SAINT LOUIS UNIVERSITY.

Doisy College of Health Sciences

2021-2022 Program-Level Assessment: Annual Report

Program Name (no acronyms): Nuclear Medicine Technology	Department: Clinical Health Sciences
Degree or Certificate Level: BS	College/School: Doisy College of Health Sciences
Date (Month/Year): September 2022	Assessment Contact: Crystal Botkin

In what year was the data upon which this report is based collected? 2021-2022

In what year was the program's assessment plan most recently reviewed/updated? The current plan was reviewed/updated in 2020 (New Plan for 2022-2023 cycle will be submitted with this report).

Is this program accredited by an external program/disciplinary/specialized accrediting organization? Yes, Joint Review Committee on Educational Programs in Nuclear Medicine Technology (JRCNMT)

1. **Student Learning Outcomes**
   Which of the program's student learning outcomes were assessed in this annual assessment cycle? (Please list the full, complete learning outcome statements and not just numbers, e.g., Outcomes 1 and 2.)

   As required by the Joint Review Committee on Educational Programs in Nuclear Medicine Technology (JRCNMT), all program level outcomes are assessed each year.

   PLO #1: Students will demonstrate the Jesuit value of "Cura Personalis" as they perform diagnostic imaging procedures.
   PLO #2: Students will demonstrate effective communication when speaking with both patients and other healthcare professionals in the nuclear medicine department.
   PLO #3: Students will use knowledge, facts, and data to assess problems and find solutions at the relate to nuclear medicine imaging procedures.
   PLO #4: Students will demonstrate the ability to translate didactic knowledge into clinical practice as a nuclear medicine technologist.
   PLO #5: Students will exhibit professional characteristics expected of nuclear medicine technologists.

2. **Assessment Methods: Artifacts of Student Learning**
   Which artifacts of student learning were used to determine if students achieved the outcome(s)? Please describe the artifacts in detail and identify the course(s) in which they were collected. Clarify if any such courses were offered a) online, b) at the Madrid campus, or c) at any other off-campus location.

   PLO #1
   NMT 4410 Clinical Practicum / Critical Reflection Assignment #1

   A written critical reflection assignment served as an artifact to assess this PLO. Each student is given a prompt to respond the Jesuit values and how they are reflected in the clinical setting (see Appendix for assignment prompt and grading rubric).

This course meets at clinical affiliate sites in the St. Louis Metropolitan Area.

NMT 4910 Clinical Practicum / Program faculty observation during fifth month of rotation clinical visits

The NMT program faculty complete a form (see appendix) for each student clinical visit during 3rd rotation in the clinical phase of the NMT program. The form is completed bases on notes, observations, and discussion with clinical preceptors about Jesuit values. These visits occur in May each year.

This course meets at clinical affiliates sites in the St. Louis Metropolitan Area.

PLO #2
NMT 4960 Capstone in Nuclear Medicine / Capstone Presentation

The NMT capstone is a basic research assignment which includes both oral presentation and paper. The presentation portion of this assignment is used to assess this PLO (see Appendix for assignment prompt and grading rubric).

This course meets on the Saint Louis Campus.

NMT 4410 and NMT 4910 Clinical Practicum/Final evaluation questions regarding effective communication in patient interaction

The NMT program faculty conduct oral, comprehensive evaluations of each NMT student during the last month of the program. During this evaluation, the students are assessed for the ability to provide effective communication skills regarding patient interactions.

These courses meet at clinical affiliate sites in the St. Louis Metropolitan Area.

PLO #3
NMT 4350 Nuclear Medicine Information Systems / Case Study Project (Written)

This case study project serves as an artifact for this PLO. Each student is given an assignment prompt to evaluate an assigned case study. This assignment is used to demonstrate the ability to apply the skills and knowledge of processing and evaluating nuclear medicine exams based on the knowledge and skills learned in this course. (See appendix for assignment prompt and assessment rubric)

This course meets on the Saint Louis Campus.

