

Diagnostic CT for Molecular Imaging

Course Information July 2017



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The Victorian Society of Nuclear Medicine Technologists (VSNMT) Inc

Acknowledgements:

The development of these materials was funded by Sector Workforce, Department of Health and Human Services Victoria.

The pilot edition of the course was developed by the VSNMT based on learning materials provided by the Department of Medical Imaging & Radiation Sciences, Monash University. Subsequent editions have been developed by the VSNMT.

Produced and published by:

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Pilot edition published October 2008. Revised 2010, 2011, 2012, 2013, 2014, 2015, 2016 and 2017

1 INTRODUCTION

The Diagnostic CT for Molecular Imaging course provides Nuclear Medicine Technologists/Scientists with the required knowledge and skills to perform diagnostic computed tomography (CT).

The course was originally developed drawing on the CT specialist units offered in the Master of Radiographic Practice, Monash University (2008), with recognition of prior learning granted to graduates of the Bachelor of Applied Science (Medical Radiations), RMIT University who commenced their course in or after 1992. The course has been reviewed annually with a significant review and update in October 2016.

The course comprises three study Modules that cover (1) the Physics of CT Imaging and Dosimetry, (2) CT Clinical Methods and (3) CT Clinical Applications. Modules 1 and 2 are studied online, and Module 3 comprises three weeks of supervised CT clinical practice.

The course is delivered over 16 weeks, and to receive a Statement of Completion, you must satisfactorily complete all assessment requirements within this time frame.

The number of candidates admitted into each course is restricted to a maximum of 16. Candidates will be accepted based on the order of receipt of a fully completed application, including all required documents (without payment). Important dates regarding the first course in 2017 are:

Application dates:

Applications Open 9.00am Monday July 10 and close 4.00pm Thursday July 27, 2017.

Course dates:

Monday August 4 - Friday December 1, 2017.

If you are interested in applying to complete the course please read this information book and follow the application process outlined in Section 11. You can also contact the CT Course Administrator at CTAdmin@vsnm.com if you require more information before you apply.

In addition those who cannot enrol in the August 2017 course and/or do not meet the entry requirements of the current intake are encouraged to seek advice and/or submit an expression of interest for the next course, intended to be run in February 2018.

Note that this is a demanding course. Before applying ensure you can allocate sufficient time to complete the online learning Modules and undertake the clinical placement during the 16 weeks of the course.

2 PROFESSIONAL RECOGNITION

Nuclear Medicine Technologists/Scientists who successfully complete the course are eligible for a Radiation Use Licence to perform diagnostic CT in Victoria (DHHS health.vic) and New South Wales (EPA).

In Queensland (Radiation Unit, Queensland Health), South Australia (EPA) and Western Australia (Government of Western Australia, Radiological Council) they are licenced to perform diagnostic CT on hybrid systems.



3 COURSE ENTRY REQUIREMENTS

3.1 DIRECT ENTRY

Direct entry is available to:

- a. Completed the Bachelor of Applied Science (Nuclear Medicine), RMIT University, and commenced this program in or after 1992.
- b. Submit a statement from their employer acknowledging their employer's support for your enrolment in the program.
- c. Have arranged their CT Clinical Placement (Module 3) and CT supervisor. This module comprises three full-time weeks (3x40 hour weeks) of supervised clinical practice in diagnostic CT. Clinical placements must be performed using a minimum 16-slice CT scanner and capable of performing the examinations studied in Module 2 of the course

3.2 GRADUATES OF OTHER UNIVERSITY PROGRAMS

Graduates of other nuclear medicine/medical radiations programs after 2005 are eligible for direct entry into the course. Graduates who completed their program prior to 2005 may benefit from completing an assessment of their prior learning before commencing the course. This can be done online through the VSNMT website.

Please contact CTAdmin@vsnm.com for more information.

4 COURSE OUTLINE

4.1 GENERAL INFORMATION

The CT course is administered by the VSNMT Education Sub-Committee.

