistics, U.S. Department of Labor, Occupational Outlook Handbook, 2008-09 Edition, Cardiovascular Technologists and Technicians, on the Internet at <http://www.bls.gov/oco/ocos100.htm>

Occupations	Description	Licensing and Certification Requirements
<p><b>Diagnostic Medical Sonography</b></p> <ul style="list-style-type: none"> <li>• <b>Sonography</b></li> <li>• <b>Bone Densitometry</b></li> <li>• <b>Breast Sonography</b></li> <li>• <b>Vascular Sonography</b></li> </ul>	<p>Diagnostic medical sonographers use special equipment to direct non-ionizing, high frequency sound waves into areas of the patient's body. Sonographers operate the equipment, and direct the patient to move into positions that will provide the best view. Viewing the screen during the scan, sonographers look for subtle visual cues that contrast healthy areas with unhealthy ones. They decide whether the images are satisfactory for diagnostic purposes and select which ones to store and show to the physician.</p>	<p>The State of California does not regulate the field of ultrasound technology. However, most hospitals require that ultrasound technicians become registered through the professional organization, American Registry of Diagnostic Medical Sonographers (ARDMS) or Cardiac Credentialing International of Raleigh North Carolina. To maintain current registration, 30 hours of continuing education every three years is required. Recently, the ARRT also began offering a sonography certification. See <a href="http://www.arry.org/sonpilot/execsummary.pdf">http://www.arry.org/sonpilot/execsummary.pdf</a>.<sup>20</sup></p>

\*See also Appendix B for more information about specialized licensing requirements.

New sub-specialties of medical imaging emerge on a regular basis as new equipment and modalities appear. At this time, most of the training on these new procedures and equipment is done by the companies that develop and distribute the equipment. Experienced Radiologic Technicians are usually chosen to participate in this upgraded training. After the training is more established, the colleges are more likely to incorporate it into their degree or certificate programs, as they have done in the past with MRI, CT scanning, and mammography.

### Projected Job Growth

Table 3 shows the current and projected jobs in the five occupations selected for this study. Each cell shows the number of jobs in Los Angeles County + the number of jobs in Orange County. The italicized number in bold type face in each cell is the total number of jobs in the combined counties.

<sup>20</sup> Bates, Timothy and Chapman, Susan A. , Tracking the Supply of Health Professions Education Programs in California," April 2007, Health Workforce Tracking Collaborative, UCSF Center for the Health Professions, found online at [http://www.cpec.ca.gov/CompleteReports/ExternalDocuments/HWTC\\_Tracking\\_the\\_Supply\\_4-16-07.pdf](http://www.cpec.ca.gov/CompleteReports/ExternalDocuments/HWTC_Tracking_the_Supply_4-16-07.pdf)

**Table 3 - Los Angeles + Orange County Current and Projected Jobs 2007-2012\***

SOC Code	Description	2007 Jobs	2012 Jobs	Change	% Change	New & Replacement Jobs	% Change in New & Replacement jobs	2007 Average Hourly Earnings
29-1124	Radiation therapists	369 + 67 = <b>436</b>	425 + 78 = <b>503</b>	56 + 11 = <b>67</b>	15% + 16% average <b>15%</b>	84 + 16 = <b>100</b>	23% + 24% average <b>23%</b>	\$40.99 + 39.92 average <b>\$40.63</b>
29-2031	Cardiovascular technologists and technicians	1,061 + 177 = <b>1,238</b>	1,230 + 206 = <b>1,436</b>	169 + 29 = <b>175</b>	16% + 16% average <b>16%</b>	241 + 41 = <b>282</b>	23% + 23% average <b>23%</b>	\$26.87 + \$26.37 average <b>\$26.80</b>
29-2032	Diagnostic medical sonographers	1,318 + 318 = <b>1,636</b>	1,482 + 61 = <b>1,843</b>	164 + 43 = <b>207</b>	12% + 14% average <b>13%</b>	253 + 65 = <b>318</b>	19% + 20% average <b>19%</b>	\$29.45 + \$33.02 average <b>\$30.15</b>
29-2033	Nuclear medicine technologists	582 + 97 = <b>679</b>	643 + 108 = <b>751</b>	61 + 11 = <b>72</b>	10% + 11% average <b>11%</b>	100 + 18 = <b>118</b>	17% + 18% average <b>17%</b>	\$33.92 + \$40.29 average <b>\$34.83</b>
29-2034	Radiologic technologists and technicians	4,542 + 1394 = <b>5,936</b>	5,035 + 1,568 = <b>6,603</b>	493 + 174 = <b>67</b>	11% + 12% average <b>11%</b>	801 + 269 = <b>1,069</b>	18% + 19% average <b>18%</b>	\$26.88 + \$26.74 average <b>\$26.85</b>

Source: EMSI Covered Employment – Fall 2008

\*Cells in this table contain figures for Los Angeles + Orange Counties and a total number or average for both counties in bold italics.

The average wages noted in Table 3 are at the high end of the scale for allied health workers in this region. Entry level radiographers at Kaiser Permanente can expect to make \$65,000 per year.<sup>21</sup> Also, the wages of Radiologic Technologists who are trained in multiple modalities are higher and tend to pull the average salaries to a higher level.

California comes into this period of growth already short of employees in medical imaging jobs with fewer workers per capita than any other of the seven most populated states.<sup>22</sup>

**Table 4 - Imaging Employees per 100,000 Population in 2005**

Occupation	Employees per 100,000 Population	
	California	National
Radiographers	38-47	61-64
Diagnostic Medical Sonographers	7-10	14-15
Cardiovascular Technologists	8.4*	13.7*
Nuclear Medicine Technologists	2.8-5.5	5.8-6.5
Radiation Therapists	1.8-2.4	4.2-5.3

Source: Tracking the Supply of Health Professions Education Programs in California<sup>23</sup>

<sup>21</sup> Interview with Albert Hermogeno, Director of Diagnostic Imaging, Kaiser Permanente

<sup>22</sup> Lindler, Vanessa, Woo, Lorraine, and Chapman, Susan, "Diagnostic Medical Imaging Professionals in California, UCSF Center for the Health Professions, 2003, found online at [http://www.futurehealth.ucsf.edu/pdf\\_files/Diagnos\\_Imaging\\_Brief2.pdf](http://www.futurehealth.ucsf.edu/pdf_files/Diagnos_Imaging_Brief2.pdf)

<sup>23</sup> Bates, Timothy and Chapman, Susan A., "Tracking the Supply of Health Professions Education Programs in California," April 2007, UCSF Center for the Health Professions

The California report by Health Workforce Solutions, “Closing the Health Workforce Gap in California: An Education Imperative,”<sup>24</sup> identifies this shortage as a percentage that reflects how much the current supply of qualified candidates would have to increase in order to meet the demand in the future.

**Table 5 – Shortage of Qualified Candidates in Selected Imaging Occupations**

Imaging Occupation	Percentage increase needed to meet future needs
Diagnostic Medical Sonographers	60%
Cardiovascular Technologists	72%

Source: “Closing the Health Workforce Gap”<sup>25</sup>

The same report, however, projects an oversupply of 28% for Radiologic Technologists.<sup>26</sup> There are also other signs that the job market in certain areas may be becoming saturated. The 2008 Radiology Compensation Review revealed a relatively stagnant market related to wage increases over the last 12 months. Associated research during 2007 showed that it was easier to recruit technologists who perform Radiography, Computed Tomography, Magnetic Resonance Imaging and Nuclear Medicine compared to previous years. As a result, hospitals have not had to compete for these specialists keeping wages comparable to the previous year.

Beginning in 2007, many radiologic technologists were unable to find jobs due to saturated markets in some communities. The market saturation is further signaled by a decrease in “travelers” and independent contractors as those professionals take full-time jobs, relinquishing their flexibility for more security.<sup>27</sup> All of these trends were confirmed by employers in the survey done for this study.

### Career Ladders

The career ladder for imaging professionals varies from employer to employer. A detailed career ladder can be found in Appendix C. There are three general routes used to provide a career ladder for medical imaging professionals:

**Multiple Modalities** - In some organizations, a career ladder for the Radiologic Technician is available as sub-specialties are added. A Tech 1 would be trained only as a Radiologic Technologist. If that person becomes certified in Mammography or CT or MRI he/she would become a Tech 2. If certified in three of these modalities, they could become a Tech 3.

**Upward Advancement/Radiologic Assistant** - To create a true vertical career pathway in radiologic technology rather than one built horizontally on employees training in multiple modalities, new career levels both above and below the current position of

<sup>24</sup> Health Workforce Solutions, “Closing the Health Workforce Gap in California: An Education Imperative, November 5, 2007, The Campaign for College Opportunity, San Francisco, available online at [http://www.collegecampaign.org/assets/docs/hcwfs/cco\\_alliedhealth\\_report\\_10-30-07\\_final.pdf](http://www.collegecampaign.org/assets/docs/hcwfs/cco_alliedhealth_report_10-30-07_final.pdf) p. 19

<sup>25</sup> Closing the Health Workforce Gap in California: An Education Imperative.

<sup>26</sup> Closing the Health Workforce Gap in California: An Education Imperative.

<sup>27</sup> RadSciences Group, “Developing Top Talent for Healthcare Organizations, 2008 Radiology Compensation Review,” found online at <http://www.radsciences.com/docs/rsgcomp2008.pdf>

registered radiologic technologist are needed. The Radiologic Assistant position was recently created by the American Society of Radiologic Technologists (ASRT), the American College of Radiology and the American Registry of Radiologic Technologists (ARRT) and offers a step up for licensed and experienced Radiologic Technologists. As physician extenders, Radiologic Assistants will have more autonomy and more responsibility for decision making<sup>28</sup> and will hold a BA or graduate-level certificate when they qualify for their certification.<sup>29</sup> ASRT also recognizes a pre-professional level is known as the Radiologic Technology Aide.<sup>30</sup>

**Administrative Opportunities** - Experienced Radiologic Technologists also may be promoted to leads, supervisors, chief radiologic technologists, and, ultimately, department administrators or directors. Depending on the institution, courses or a master's degree in business or health administration may be necessary for the director's level position.<sup>31</sup>

## Employer Needs and Challenges

Employers in both Los Angeles and Orange Counties were surveyed via mail, e-mail, and telephone interviews. They were asked a series of questions about the current and future staffing needs in medical imaging. The 15 employers who were interviewed ranged from small imaging centers to mid-sized and larger hospitals and hospital groups. Interviews also included the director of imaging services for Kaiser Permanente for the entire southern California region and a representative of the California Hospital Association. (See Appendix D for employer survey results and interviews.)

## Survey Findings

### **Demand**

Everyone who was interviewed indicated that they were able to fill their imaging positions fairly easily, in spite of the fact that many employers were only willing to hire experienced job candidates. Some indicated a change in availability of candidates that started in 2006-2007. The smaller the facility, the lower their turnover AND difficulty in filling vacant positions. Kaiser, the largest employer interviewed, has employed a series of strategic programs including extensive internal training in order to keep qualified employees in its 1,300 southern California imaging positions. In one training, they take entry level radiologic technicians and cross-train them in multiple modalities like MRI, mammography, and CT.<sup>32</sup>

The occupation most commonly reported as difficult to fill (by five employers of all sizes) was Diagnostic Medical Sonographer or Ultrasound Technician. Though these occupations are not licensed in California, most employers want candidates with RDMS certification. Many of the private school graduates are not eligible for this certification until they have worked for one

<sup>28</sup> American Society of Radiologic Technologists, "Career Advancement for Radiologic Technologists," found online at [https://www.asrt.org/content/recruitmentretention/RetentionTools/Career\\_Advancement.aspx](https://www.asrt.org/content/recruitmentretention/RetentionTools/Career_Advancement.aspx)

<sup>29</sup> Association of Registered Radiologic Technologists, "Recognition Criteria for Radiologic Assistant Education Programs," July 1, 2005, found online at <http://www.rrrt.org/radasst/pgmrecognitioncriteria.pdf>

<sup>30</sup> Mehallow, Cindy, "Radiologist Assistant Career Path Expands Rad Tech Role," found online at <http://career-advice.monster.com/career-planning/healthcare/Radiologist-Assistant-Career-Path-E/home.aspx>

<sup>31</sup> AllAlliedHealthSchools.com, "Radiologic Technology Careers," found online at <http://www.allalliedhealthschools.com/faqs/radiographer.php>

<sup>32</sup> Phone interview with Albert Hermogena, Director of Diagnostic Medical Imaging, Kaiser Permanente

year.<sup>33</sup> Two small employers and one large employer reported occasional trouble hiring radiologic technologists, but most employers who were interviewed reported no trouble filling these positions. Smaller employers were looking for candidates who were experienced and/or licensed in several modalities. Two employers had specialties like pediatric radiology or catheterization lab cardiologic technologists that they had trouble filling. Though most of the employers who were interviewed have small numbers of Nuclear Medicine Technologists on staff, this specialty also seemed to represent more of a challenge when it came to filling vacancies.

Several employers reported a deliberate reduction in the number of registry or travelling employees that they used. Because of the high cost of registry staffing, it is generally a goal to keep this type of staffing at a minimum. The ability of hospitals to avoid using registry employees is also a sign of the available supply of qualified job candidates for full-time positions. When demand is high and supply is low, it is often impossible to find employees for night shifts and other less desirable jobs so these positions then are filled in with registry professionals.

Four employers talked about industry changes that will affect the imaging field. One discussed the closure of imaging centers and felt that this would reduce the demand for imaging professionals. Several employers cited the closure of hospitals (or sections of hospitals) because of financial concerns. The remaining hospitals then need to improve their cost effectiveness, which can affect the resources available, for example, for inpatient imaging services. Changes in Medicare and insurance reimbursements were also discussed as problematic, since imaging studies are expensive and not always fully reimbursed.

### **Skills**

Employers hiring community college graduates were generally “very” satisfied with students coming out of those programs. Many of these employers provide clinical positions for the area community college programs and frequently hire the students who have completed clinical work with them. This makes an easy transition since the incoming employees know the setting and have already proven their technical and patient care skills to the employer. A majority of the larger employers interviewed or surveyed reported that they only hire experienced job candidates or those who graduate from the community college programs. They will not hire graduates of the private, proprietary school programs.

One employer stressed the need for training in communication and critical thinking skills as an integral component of the students’ education. One employer mentioned the superior preparation of candidates coming out of the Loma Linda program. These graduates, whether AA- or BA-degree holders, have clinical experience on more sophisticated equipment which makes them in high demand. See Appendix D for details of the employer survey results and interviews.

### **Interviews**

**Kaiser Permanente** – An extensive telephone interview was conducted with Albert A. Hermogeno, Director of Diagnostic Imaging for Kaiser Permanente’s southern California region. Hermogeno oversees 1,300 diagnostic imaging positions at 12 facilities in southern California. One of his main duties is to build partnerships with the local community college programs and

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<sup>33</sup> Association of Registered Diagnostic Medical Sonography, “2008 Prerequisites for RDMS Certification,” [http://www.ardms.org/downloads/Prerequisite\\_Chart.pdf](http://www.ardms.org/downloads/Prerequisite_Chart.pdf)

support imaging students who might become future employees. The past few years, Kaiser has hired the entire graduating class of Chaffey College and 90% of the Mt. San Antonio class. A new partnership with Orange Coast College is being developed to help staff the new Irvine facility. Hermogeno has developed an internal training program at Kaiser to train incumbent Radiologic Technologists as mammographers, CT techs, and MRI techs. This has been an expensive program but it is the only way he can fill the growing need within Kaiser and reduce the use of costly registry staffing. Kaiser provides as many clinical positions as it can at each of its facilities. They will hire community college graduates or experienced professionals, but not graduates of private, proprietary programs because they have found that it takes 3-6 months of remediation to prepare them for work at Kaiser.

**California Hospital Association (CHA)** – A phone interview was conducted with Cathy Martin, Workforce Project Director for the California Hospital Association. Martin emphasized the importance of Radiology Technology students being training in several modalities (mammography, CT scan, MRI) and supports the Orange Coast College and Cypress College models where students complete these certifications as part of their 2-year degree programs. Martin heads a CHA task force that is preparing a report on workforce issues in allied health. The task force and the Hospital Association are interested in how students are admitted to the training and education programs. As public institutions, the community colleges ultimately have to use a lottery to admit students to their programs although the effect of this can be mitigated somewhat by the requirement for students to take prerequisites before admission. Martin is interested in other models, like the one used in Washington State that employ a greater emphasis on qualifications.

## Community Support and Resources

The local Workforce Investment Boards (WIB), especially the one in Orange County, have taken an active interest in health care workforce issues. In the June, 2004 report by the Health Care Collaborative of the Orange County WIB, a recommendation was made to establish a Regional Skills Partnership. This would bring together wide ranging public and private partners such as schools, industry, trade associations, labor unions, and public agencies to improve workforce preparation for medical careers. This report also identified sources of funding for programs to market, develop, and support enrollment of more students in healthcare occupation training and education programs.<sup>34</sup>

A more detailed report on the healthcare industry was produced by the Orange County WIB in 2006.<sup>35</sup> That report identified a growing need for Cardiovascular Technologists and Technicians but categorized Radiologic Technologists as having “little or no” indication that they will be undersupplied in the future, although both occupations appeared on the list of the top 5 most difficult jobs to fill at this time. Recommendations of this report that would affect the community colleges include: Continue to expand the educational capacity for students studying healthcare, find ways to bring individuals with non-traditional backgrounds (like military training or education in other countries) into the workforce, increase marketing to younger students of the benefits of health care careers, and work in public/private partnerships to improve the career ladder opportunities of healthcare occupations outside of nursing.