The course comprises three study modules as follows:

- a. Module 1: Physics of CT Imaging and Dosimetry

NOTE: It is suggested that Module 1 be completed within the first six (6) weeks of the course. In addition to working through the academic component of Module 1, candidates are required to write up a practical exercise that relates to acquiring CT images on a phantom. A face-to-face practical session will be scheduled during the first week of the course during which time the phantom data will be acquired. Candidates will be advised of the date for this session in the new year, and it is highly recommended all Victorian based candidates attend. Interstate candidates will be able to download a copy of the dataset from the VSNMT website. All Victorian and interstate candidates must submit a write-up of the practical exercise at the end of their clinical placement.

- b. Module 2 - CT Clinical Methods
- c. Module 3 - CT Clinical Applications.

Modules 1 and 2 are delivered online, and each module is divided into a series of topics. Each topic is provided as a set of learning materials comprising notes (like lecture notes) and readings (e.g. chapters of a text, journal articles, and online material/websites). The lecture notes also contain a series of assessment tasks or activities that are done at various times during your study of the topic. These assessment tasks or activities are there to help you reflect upon the materials, as well as extend and test your own understanding of the concepts covered in each topic. They also aim to bring together particular concepts. Some activities can be completed without input from your clinical placement in CT, while others are designed to be completed during, or may be enhanced by, your CT placement.

At the completion of each topic in Module 1 and 2, you will complete a formal online assessment. Successful completion of each assessment is required to complete the course. You will be given 3 attempts to successfully complete each assessment. Failure of the same assessment for a third time means failure of the course.

Module 3 is delivered in the workplace. Candidates will record their CT practical experience in a dedicated Clinical Workbook, and this must be submitted as the assessment task for this module.

Candidates must successfully complete Module 1 prior to commencing Module 2. Candidates can however commence Module 3, after successfully completing Topics 1 & 2 of Module 2.

The following is a brief outline of each Module of study.

4.2 MODULE 1: PHYSICS OF CT IMAGING AND DOSIMETRY

Module 1 comprises four topics designed to build on your prior undergraduate studies in CT, and so prepare you for practising CT. This Module will:

- a. Introduce you to the theory of CT image acquisition and reconstruction
- b. Describe the physical components of CT scanners;
- c. Explain the factors which affect CT image quality;
- d. Detail how x-ray dose is measured, and the factors affecting patient dose.

Module One Outline

Topic 1

- Unit 1 - X rays: Production and Attenuation
- Unit 2 - Tomographic Imaging and Fourier Transforms
- Unit 3 - Filtered Back Projection Reconstruction
- Unit 4 - Iterative Reconstruction

Topic 2

- Unit 1 - Attenuation and the CT Image
- Unit 2 - Image Characteristics

Topic 3

- Unit 1 - Components of the CT Scanner
- Unit 2 - Operator Control

Topic 4

- Radiation Dose

Overview of Module 1

Module 1 is divided into topics, with each topic provided as a set of lecture notes, and supporting material. The lecture notes also contain a number of questions, which are designed to test your understanding of the material. These questions can be thought of as exam practice questions. It is strongly recommended that candidates attempt these practice questions.

Please note that:

- Answers to the practice questions are NOT available for download. Candidates are welcome to check their answers by sending them to the Module 1 Advisor. Where the answer demonstrates a lack of understanding the Module 1 Advisor will provide additional clarification.
- **Some questions are compulsory.** Candidates must send satisfactory answers to the Module 1 Advisor. Successful completion of the nominated compulsory questions is required to proceed to either the next unit within the topic, or to sit the online examination to complete each topic. Note that there is no penalty for attempting questions several times. The aim is to ensure the candidate reaches an adequate level of understanding prior to sitting the formal online examination.