<sup>34</sup> Orange County Business Council, “Orange County Workforce Investment Board Health Care Collaborative Report”, June, 2004, Orange County, California found online at <http://www.ocwib.org/LinkClick.aspx?fileticket=BoGapt%2bzlg%3d&tabid=36&mid=409>

<sup>35</sup> Ibid.

## College Response and Issues

In Los Angeles and Orange counties, there are seven colleges with medical imaging programs, most of them in Radiologic Technology. See Appendix F for program details.

**Table 6 - Community College Programs in Los Angeles and Orange Counties**  
(Number of Program/Degree Completers for 2007 are Noted in Parentheses)

College	Degree Programs	Certificate Programs
<b>El Camino College/ Compton College Center</b>	AS Degree – Radiologic Technology (20)	Certificate of Accomplishment- Radiology Technology (12)
<b>Cypress College</b>	AS- Diagnostic Medical Sonography AS- Radiologic Technology (28)	Diagnostic Medical Sonography Certificate (9) Radiologic Technologist (30) One year Certificate in Radiology Assistant/Darkroom Technician (1)
<b>Long Beach City College</b>	AS Degree – Diagnostic Medical Imaging Sciences (Radiologic Technology) (30)	Certificate of Achievement (32)
<b>Los Angeles City College</b>	AS Degree – Radiologic Technology (19)	
<b>Mt. San Antonio College</b>	AS Degree – Radiologic Technology (28)	
<b>Orange Coast College</b>	AS Degree – Radiologic Technology (20) AS Degree – Diagnostic Medical Sonography (16) AS Degree – Cardiovascular Technology (11)	Certificates of Achievement – Cardiovascular Technology/Technician (10) Diagnostic Medical Sonographer Certificate (19) Electrocardiography Technician (18) Radiologic Technology (22) MRI Certification (9)
<b>Pasadena City College</b>	AS Degree – Radiologic Technology (0)	Certificate of Achievement – Radiologic Technology (26)

A face-to-face interview was conducted with Kevin Ballinger, Dean of Consumer and Health Sciences at Orange Coast College. Ballinger oversees the most extensive program in the two-county area and graduates students in Radiologic Technology, Diagnostic Medical Sonography, and Cardiovascular Technology. He confirmed that the student demand for these programs is very high but they have limited the program size because it is important to be able to place 100% of the graduates. He also discussed the private schools and the problems that their graduates are having. Sometimes they come to Orange Coast and enroll in hopes of starting over and being able to get a job when they finish. They are usually little better off than the beginning students who have had no prior training in medical imaging.

### Other Training Providers

There are an undetermined number of BS degree graduates with specialties in Radiology Sciences graduating from: Cal State Long Beach (BS—Health Science, Option in Radiation Therapy) and Cal State Northridge (BS-Radiography). Loma Linda Medical Center also provides AA- and BS-degree graduates in medical imaging to area employers. It is located in San Bernardino County, outside the study area but in relative proximity.

As Table 7 and Appendix E indicate, some of the private proprietary schools in the area graduate large numbers of candidates in several of the imaging occupations. A recent article in the Orange County Register<sup>36</sup> reported that graduates of private programs sometimes have difficulty being hired for a variety of reasons. Employers surveyed for this report also frequently mentioned that they will not hire graduates of the private programs, that private program graduates have come to them seeking clinical placements so they can qualify to sit for certification exams, and that private school graduates generally need 3-6 months of remedial training to be able to step into entry level positions.<sup>37</sup> Another barrier noted in the article is the high cost of the private programs, some charging students as much as \$30,000 to complete a 2-year course of study. See Appendix F for a complete list of accredited schools in Los Angeles and Orange Counties.

### Current Capacity

As Table 7 shows, there is a balance or oversupply of graduates to job openings in four of the five medical imaging occupations in Los Angeles and Orange Counties. Cardiovascular Technologists and Technicians is the only area where there is a clear need for more graduates. The oversupply in three of the areas would account for the lack of reported difficulty in hiring.

**Table 7 – 2007 Medical Imaging Graduates/Los Angeles and Orange Counties**

Degree or Certificate Program	2007 Graduates/ Accredited & Certified Schools	Total Anticipated New and Replacement Jobs/Year	Graduates of Non-accredited schools who may not be eligible for certification and/or licensure
Radiation Therapist	33*	20	54
Diagnostic Medical Sonography	52	56	496
Cardiovascular Technology	39	63	394
Nuclear Medicine Technology	39	23	0
Radiologic Technology	277	213	0

Source: EMSI, Fall 2008 \*This does not include 76 BS graduates of Cal State Long Beach who have the option of electing Radiation Therapy as their specialty.

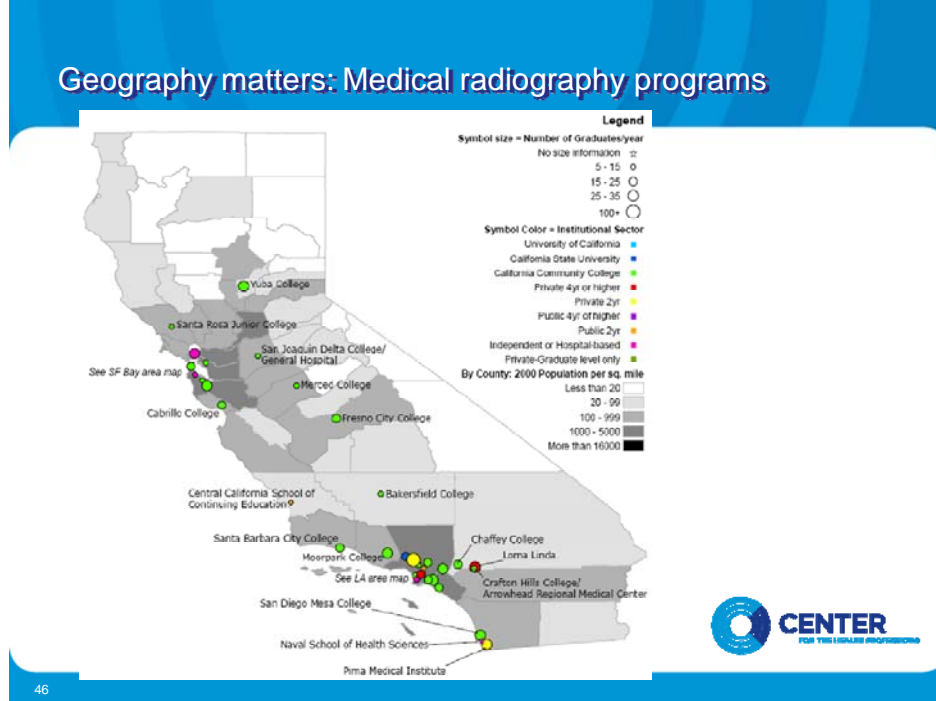
The statewide distribution of medical imaging programs show clusters of programs in the greater Los Angeles (including Orange County) and San Francisco areas. Since graduates tend

<sup>36</sup> Fisher, Marla Jo, “Diploma wasn’t worth a darn”, Orange County Register, August 3, 2008, page Local 1.

<sup>37</sup>Phone interview with Albert Hermogeno, Director, Diagnostic Medical Imaging, Kaiser Permanente

to seek jobs in the communities where they attend school and are often hired by the hospitals where they do their clinical practice, there may be a significant shortage of medical imaging professionals in other parts of the state. Studies by colleges in those areas can document the needs for additional programs and graduates to serve them.

**Exhibit 2 – Geographic Distribution of Programs Throughout the State**



Source: "Health Workforce Needs in California and the Role of Community Colleges."

Although none of the Los Angeles or Orange County Community Colleges offers programs in Radiation Therapy or Nuclear Medicine Technology, there are community colleges elsewhere that offer such programs. The City College of San Francisco is approved by JRCERT to offer an Award of Achievement in Radiation Oncology Technology after students complete a 54-unit program that includes four semesters of clinical work experience in Therapeutic Radiology. (See <http://www.ccsf.edu/Catalog/Medical/dmicurr.html#Radiation Oncology Technology> for details.) Bellevue Community College in Washington State offers a 2.5 year program in Nuclear Medicine Technology. (See <http://bellevuecollege.edu/NUCMED/> for details.) In the southern California area, both UCLA Medical Center and Charles Drew University of Medicine offer BA- or BS-level degrees for Nuclear Medicine Technologists.

**Recommendations**

Despite the continued attention to shortages of employees in the allied health occupations and a projected demand that is significantly higher than expected overall job growth, there are many factors to be weighed before making decisions regarding development of new programs in medical imaging. One of the main reasons for creating this report as a Los Angeles/Orange County joint effort is to paint an accurate picture of the supply and demand dynamics on a regional basis since the Orange County schools are graduating more students than can be employed in that county.

## Opportunities

### ***Existing versus New Programs***

The barriers to starting new programs in medical imaging are very high. Programs require expensive equipment which must be replaced regularly to keep the program “state of the art.” It is difficult finding qualified instructors who are willing to work for community college salaries. The largest barrier, however, may be finding enough clinical sites for the students. Clinical sites are not allowed to take more than 5 students per site for clinical practice, so it takes a large number of hospitals/sites to provide the required clinical practice for a class of 30 students.<sup>38</sup>

In spite of the large number of applicants for the existing programs (at Orange Coast there are 300 applicants for each incoming class of 30), community college program directors are reluctant to expand their programs because they must be able to show that they have placed their students in appropriate jobs after graduation. Some of the pressure to do this is being relieved by Kaiser Permanente as they partner with the colleges and in some cases hire an entire graduating class of Radiologic Technologists. However, as these arrangements proliferate, it will become more and more difficult for the smaller employers to find qualified candidates.

### ***Radiologic Technology***

Employment projections and employer interviews do not support the need for additional or expanded programs at this time in Los Angeles or Orange counties. Despite the fact that this is the entry point to many of the medical imaging occupations and specialties, it appears that the demand for graduates will be met for the coming 5-10 years.

### ***Multiple Modalities and Sub-Specialties***

Though there is not a lot of evidence that there will be an oversupply of medical imaging professionals in the near future, it is clear that those candidates who are trained in multiple modalities are more desirable and more likely to be hired into higher paying jobs. The programs at Orange Coast and Cypress Colleges, in which students actually study and take the sub-specialty exams (mammography, CT, MRI) during their Radiologic Technology program, are good models for producing highly qualified job candidates. Another strategy that is being used by Long Beach City College and some of the other colleges is to create programs for in-service training in the sub-specialties such as MRI, allowing registered and experienced Radiologic Technologists to use those programs to prepare for certification in a sub-specialty.

### ***Diagnostic Medical Sonography***

As an unlicensed medical imaging occupation, DMS has attracted the development of many programs at private proprietary schools. (See Appendix G.) These programs are of various lengths and often do not include clinical components, so graduates have difficulty finding jobs since most employers want candidates who are at least qualified to sit for the RDMS exam. The two community college programs in the region (at Orange Coast and Cypress Colleges, both in Orange County) seem to be graduating enough RDMS registered job candidates to fill the open positions, but employers are reporting difficulty finding qualified candidates. Some of this may be a geographical problem with Orange County graduates trying to stay in Orange County and not applying for jobs in Los Angeles. It seems appropriate that at least one of the Los Angeles county community colleges that is not located near the Orange County line should explore the opportunity of adding a DMS program.

<sup>38</sup> Interview with Kevin Ballinger, Dean, Consumer and Health Sciences, Orange Coast College

### ***Cardiovascular Technologists and Technicians***

Several employers did report problems finding Cardiovascular Technologists and Technicians to staff their Catheterization Labs. This type of staffing involves a specialty, requiring someone who is certified to practice invasive cardiovascular technology. The number of graduates versus the projected demand for all types of Cardiovascular Technologists and Technicians shows the biggest potential for unmet demand in the coming decade. Orange Coast College currently has the only accredited program in the two counties. It is not clear why none of the other community colleges have added programs in Cardiovascular Technology, but there seems to be evidence that it would be beneficial for one of the Los Angeles County colleges that already has a Radiologic Technology program to add a program in Cardiovascular Technology.

### ***Radiation Therapy and Nuclear Medicine Technology***

Although there are examples of community colleges that are offering programs in these two specialties, the local programs in this region are primarily BA or BS-degree programs. The supply of graduates in this region appears to be sufficient to meet the current and future demand, so there does not seem to be any reason to recommend community colleges look at these areas for future program development.

### ***Diversity in the Field***

Though the need for diversity among imaging professionals and job candidates did not come up during this study's interviews, it is well documented in the literature. The pipeline programs at Charles Drew University, which reach all the way down to Head Start pre-school programs, are good models for drawing a diverse, multilingual population into the medical imaging field. See [http://www.cdrewu.edu/022/html/pipeline\\_programs/default.htm](http://www.cdrewu.edu/022/html/pipeline_programs/default.htm) for more information on the Drew pipeline programs.

## **Conclusions**

The dynamic nature of the medical imaging industry requires constant monitoring by college programs and workforce projects. This study should be revisited in five years both to examine the impact of new technology on the occupations and to look at projected employment data for the next decade.

The geographic clustering of the community college programs that serve this industry may have created a situation in which there are areas around the state where the need for qualified job candidates is acute, while the need is being met in the metropolitan areas like Los Angeles and Orange Counties. For this reason, it is also recommended that similar studies of the medical imaging job market be conducted around the state to determine where new programs may be needed and where recent graduates are likely to find employment.

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## Resources

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## Appendix A: How to Utilize this Report

This report is designed to provide current industry data to:

- Define potential strategic opportunities relative to an industry's emerging trends and workforce needs;
- Influence and inform local college program planning and resource development;
- Promote a future-oriented and market responsive way of thinking among stakeholders; and,
- Assist faculty, Economic Development and CTE administrators, and Community and Contract Education programs in connecting with industry partners.

The information in this report has been validated by employers and also includes a listing of what programs are already being offered by colleges to address those workforce needs. In some instances, the labor market information and industry validation will suggest that colleges might not want to begin or add programs, thereby avoiding needless replication and low enrollments.

### ***About the Centers of Excellence***

The Centers of Excellence (COE), in partnership with business and industry, deliver regional workforce research customized for community college decision making and resource development. This information has proven valuable to colleges in beginning, revising, or updating economic development and Career Technical Education (CTE) programs, strengthening grant applications, assisting in the accreditation process, and in supporting strategic planning efforts.

The Centers of Excellence Initiative is funded in part by the Chancellor's Office, California Community Colleges, Economic and Workforce Development Program. The total grant amount (grant number 08-305-016 for \$205,000) represents funding for multiple projects and written reports through the Center of Excellence. The Centers aspire to be the premier source of regional economic and workforce information and insight for California's community colleges.

More information about the Centers of Excellence is available at [www.coecc.net](http://www.coecc.net).

### ***Important Disclaimer***

All representations included in this report have been produced from primary research and/or secondary review of publicly and/or privately available data and/or research reports. Efforts have been made to qualify and validate the accuracy of the data and the reported findings; however, neither the Centers of Excellence, COE host District, nor California Community Colleges Chancellor's Office are responsible for applications or decisions made by recipient community colleges or their representatives based upon components or recommendations contained in this study.

## Appendix B – Certification and Licensing Requirements

### Certifications Offered<sup>39</sup>

#### Primary Pathway

- Radiography
- Nuclear Medicine Technology
- Radiation Therapy
- Sonography
- Magnetic Resonance Imaging

#### Post-Primary Pathway

ARRT offers twelve post-primary certifications. Candidates for post-primary certification must be registered by ARRT in the appropriate supporting discipline to be eligible.