The Module 1 Advisor will make every effort to respond to all communications within 48 hours. However, if an individual candidate requires extensive tutoring to understand a compulsory question, several days may pass in an exchange of emails before a successful outcome is achieved. Therefore each candidate is **strongly encouraged to start Topic 1 promptly** thus ensuring there is time for any exchanges to occur.

4.3 MODULE 2: CT CLINICAL METHODS

Module 2, comprises seven topics designed to build on your learning from Module 1. It also builds on your prior learning from undergraduate studies in CT, and so prepares you for practising diagnostic CT. This Module will:

- a. Describe the concepts and use of contrast agents in CT, and
- b. Provide a range of imaging protocols relevant to the current hybrid imaging environment.

Of the seven topics in Module 2, Topics 1 and 2 cover the scientific principles of contrast used in radiography and their clinical use in CT. Topics 3–7 address specific CT imaging protocols relevant to the daily practice of CT. Engagement in CT clinical practice (as required for Module 3) is necessary to complete aspects of these topics.

4.4 MODULE 3: CT CLINICAL APPLICATIONS

Module 3 is a supervised clinical placement in CT. To complete this Module, candidates are required to spend a minimum of 120 hours in diagnostic CT. The facility must be able to offer experience in the full range of studies covered in Module 2.

This period of supervision provides the opportunity to participate in CT examinations and develop competence in the full range of diagnostic CT examinations, under the direct supervision of a CT radiographer. The clinical placement in CT can be completed as a full-time three week block i.e. 15 working days / 3x40 hour weeks, or as day release. If day release is chosen, it must be a minimum of 2 consecutive days per week.

CT placements are organised by the candidate, not the VSNMT. Information about the proposed placement, including the location and Clinical CT Supervisor, must be provided to the VSNMT as part of the application process. A site visit may be required if the facility has not supervised candidates in the past. The Module 3 advisor will make the decision about a site's suitability.

Module Two Outline

1. Contrast Agents in Radiology
2. The Use of Contrast Agents in Clinical CT
3. CT Protocols for the Head
4. CT Protocols for the Neck and Spine
5. CT Protocols for the Chest
6. CT Protocols for the Abdomen and Pelvis
7. CT Protocols for the Extremities

5 SUPPORT FOR CANDIDATES

COURSE ADVISOR AND DISCUSSION BOARD

Candidates enrolled in the course supported by two Advisors. The Advisor for Module 1 is a senior Medical Physicist with extensive experience in nuclear medicine, CT and education. The Advisor for Modules 2 and 3 is a senior Medical Imaging Technologist with experience in clinical CT, education and research. As candidates study each Module in this course they will have access to the relevant Advisor via the course discussion board where they will act as tutors, offering support as candidates work through the learning materials.

In addition to this, each candidate will have an onsite Clinical CT Supervisor who will provide direction, clinical

support and assessments during Module 3, the clinical CT placement. The course Advisor for Modules 2 and 3 will liaise with each clinical CT Supervisor to ensure satisfactory progress of Module 3.

The VSNMT will also provide administrative support to ensure effective management of the course and to be available if candidates require clarification of any administrative issues related to undertaking the course, via email to CTAdmin@vsnm.com.

6 COURSE MATERIALS

6.1 STUDY NOTES AND READINGS FOR MODULES 1 AND 2

To undertake the course, it is essential that you have access to a PC / Mac connected to the internet. Your PC/MAC should run the latest operating system and any browser can be used to access the VSNMT website, although Google Chrome is preferred.

The learning materials (study/lecture notes and readings) for Modules 1 and 2 are available from the dedicated course pages on the VSNMT website. Access to these resources is via password, and you will receive your password when your application for the course is confirmed. This password will work from the first day of the course in which you are enrolled.

When you access the course materials you will be able to save the files directly to your computer hard drive, or to a USB, etc. You can also print a hard copy of the course materials for personal use. All files have been converted to PDF to keep them as small as possible and so assist in transfer and downloading. If you encounter problems in downloading any file you need as part of this course, please contact your Module Advisor or CTAdmin@vsnm.com as soon as possible.