- Cardiovascular-Interventional Radiography (Note: No longer available for new candidates)
- Mammography
- Computed Tomography
- Magnetic Resonance Imaging (Note: Both a primary and post-primary track)
- Quality Management
- Sonography (Note: Both a primary and post-primary track)
- Bone Densitometry
- Vascular Sonography
- Cardiac-Interventional Radiography
- Vascular-Interventional Radiography
- Breast Sonography
- Registered Radiologist Assistant

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<sup>39</sup> The American Registry of Radiologic Technicians, "Certifications Offered", found online at <http://www.arrt.org/index.html?content=examinations/examlist.htm>

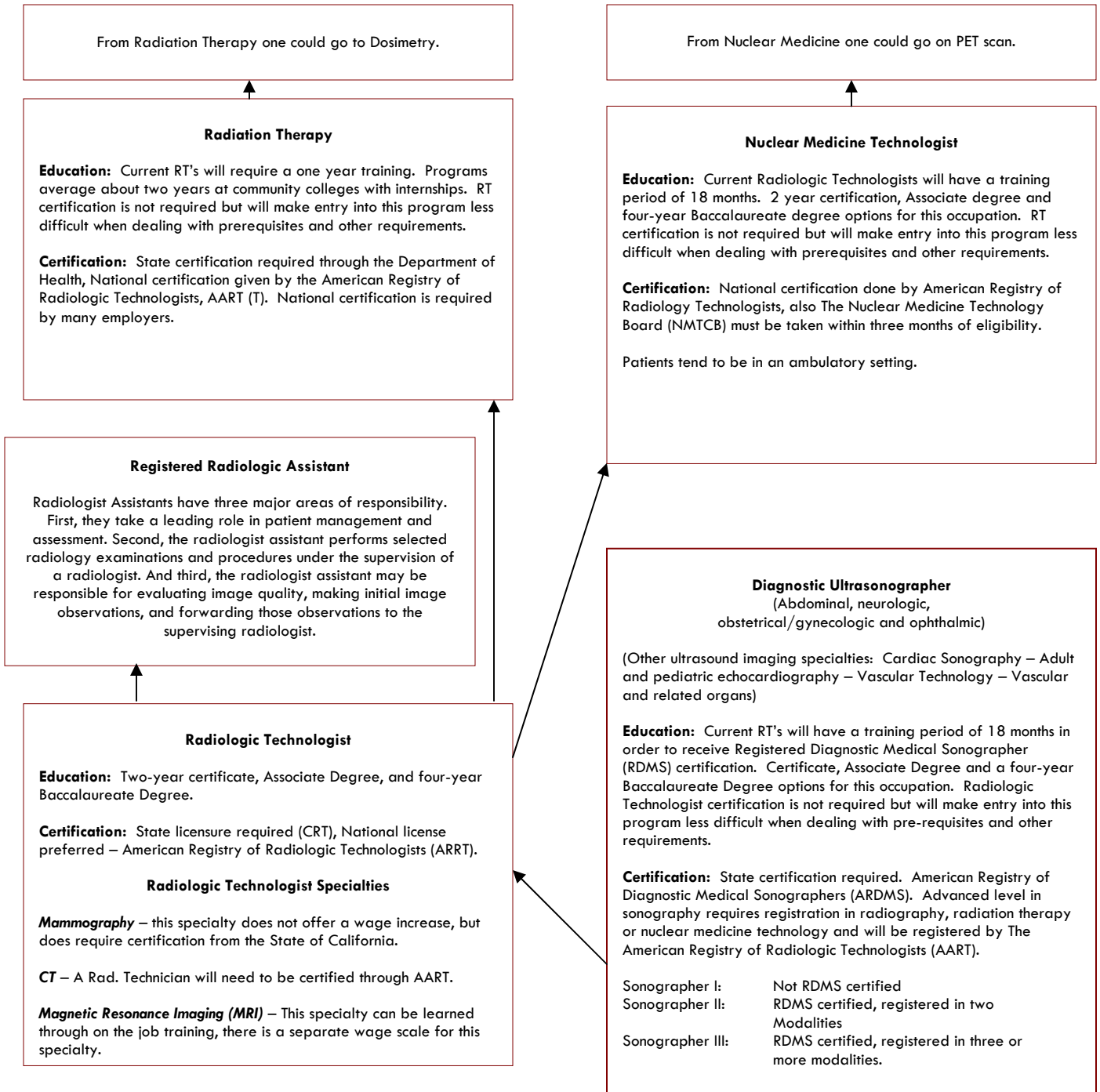
California Licensing Requirements

CT, PET, SPECT, CT/PET or CT/SPECT procedure	Certification required
<b>CT Scan (single mode machine)</b>	CRT or student in an RHB-approved RT School per Health and Safety Code §106975(b).
<b>PET Scan (single mode machine)</b>	CTNM or student per 17 CCR 30540.
<b>CT Scan (dual mode machine)</b>	<ol style="list-style-type: none"> <li>1. CRT (supervision by S&amp;O holder), or</li> <li>2. CTNM with ARRT CT certificate (Performance by the CTNM must be under supervision of an authorized user specified on a radioactive material (RAM) medical license.) or</li> <li>3. A student in an RHB-approved RT School per Health and Safety Code §106975(b). This student can be a CTNM.</li> </ol>
<b>PET Scan (dual mode machine)</b>	<ol style="list-style-type: none"> <li>1. CTNM, or</li> <li>2. CRT with NMTCB PET certificate, or</li> <li>3. A student per 17 CCR 30540.</li> </ol> <p>Performance must be under supervision of an authorized user specified on a RAM medical license.</p>
<b>CT/PET scan (dual mode machine)</b>	<ol style="list-style-type: none"> <li>1. CTNM with ARRT CT certificate,</li> <li>2. CRT with NMTCB PET certificate, or</li> <li>3. A Student in both an approved RT school AND NMT program (e.g. an individual enrolled simultaneously in an RT school and an NMT program).</li> </ol> <p>Performance by either CRT or CTNM may only be under supervision of an authorized user specified on a RAM medical license.</p> <p>RSA-00-1 rescinded effective December 31, 2007.</p>
<b>SPECT (single mode machine)</b>	<ol style="list-style-type: none"> <li>1. CTNM, or</li> <li>2. A student per 17 CCR 30540.</li> </ol> <p>Performance may only be under supervision of an authorized user specified on a RAM medical license.</p>
<b>CT/SPECT (dual mode machine)</b>	<ol style="list-style-type: none"> <li>1. CTNM with ARRT CT certificate (Performance may only be under supervision of an authorized user specified on a RAM medical license), or</li> <li>2. A Student in both an approved RT school AND NMT program (e.g. an individual enrolled simultaneously in an RT school and an NMT program). Supervisor of student must be authorized user specified on a RAM medical license who also possesses either an X-ray “Radiology Supervisor and Operator Certificate” or “Radiography Supervisor and Operator Permit.”</li> </ol> <p>(NOTE: CRTs are not authorized for SPECT in any capacity unless dually certified as a CTNM.)</p>

Source: California Department of Health Services<sup>40</sup>

<sup>40</sup> State of California, Department of Health Services, Operator Certification Requirements, June 18, 2007, found online at <http://www.cdph.ca.gov/certlic/radquip/Documents/RHB-HT-CT-PET-AB2720.pdf>

## Appendix C – Career Ladder<sup>41</sup>



<sup>41</sup> Adapted from: Shirley Ware Educational Center, "The Career Mapping Project," December, 2002, found online at [http://74.125.47.132/search?q=cache:URttZPuevUJ:www.seiu-uhw.org/documents/swec/CareerLadderMappingProject.pdf+career+ladder+mapping&hl=en&ct=clnk&cd=1&gl=us\\_page 26](http://74.125.47.132/search?q=cache:URttZPuevUJ:www.seiu-uhw.org/documents/swec/CareerLadderMappingProject.pdf+career+ladder+mapping&hl=en&ct=clnk&cd=1&gl=us_page 26)

**Appendix D – Summary of Employer Surveys**

	<b>Organizations Employing Fewer than 1,000 employees</b>	<b>Organizations Employing 1,000-5,000 employees</b>	<b>Organizations Employing Over 5,000 employees</b>
<b>Number of Employers Surveyed</b>	9	4	2
<b>Number of medical imaging positions</b>	5 organizations had fewer than 10 positions 2 organizations had 10-20 positions Two organizations had 33 and 45 positions respectively	Ranged from 55-108 with an average of 80	One organization had 97 positions, not counting CVT or Radiation Techs. One organization had 160 positions.
<b>Positions seen as “difficult” to hire</b>	Most reported no difficulty hiring Two reported difficulty hiring Radiologic Technologists One reported difficulty hiring DMS	Three reported difficulty hiring DMS. These were organizations wanting certified DMS. One reported difficulty hiring Interventional Cardiac (Cath Lab) Techs One reported difficulty hiring Pediatric Radiographers	One reported difficulty hiring DMS One reported occasional difficulty hiring Radiologic Technologists and Nuclear Medicine Technologists One reported difficulty hiring Interventional Cardiac Techs for Cath Labs
<b>Number of employees who work in more than one modality</b>	2-4	4-32 (average 17)	10
<b>Do you employ limited license x-ray techs?</b>	5 organizations reported employing between 1-3 limited license x-ray technicians	No	No
<b>Do You Hire private school grads?</b>	2 organizations hire radiologic technologists from private schools 1 prefers grads of Loma Linda (with BA or AA degrees) because they do their clinicals on more sophisticated equipment	All but one reported hiring DMS candidates from private schools although they noted the difficulty in using these graduates unless they had much prior experience or could be ARDMS certified	1 organization reported hiring radiologic technologists from private schools.  1 organization reported hiring DMS from private schools
<b>Other imaging positions you employ</b>		Interventional Radiology Certified Bone Densitometry Technologist	

	<b>Organizations Employing Fewer than 1,000 employees</b>	<b>Organizations Employing 1,000-5,000 employees</b>	<b>Organizations Employing Over 5,000 employees</b>
<b>Skills lacking in entry level positions</b>	<p>RT Sub-specialties</p> <p>CVT EEG</p> <p>DMS- Biopsy training</p> <p>Only hire experienced job candidates</p>	<p>Digital knowledge</p> <p>PET and SPECT CT for NMTS</p> <p>2 responses- RDMS certification for DMS</p> <p>DMS- at least 1 yr. clinical in acute hospital environment</p> <p>Customer service/patient care</p>	<p>Hands-On Experience with high volume</p> <p>Writing, Communication, Critical Thinking</p>
<b>How well are community colleges preparing people?</b>	<p>All reported “good” to “very satisfied” with preparation of community college candidates</p>	<p>All reported “great” to “very satisfied”</p> <p>One reported great in entry levels but not well enough in MRI, CT, Mammography</p>	<p>All reported “Satisfied”</p> <p>One reported technically prepared, but lacking people or “soft” skills</p>
<b>Other comments on role of community colleges</b>	<p>Would like to see EKG and EEG programs</p> <p>CC Programs should be downsized in current market. Govt/insurance payments are reducing number of imaging centers and demand for grads. “Please don’t glut the market.”</p>	<p>Introduce more/better programs in digital imaging, MRI, CT, mammography, interventional radiology, SPECT, PET, CT, fluoroscopy</p> <p>Need more DMS programs, CT &amp; MRI</p> <p>Affiliated with El Camino and hire all of our clinical students when they graduate</p>	<p>Mammography</p> <p>Focus on developing the “entire person” not just the technical person.</p>

## Appendix E – Graduates of Medical Imaging Programs

### Occupational Programs By Institution

CIP Code	Title	Institution	Award Level	2007 Completions
<b>CARDIOVASCULAR TECHNOLOGY/TECHNOLOGIST</b>				
Only OCC has a CAAHEP accredited program (shown in Orange)				
51.0901	Cardiovascular Technology/Technologist	Associated Technical College	Award of less than 1 academic year	315
51.0901	Cardiovascular Technology/Technologist	American Medical Sciences Center	Award of less than 1 academic year	14
51.0901	Cardiovascular Technology/Technologist	West Coast Ultrasound Institute	Award of at least 1 but less than 2 academic years	53
51.0901	Cardiovascular Technology/Technologist	Pacific College	Award of at least 1 but less than 2 academic years	12
<b>51.0901</b>	<b>Cardiovascular Technology/Technologist</b>	<b>Orange Coast College</b>	<b>10 Certificates and 11 Associates Degree</b>	<b>21</b>
<b>51.0902</b>	<b>Electrocardiograph Technology/Technician</b>	<b>Orange Coast College</b>	<b>Award of at least 1 but less than 2 academic years</b>	<b>18</b>

CIP Code	Title	Institution	Award Level	2007 Completions
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**RADIATION THERAPIST**

In order to sit for the Radiation Therapist Certification exam, you must have attended a school approved by ARRT. See Charles Drew and Cal State Long Beach in teal font below.

51.0907	Medical Radiologic Technology/Science - Radiation Therapist	Modern Technology School	Award of at least 1 but less than 2 academic years	54
51.0907	Medical Radiologic Technology/Science - Radiation Therapist	Charles R Drew University of Medicine and Science	Associate's degree	33
51.0907	BS- Health Science	Cal State Long Beach	BS- Health Science—Option in Radiation Therapy	76*

\*Total includes other Health Science Options in Addition to Radiation Therapy

Only accredited JRCERT programs in region are at City of Hope, Loma Linda and CSULB

**NUCLEAR MEDICINE TECHNOLOGIST**

These are all certified programs. Their graduates can sit for the licensing exam.

51.0905	Nuclear Medical Technology/Technologist	Charles R Drew University of Medicine and Science	Award of at least 1 but less than 2 academic years	25
	LA Harbor UCLA Medical Center / Torrance	AMA directory	24-month program in radiologic technology with specialty in Nuclear Medicine	5
51.0905	Nuclear Medical Technology/Technologist	Charles R Drew University of Medicine and Science	Bachelor's degree	9

CIP Code	Title	Institution	Award Level	2007 Completions
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**DIAGNOSTIC MEDICAL SONOGRAPHER**

Although this is an unlicensed occupation, many employers prefer candidates with ARDMS certification. ARDMS certification requires graduation from a two-year program plus 12 months of experience OR graduation from an accredited 2-year program.

Only OCC, Cypress and Charles Drew have CAAHP accredited programs noted in orange and teal font.

**Less than 1-year long Programs**

51.0910	Diagnostic Medical Sonography/Sonographer & Ultrasound Technician	PCI College	Award of less than 1 academic year	22
51.0910	Diagnostic Medical Sonography/Sonographer & Ultrasound Technician	Cypress College	Award of less than 1 academic year	9

Sub-Total for Programs of Less than 1-year in Length = 29

**1-2 Year Long Programs**

51.0910	Diagnostic Medical Sonography/Sonographer & Ultrasound Technician	American Medical Sciences Center	Award of at least 1 but less than 2 academic years	6
51.0910	Diagnostic Medical Sonography/Sonographer & Ultrasound Technician	Newbridge	Award of at least 1 but less than 2 academic years	154
51.0910	Diagnostic Medical Sonography/Sonographer & Ultrasound Technician	West Coast Ultrasound Institute	Award of at least 1 but less than 2 academic years	117
51.0910	Diagnostic Medical Sonography/Sonographer & Ultrasound Technician	ATI College and ATI- Tustin	Award of at least 1 but less than 2 academic years	56

Sub-Total for Programs of 1-2 years in Length = 333

**Programs of 2 – 4 years Length**

51.0910	Diagnostic Medical Sonography/Sonographer & Ultrasound Technician	Maric College-North Hollywood	Award of at least 2 but less than 4 academic years	55
51.0910	Diagnostic Medical Sonography/Sonographer & Ultrasound Technician	Newbridge –Long Beach	Award of at least 2 but less than 4 academic years	30
51.0910	Diagnostic Medical Sonography/Sonographer & Ultrasound Technician	Modern Technology School	Award of at least 2 but less than 4 academic years	56
51.0910	Diagnostic Medical Sonography/Sonographer & Ultrasound Technician	Orange Coast College	Award of at least 2 but less than 4 academic year (16 AS degrees)	35

Sub-Total for Programs of 2-4 years Length = 185

**Diagnostic Medical Sonography Bachelor’s Degree Program**

51.0910	Diagnostic Medical Sonography/Sonographer & Ultrasound Technician	Charles R Drew University of Medicine and Science	Bachelor’s degree	8
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CIP Code	Title	Institution	Award Level	2007 Completions
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**RADIOLOGIC TECHNOLOGIST**

Los Angeles County certified programs are listed in teal. Orange County certified programs are listed in orange.

**Certificate Programs**

51.0911	Radiologic Technology/Science – Radiographer	El Camino Community College District-Compton Education Center	Certificate	12
51.0911	Radiologic Technology/Science – Radiographer	Pasadena City College	Award of at least 2 but less than 4 academic years	26
51.0911	Radiologic Technology/Science – Radiographer	LA Harbor UCLA Medical Center; Torrance	Certificate (24 mo)	19*
51.0911	Radiologic Technology/Science – Radiographer	Long Beach City College	Certificate	32
51.0911	Radiologic Technology/Science – Radiographer	Orange Coast College	MRI Certification	9
51.0911	Radiologic Technology/Science - Radiographer	Cypress College	Award of at least 1 but less than 2 academic years	30
51.0911	Radiologic Technology/Science - Radiographer	Cypress College	Award of less than 1 academic year	1

Sub – Total of Certificates Awarded = 132  
 See \* below for explanation of how this number was calculated.

**\* Not included in totals because this is a capacity estimate, not a verified number of completers.**

CIP Code	Title	Institution	Award Level	2007 Completions
<b>Radiologic Technology Associate's Degree Programs</b>				
51.0911	Radiologic Technology/Science – Radiographer	Charles R Drew University of Medicine and Science	Diploma; AS	54*
51.0911	Radiologic Technology/Science – Radiographer	Long Beach City College	Associate's degree	30
51.0911	Radiologic Technology/Science – Radiographer	El Camino Community College District	Associate's degree	20
51.0911	Radiologic Technology/Science – Radiographer	Los Angeles City College	Associate's degree	19
51.0911	Radiologic Technology/Science – Radiographer	Mt San Antonio College	Associate's Degree	28
51.0911	Radiologic Technology/Science – Radiographer	Orange Coast College	Associate's Degree	20
51.0911	Radiologic Technology/Science – Radiographer	Cypress College	Associate's Degree	28

Sub-Total Associate's Degrees Awarded = 145  
 See \* below for explanation of how this number was calculated.