IMPORTANT: If you download and store course materials or print them they are protected by copyright. This means they have been made available to you for your personal use ONLY and you cannot copy the files (in full or in part), manipulate them or distribute them for any other reason than to directly support your study of this course, without written permission of the publisher (VSNMT Inc.).

As this course is offered online, you are expected to actively check the course discussion board so that the Module Advisors can maintain regular contact with you. This contact is essential when advice is forwarded to you with regard to changes to course materials or assessment tasks. In general, you should aim to check the discussion board at least every 48 hours during your candidature.

6.2 PRIOR LEARNING AND REVISION

Modules 1 and 2 provide 'Prior Learning' materials in the form of a list of readings in PDF form that will assist in revising some of the CT concepts covered in previous undergraduate studies.

6.3 MODULE 3

To complete Module 3 candidates will use the dedicated Clinical Workbook. This Clinical Workbook is only available in hard copy, and it will be sent to you by mail as soon as your enrolment in the course is confirmed. Your completed Clinical Workbook must be returned to the VSNMT as it forms part of the course assessment. The Clinical Workbook must be received by the VSNMT within one week of the closing date of the course i.e. on or before Friday 8th December 2017. Before submitting your Clinical Workbook candidates are advised to keep a photocopy. The original Clinical Workbook will be returned to candidates upon completion of the course assessment period.



7 WORKLOAD AND STUDY TIME

The amount of time each candidate spends studying the topics in this course will vary. However you should aim to spend at least four (4) hours on each of the 11 topics in Modules 1 and 2. It is suggested that Module 1 be completed within 6 weeks of the course commencement date and before Module 3 is commenced. Module 2 should be completed within 12 weeks of the commencement date of the course.

8 ASSESSMENT

The VSNMT reminds candidates of the following:

Plagiarism occurs when candidates do not acknowledge when they use the ideas of others. To ensure plagiarism does not occur in the conduct of assessment tasks in this course, when completing online tests during this course, candidates will be required to confirm that their answers are entirely their own work via a pop-up check box. Candidates will also sign a similar statement within their Clinical Workbook.

Cheating is when a candidate seeks to obtain an unfair advantage in an assessment task. To ensure cheating does not occur in the conduct of assessment tasks in this course, when completing online tests during this course, candidates will be required to confirm that their answers are entirely their own work and that they comply with the assessment rules governing the task via a pop-up check box.

8.1 MODULE 1 ASSESSMENT

Module 1 comprises five (5) formal assessment tasks. You must pass each assessment to satisfactorily complete Module 1. All assessment tasks in Module 1 will be marked by the Module 1 Advisor and candidates will be notified of their results by email.

Assessment tasks 1 – 4

Module 1 is divided into four topics each followed by an examination. You will be given 3 attempts to pass each examination. Failure of the same assessment for a third time means failure of the course. Within each topic there are one or more units. To proceed, students must provide a satisfactory response to the compulsory practice questions. Successful completion of the nominated compulsory questions is required to proceed to either the next unit within the topic, or to sit the online examination to complete each topic. Once the candidate has successfully completed each examination they will be able to access material for the next topic.

Candidates can undertake the online examination at any time after successfully completing the nominated compulsory questions. Each assessment is marked individually so it may take a few days for results and feedback to be given.

To achieve a pass in each online examination you must achieve a mark of at least 65%.

Assessment task 5

You must submit the assessment task associated with the CT practical exercise. The practical assessment will be graded pass or fail.

Important information regarding Module 1 online examinations:

When the online examination is commenced the candidate has two (2) hours to complete the assessment. After two hours the examination will 'time out'. If a candidate commences the examination he/she must complete the examination. If the examination is closed even after a short time this is recorded as a failed attempt.