**Bachelor Degree Program**

51.0911	Radiologic Technology/Science - Radiographer	Cal State Northridge	BS Radiography	30*
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\* Not included in totals because this is a capacity estimate, not a verified number of completers.

**LIMITED LICENSE X-RAY TECHNICIAN PROGRAM (CERTIFIED)**

51.0911	Radiologic Technology/Science – Radiographer X-ray Technician	Maric College – North Hollywood	(22 mo “diploma”) Award of at least 2 but less than 4 academic years	106
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Sources: National Center for Education Statistics and Health Professions Career and Education Directory 2006-2007 By American Medical Association, Published by AMA Bookstore, 2006, ISBN 1579477135, 9781579477134, 654 pages

**Appendix F – Details of Community College Programs**

<b>Cypress College</b>	
<b><u>Diagnostic Medical Sonography</u></b>	
The following Foundation courses must be completed prior to the end of the spring semester with a minimum "C" grade in each course.	
<ul style="list-style-type: none"> <li>• Radiologic Electronics</li> <li>• Radiography Patient Care</li> <li>• Survey of Medical Terminology</li> <li>• Survey of Disease</li> <li>• Anatomy and Physiology</li> </ul>	<ul style="list-style-type: none"> <li>• Writing/Communication</li> <li>• Computer Literacy</li> <li>• Elementary Algebra</li> <li>• Medical Sonography Theory</li> </ul>
Radiologic Technologists must present official transcripts to verify completion of Foundation courses: California C.R.T. license; A.R.R.T. Registry; and certificate of completion from a J.R.C.E.R.T. or AMA approved program in Radiologic Technology. Satisfactory completion of RADT 60 C –Medical Sonography Theory must be completed during the Summer Session prior to the next Fall Semester.	
<b>Semester 1</b>	
<ul style="list-style-type: none"> <li>• Ultrasound Physics (9 wks)</li> <li>• Ultrasound Instrumentation</li> <li>• Cross Sectional Imaging (9 wks)</li> </ul>	<ul style="list-style-type: none"> <li>• Ultrasound Abdominal Scanning</li> <li>• Ultrasound Clinical Education I</li> <li>• (29 hr.wk. directed practice)</li> </ul>
<b>Semester 2</b>	
<ul style="list-style-type: none"> <li>• Abdominal Pathology Obstetrics/Gynecology</li> <li>• Scanning (9 wks) Ultrasound Clinical</li> </ul>	<ul style="list-style-type: none"> <li>• Education II (34 hr./wk.directed practice)</li> </ul>
<b>Summer Intercession</b>	
<ul style="list-style-type: none"> <li>• Ultrasound Clinical Education III</li> <li>• (38 hr./wk. directed practice for 10 weeks)</li> </ul>	<ul style="list-style-type: none"> <li>• Ultrasound Seminar</li> </ul>
<b>Elective</b>	
<ul style="list-style-type: none"> <li>• Physical Principles of Vascular Ultrasound Technology</li> </ul>	<ul style="list-style-type: none"> <li>• Princ. Of Breast Ultrasound</li> </ul>
<b><u>Radiologic Technology</u></b>	
<ul style="list-style-type: none"> <li>• Radiologic Technology</li> <li>• Radiologic Positioning</li> </ul>	<ul style="list-style-type: none"> <li>• Patient Care &amp; Medical Techniques in Radiology*</li> <li>• Survey of Disease*</li> </ul>

<b>Cypress College (continued)</b>	
<b>Semester 2</b>	
<ul style="list-style-type: none"> <li>• Radiologic Advanced</li> <li>• Positioning Radiation Control</li> <li>• Regulations for Radiologic Technology*</li> </ul>	<ul style="list-style-type: none"> <li>• Radiologic – Hospital Work Experience (Externship)</li> <li>• Radiology Special Procedures</li> </ul>
<b>Summer Intercession</b>	
<ul style="list-style-type: none"> <li>• Summer – Internship</li> </ul>	<ul style="list-style-type: none"> <li>• Selected Topics for Radiologic Technology</li> </ul>
<b>Semester 3</b>	
<ul style="list-style-type: none"> <li>• Fall – Internship</li> </ul>	<ul style="list-style-type: none"> <li>• Selected Topics for Radiologic Technology</li> </ul>
<b>Semester 4</b>	
<ul style="list-style-type: none"> <li>• Spring – Internship</li> </ul>	<ul style="list-style-type: none"> <li>• Selected Topics for Radiologic Technology</li> </ul>
<b>Elective</b>	
<ul style="list-style-type: none"> <li>• Principles &amp; Techniques of Fluoroscopy</li> </ul>	
<p><b>The Radiology Assistant/Darkroom Technician</b> program prepares a student for an entry level position as radiology assistant and/or darkroom technician in a health care facility such as a hospital, private physician’s office, or clinic. The program can be completed in one year. To earn the certificate, the student must complete the 17 units of required courses with a minimum grade of “C”. At least 50% of all course work must be completed at Cypress College.</p>	
<b>Course Name</b>	
<ul style="list-style-type: none"> <li>• Effective Written Communication</li> <li>• Survey of Medical Terminology</li> <li>• Computer Literacy</li> </ul>	<ul style="list-style-type: none"> <li>• Patient Care and Medical Techniques</li> <li>• Introduction to Radiologic Technology</li> </ul>
<b>Total Units</b>	<b>17</b>

**El Camino College/Compton College Center**

Certificate of Accomplishment  
AS degree- Radiologic Technology (58 units)

- Radiographic Pathology
- Venipuncture and Pharmacology for the Radiologic Technologist
- Clinical Experience 1,2, 3, 4, 5,
- Fundamentals of Radiologic Technology
- Radiographic Positioning 1A, 1B and 2
- Radiation Physics, Equipment, and Safety Advanced Imaging/Special Procedures
- Medical Terminology 1
- General education requirements described in the college catalog (see A.S. Degree requirements), to be eligible for certification by the American Registry of Radiologic Technologists.

**Long Beach City College**

Diagnostic Medical Imaging Sciences (Radiology Technology)  
Certificate of Achievement,  
AS Degree (92.5-95.5 units, including prerequisites and general education requirements)

- Anatomy & Physiology
- Medical Terminology
- Integration of Patient Care
- Intro. to Radiologic Technology
- Intro. to Radiologic Physics
- Radiographic Techniques
- Contrast Fluoroscope & Radiographic Procedures.
- Applied Radiological Physics
- Positioning for General Diagnostic Radiography
- Clinical Radiology
- Radiographic Techniques
- Contrast Fluoroscope & Radiographic Procedures
- Applied Radiological Physics
- Positioning for General Diagnostic Radiography
- Intravenous Therapy
- Computer Applications in Radiology
- Trends & Self-Assessment. in Rad. Tech.
- Fluoroscopy
- General Education Courses as Required for the AS Degree

Also offers Certificates of Accomplishment in Radiologic Technology Fluoroscopy, Mammography, and Magnetic Resonance Imaging Technologist

**Los Angeles City College**

AS degree in Radiologic Technology (62 units plus general education requirements)

- |                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Anatomy 1</li> <li>• English 101 or 28</li> <li>• Mathematics 115 or higher</li> <li>• Physiology</li> <li>• Introduction to Radiologic Technology</li> <li>• Medical Terminology for Radiologic Technology</li> <li>• Image Recording and Film Processing</li> <li>• Radiographic Anatomy and Positioning - Skeletal System</li> <li>• Radiographic Anatomy and</li> </ul> | <ul style="list-style-type: none"> <li>Positioning - Cranium and Visceral Organs</li> <li>• Fundamentals of X-ray Physics</li> <li>• Radiographic Exposure</li> <li>• Patient Care and Management</li> <li>• Radiographic Mathematics</li> <li>• Radiation Protection and Biology</li> <li>• Introduction to Clinical Education</li> <li>• Clinical Education in Radiologic Technology</li> </ul> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Orange Coast College**

*Radiologic Technology  
Diagnostic Medical Sonography  
Electrocardiography Technician*

**Program prerequisites:**

- Health Occupations
- Anatomy-Physiology

**Course**

- Medical Terminology
- Patient Care
- Intro Info Sys & Appl
- Intro to Electrocardiography
- Cardiac Anat & Pathophysiology
- Technical Math\*
- Human Diseases
- Intro to Invasive Cardiology
- Adv Electrocardiography
- ECG Clinical Experience
- Ethics

**Course**

- Intro to Echocardiography
  - Intro to Echocardiography Lab
  - Echocardiography Clin Lab 1
  - Sono Physics/Instrumentation
  - Adv Echocardiography
  - Adv Echocardiography Lab
  - Cerebrovascular Ultrasound
  - Echocardiography Clin Lab 2
- Subtotal (24.5)**
- Total (55.5)**

**Required prerequisites:**

- Electrocardiography Technician
  - Certificate of Achievement
- Subtotal (31)**



**Mt. San Antonio College**

AS Degree Radiology Technology (77 units plus general education requirements)

- |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Introductory Human Anatomy</li> <li>• Medical Terminology</li> <li>• Radiographic Pathology</li> <li>• Fluoroscopy</li> <li>• Digital Imaging in Radiology</li> <li>• Radiologic Technology</li> <li>• Techniques of Radiologic</li> </ul> | <ul style="list-style-type: none"> <li>• Technology (8 classes)</li> <li>• Radiographic Positioning</li> <li>• Radiologic Technology Seminar</li> <li>• Theory of Radiologic Technology (4 classes)</li> <li>• Radiographic Positioning</li> <li>• Radiologic Technology Seminar</li> </ul> |
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**Pasadena City College**

AS degree in Radiologic Technology

- |                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Math 125</li> <li>• Physiology 2 A &amp; B or Anatomy 25 and Physiology 1</li> <li>• MA 115 or equivalent course</li> <li>• Basic Radiologic Technology Practices</li> <li>• Medical Procedures for Radiologic Technology</li> <li>• Radiographic Anatomy &amp; Positioning</li> <li>• Ethics</li> <li>• Radiologic Physics</li> <li>• Clinical Experience (1 class each semester)</li> </ul> | <ul style="list-style-type: none"> <li>• Radiographic Anatomy &amp; Positioning</li> <li>• Principles of Radiographic Exposure</li> <li>• Radiographic Physics</li> <li>• Venipuncture</li> <li>• Anatomy and Positioning</li> <li>• Special Radiographic Procedures</li> <li>• Computerized Experience</li> <li>• Perspectives in Radiologic Technology</li> <li>• Fluoroscopy</li> <li>• Computed Tomography</li> <li>• Mammography</li> </ul> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Appendix G – Accredited Programs<sup>42</sup>**

<b>Diagnostic Radiologic Technology Schools Updated on June 12, 2008</b>						
<b>Name</b>	<b>Name 2nd line</b>	<b>Address</b>	<b>City</b>	<b>Zip Code</b>	<b>Main Phone</b>	<b>Extension</b>
California State University Northridge	Health Sciences	18111 Nordhoff Street	Northridge	91330-8285	(818) 677-2475	
Charles R. Drew University of Medicine and Science	Medical Imaging	1731 East 120th Street	Los Angeles	90059	(323) 563-5835	
Cypress College		9200 Valley View Street	Cypress	90630-5897	(714) 484-7000	47286
East Los Angeles Education and Career Center	Allied Health	2100 Marengo Street	Los Angeles	90033	(323) 223-1283	161
El Camino Community College	Radiologic Technology	16007 Crenshaw Boulevard	Torrance	90506	(310) 532-3670	
Long Beach City College	Allied Health	4901 East Carson Street	Long Beach	90808	(562) 938-4176	
Los Angeles City College	Radiologic Technology	855 North Vermont Avenue	Los Angeles	90029	(323) 953-4000	2943
Los Angeles County Harbor - UCLA Medical Center	Radiology	1000 West Carson Street	Torrance	90509-2910	(310) 222-2825	
Maric College - North Hollywood Campus	Radiologic Technology	6180 Laurel Canyon Boulevard, Suite 101	North Hollywood	91606	(818) 763-2563	247
Merced College	Allied Health - Diagnostic Radiologic Technology Program	3600 M Street	Merced	95348-2898	(209) 384-6132	
Merritt College	Radiologic Science	12500 Campus Drive	Oakland	94619	(510) 436-	

<sup>42</sup> California Department of Public Health, Approved Radiologic and Nuclear Medicine Technology Schools, found online at <http://www.cdph.ca.gov/pubsforms/Guidelines/Documents/RHB-SchoolsList-2008-11-12.pdf>

Diagnostic Radiologic Technology Schools Updated on June 12, 2008						
Name	Name 2nd line	Address	City	Zip Code	Main Phone	Extension
					2427	
Mills-Peninsula Health Services School of Diagnostic Imaging		1501 Trousdale Drive	Burlingame	94010	(650) 696-5519	
Mt. San Antonio College		1100 North Grand Avenue	Walnut	91789	(909) 594-5611	4790/4750
Orange Coast College	CHS/Rad Tech	2701 Fairview Road	Costa Mesa	92628-5005	(714) 432-5540	
Pasadena City College	Health Science Division - Radiologic Technology Program	1570 East Colorado Boulevard	Pasadena	91106	(626) 585-7469	

Therapeutic Radiologic Technology Schools Updated on June 12, 2008						
Name	Name 2nd line	Address	City	Zip Code	Main Phone	Extension
City of Hope	Department of Radiation Oncology	1500 East Duarte Road	Duarte	91010	(626) 301-8247	
Loma Linda University	Radiation Technology/School of Allied Health Professions	24951 North Circle Drive	Loma Linda	92350	(909) 558-4931	
California State University Long Beach	Health Science/Radiation Therapy	1250 Bellflower Boulevard	Long Beach	90840-4902	(562) 985-7507	

Radiologic Technologist Fluoroscopy Permit Schools Updated on June 12, 2008						
Name	Name 2nd line	Address	City	Zip Code	Main Phone	Extension
Charles R. Drew University of Medicine and Science	Medical Imaging	1731 East 120th Street	Los Angeles	90059	(323) 563-5835	
Cypress College		9200 Valley	Cypress	90630-	(714)	47286

<b>Radiologic Technologist Fluoroscopy Permit Schools Updated on June 12, 2008</b>						
<b>Name</b>	<b>Name 2nd line</b>	<b>Address</b>	<b>City</b>	<b>Zip Code</b>	<b>Main Phone</b>	<b>Extension</b>
		View Street		5897	484-7000	
East Los Angeles Education and Career Center	Allied Health	2100 Marengo Street	Los Angeles	90033	(323) 223-1283	161
El Camino Community College		16007 Crenshaw Boulevard	Torrance	90506	(310) 660-3247	
Loma Linda University	Department of Radiation Technology	Nichol Hall A 829, School of Allied Health	Loma Linda	92350	(909) 558-4931	
Long Beach City College	Allied Health	4901 East Carson Street	Long Beach	90808	(562) 938-4176	
Los Angeles City College	Radiologic Technology	855 North Vermont Avenue	Los Angeles	90029	(323) 953-4000	2943
Los Angeles County Harbor - UCLA Medical Center	Radiology	1000 West Carson Street	Torrance	90509-2910	(310) 222-2825	
Maric College - North Hollywood Campus	Radiologic Technology	6180 Laural Canyon Boulevard, Suite 101	North Hollywood	91606	(818) 763-2563	247
Orange Coast College	CHS/Rad Tech	2701 Fairview Road	Costa Mesa	92628-5005	(714) 432-5540	
Pasadena City College	Radiologic Technology Program-Under Health Sciences Division	1570 East Colorado Boulevard	Pasadena	91106	(626) 585-7469	

<b>Limited Permit X-ray Technician Schools – Chest, Extremities, Leg-Podiatric, Skull, or Torso-Skeletal Categories Updated on June 12, 2008</b>						
<b>Name</b>	<b>Name 2nd line</b>	<b>Address</b>	<b>City</b>	<b>Zip Code</b>	<b>Main Phone</b>	<b>Extension</b>
East Los Angeles Education and Career Center		2100 Marengo Street	Los Angeles	90033	(323) 223-1283	

<b>Limited Permit X-ray Technician Schools – Chest, Extremities, Leg-Podiatric, Skull, or Torso-Skeletal Categories</b>						
<b>Updated on June 12, 2008</b>						
<b>Name</b>	<b>Name 2nd line</b>	<b>Address</b>	<b>City</b>	<b>Zip Code</b>	<b>Main Phone</b>	<b>Extension</b>
Maric College - North Hollywood Campus		6180 Laurel Canyon Boulevard, Ste 101	North Hollywood	91606	(818) 763-2563	248
Modern Technology School		16560 Harbor Boulevard	Fountain Valley	92708	(714) 418-9100	
Technical Career Institute		23591 El Toro Road, Suite 108	Lake Forest	92630	(949) 472-4691	

<b>Limited Permit X-ray Technician Schools – Bone Densitometry</b>						
<b>Updated on June 12, 2008</b>						
<b>Name</b>	<b>Address</b>	<b>City</b>	<b>Zip Code</b>	<b>Main Phone</b>	<b>Extension</b>	
<b>None in Los Angeles County or Orange County</b>						