- If a candidate fails an online examination they will be able to undertake it again with different examination questions.*
- If a candidate fails an online examination they cannot undertake the next attempt until they receive a mark for the previous assessment.*
- Candidates will be given a pass (or fail) for each assessment.*
- Failure of the same assessment for a third time means failure of the course.*

8.2 MODULE 2 ASSESSMENT

Module 2 comprises seven (7) formal assessment tasks as outlined below. You must pass each assessment to satisfactorily complete Module 2.

Module 2 is divided into seven topics each followed by an examination. The examination is delivered online, and each comprises 20 multiple choice questions (MCQs) at different levels of difficulty. Questions for each examination are selected at random from a pool of questions on that topic.

Important information regarding Module 2 online examinations:

When the online test is commenced the candidate has one (1) hour to complete the assessment. After one hour the examination will 'time out'. If a candidate commences the test he/she must complete the test. If the test is closed even after a short time this is recorded as an attempt.

- Topics 1 and 2 should be completed before the clinical placement. Topics 3 - 7 can be completed in any order.*
- To satisfactorily complete Module 2 candidates must complete all MCQ examinations for Topics 1-7 inclusive, and achieve a mark of at least 65% for each topic.*
- MCQ tests for each topic are available to candidates 24 hours a day.*
- When candidates submit their answers to the set of MCQs they will automatically receive the % mark.*
- If a candidate fails an on-line examination, they will be able to undertake the assessment again, however the questions will change. A candidate is able to undertake each assessment a total of THREE times*

only. If a candidate fails an MCQ test, they are strongly encouraged to seek advice from the Module 2 Advisor as soon as possible prior to a subsequent attempt. The Module 2 Advisor will also monitor the number of attempts made by candidates, and if appropriate they will contact the candidate to follow up and provide advice.

- Failure of the same assessment for the third time means failure of the course.*

8.3 MODULE 3 ASSESSMENT

Module 3 is assessed in the workplace. Candidates complete a series of clinical skills assessments in CT and the Clinical CT supervisor will provide feedback to support development of competency. All assessment forms are in the Clinical Workbook, and they clearly outline the clinical competencies that need to be demonstrated to pass each assessment.

Candidates will keep a log of the CT studies performed during their placement, and supervisors will provide detail on the level of involvement in each study, and an estimate of the candidate's competency. This log will allow Clinical CT Supervisors to monitor developing competency, as well as the range of studies candidates are performing and, if necessary, modify the program to ensure candidates achieve the full range of studies expected.

The completed Clinical Workbook must be submitted for evaluation by the due date as part of the course assessment.

8.4 EXCEPTIONAL CIRCUMSTANCES

Candidates must satisfactorily complete all assessment tasks for Modules 1, 2 and 3, including their 120 hours of clinical CT practice, within the dates allocated to the course. Candidates who do not meet these requirements or timeline will not be considered to have completed the course satisfactorily and will not receive a Statement of Completion.

Only in exceptional circumstances will extensions be granted, deferments allowed or cancellations of enrolment permitted. The grounds for issuing an extension, deferment or cancellation will be acute illness, loss or bereavement, family relationship breakdown, hardship or trauma, or jury duty, and all will be based on the submission of documentary evidence.

Applications for an extension, deferment or cancellation of enrolment must be received by the VSNMT within five working days of the relevant event. The decision to provide an extension for an assessment task, deferment of assessment task or enrolment, or cancellation of enrolment will be solely at the discretion of the VSNMT, and such decisions are not open to appeal.

9 STATEMENT OF COMPLETION

A Statement of Completion will be issued to all candidates who satisfactorily complete this course. To satisfactorily complete the course, a candidate must:

- a. Achieve a pass grade for all assessment tasks in Module 1, and
- b. Achieve a pass grade for all online examinations in Module 2, and
- c. Achieve a satisfactory grade for all Clinical Skills Assessments, and
- d. Complete 120 hours of supervised CT clinical practice in a course approved CT department, and
- e. Complete and submit their Clinical Workbook by the due date, and
- f. Provide a signed statement from their Clinical CT Supervisor confirming they are competent to perform routine diagnostic CT by the due date.

10 APPLICATION PROCESS & SUBMISSION

Candidates can apply for a place in the Diagnostic CT for Molecular Imaging course as outlined below. The application form and related documents are contained in this booklet.

○ **Candidate Application Form** ↓

This is completed and signed by the applicant.

○ **A Certified Copy of your University Qualification**

This may be an official transcript of results or a copy of your Award. Ensure this document clearly shows that you commenced this course on or after 1992. To have a document certified you should take the original and a copy to an authorised person. The person must then write on every page of the copy document: 'I have sighted the original document and certify this to be a true copy of the original.' The person should sign each statement and provide their designation, for example, 'Pharmacist'.

○ **Employer's Form** ↓

This is completed and signed by the applicant's employer.

○ **Clinical CT Supervisor's Form**

This is completed and signed by the person who has agreed to be the applicant's Clinical CT Supervisor.

When these forms are completed in full and you have a certified copy of your qualifications convert them to an electronic PDF document and email to CTAdmin@vsnmmt.com.au.

Please note:

- Applications for the course will only be accepted via email to CTAdmin@vsnmmt.com.
- The number of candidates for the course is limited to 16, and applications will be processed in the order of receipt of fully completed applications (without payment).

11 TIMELINES

- a. Fully completed applications must be received between 9.00AM Monday 10 July 2017 to 4.00PM Thursday 27 July 2017.
- b. Successful applicants will be notified via email on Monday 31 July 2017. This will be a conditional offer that is subject to approval of the CT placement site and full payment.
- c. CT placement site will be contacted by the Module 3 Advisor to ensure that appropriate facilities and supervision are available.
- d. Applicants who receive a conditional offer must ensure full course payment is received by the VSNMT by Monday 7 August 2017. Payment is to be made online through the VSNMT website.
- e. Candidates enrolled in the course will receive their Course Login and Password in the week beginning Monday 7 August 2017.

12 2017 COURSE FEE

In 2017 the course fee is as follows:

VSNMT members \$2500 (GST inclusive)

VSNMT non-members \$3000 (GST inclusive)

To claim the reduced VSNMT member course fee, applicants must be full financial members of the VSNMT. Full course payment is not required until you are notified by the VSNMT. Failure to pay within 2 weeks of this notification will result in forfeit of your place.

Refund of course fees will only be allowed in the following exceptional circumstances: acute illness, loss or bereavement, family relationship breakdown, hardship or trauma or jury duty. Documentary evidence must be provided by the applicant to support a refund. The decision to issue a refund or part refund of course fees will be solely at the discretion of the VSNMT and will be incontestable. Failure to meet the course requirements (either in terms of time constraints for the completion of the course or successfully completing the assessments and Clinical Workbook) will not constitute grounds for a refund.

13 PRIVACY & CONFIDENTIALITY

All personal and course related information for candidates undertaking this course is stored securely by the VSNMT Inc. The Module Advisors and course administrator will have access to each candidate's course information, including individual assessment results, for the following purposes:

- a. Monitoring each candidate's progress through the course with a view to providing ongoing academic support and guidance;
- b. Ensuring candidates complete the course as prescribed so that a Statement of Completion can be issued;
- c. Monitoring response rates and duration of assessment tasks for quality assurance purposes;
- d. Providing reports to the VSNMT education sub-committee with regard to commencing numbers, completion rates and course duration at 6 monthly

intervals. Reports will comprise pooled results only, and no identifying information of any kind (such as candidate name, initials or workplace) will be contained in any report.

Candidate information held by the VSNMT will not be made available to any third party, without the individual consent of candidates, except as required by law. If a candidate wishes to view the information held by the VSNMT with respect to their enrolment in this course, they can do so by contacting the VSNMT Secretary in writing via email to Secretary@vsnm.com.au or by mail to Secretary, VSNMT PO Box 7345 Beaumaris 3193.



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