NMT 4430 Emerging Technologies / Case Study Presentation (Oral)

The presentation of interesting nuclear medicine exams is used as an artifact for this PLO. Each student is given an assignment prompt to identify 2 different nuclear medicine exams to present in class. One if the cases is assigned by the course instructor and the other is chosen by the student. The oral presentations are completed toward the end of the semester and are used to demonstrate the students' ability to build on the knowledge obtained in class, by providing "real" cases seen in the clinic and conveying knowledge to their peers in the class.

<u>**PLO #4**</u>
NMT 4340 Clinical Nuclear Medicine / Clinical Simulation/Role-Playing

Based on the content covered in the course, the course instructor assigns each student nuclear medicine procedure(s) to portray a technologist and/or patient perspective. The assessment rubric (see appendix) is used to guide the students on the specific areas the students must explain during the role-playing exercise. The students are paired up and provide explanation to a classmate and/or course instructor. This exercise provides the opportunity for the students to begin to translate didactic knowledge into clinical practice before beginning clinical practicum rotations.

This course meets on the Saint Louis Campus.

NMT 4910 Clinical Practicum / Clinical visit evaluation during last month of clinical practicum

The NMT program faculty conduct oral, comprehensive evaluations of each NMT student during the last month of the program. During this evaluation, the students are required to translate didactic knowledge into clinical practice.

This course meets at clinical affiliate sites in the St. Louis Metropolitan Area.

<u>**PLO #5**</u>
NMT 4410 Clinical Practicum / Clinical visit evaluation during 2 months of clinical practicum

The NMT program faculty complete a form (see appendix) for each student clinical visit during 1st rotation in the clinical phase of the NMT program. The form is completed bases on notes, observations, and discussion with clinical preceptors about professional behavior. These visits occur in February each year.

This course meets at clinical affiliate sites in the St. Louis Metropolitan Area.

NMT 4910 Clinical Practicum / Clinical visit evaluation during 7 months of clinical practicum

The NMT program faculty complete a form (see appendix) for each student clinical visit during 4th rotation in the clinical phase of the NMT program. The form is completed bases on notes, observations, and discussion with clinical preceptors about professional behavior. These visits occur in June each year.

This course meets at clinical affiliate sites in the St. Louis Metropolitan Area.

3. **Assessment Methods: Evaluation Process**
   What process was used to evaluate the artifacts of student learning, and by whom? Please identify the tools(s) (e.g., a rubric) used in the process and **include them in/with this report document** (please do not just refer to the assessment plan).

<u>**PLO #1**</u>
NMT 4410 Clinical Practicum / Critical Reflection Assignment #1

Each of the critical reflection assignments were evaluated by the course instructor using an assessment rubric (see appendix). The instructor provided a summary of the student scores to the program director. In addition, the program director identified students scoring >10 out of 15 <u>AND</u> providing appropriate examples of "cura personalis" in the clinic as achieving the ranking of "knowledge" or higher.

The program director then reviewed the assessment rubric contents to determine whether the rankings and

descriptions are appropriate for this artifact.

NMT 4910 Clinical Practicum / Program faculty observation during the fifth month of rotation clinical visits

The NMT faculty collected the visit forms (see appendix) and notes from the third rotation visits which occur in May of each year for the students enrolled in this course. The program director reviewed the data, including the pass/fail status of the visit. The comments were reviewed to assess each students' ability to convey the concepts discussed during the visit. In addition, the program director sought comments/noted which relate to Jesuit values of "cura personalis" on each of the visit forms. If such comments were identified this was marked as achieving the raking of "application" or higher.

The program director consulted the NMT faculty to identified terms that would constitute the application of "cura personalis" if the term was not said or documented directly.

PLO #2
NMT 4960 Capstone in Nuclear Medicine / Capstone Presentation

Each of the student presentations are evaluated by NMT program faculty and/or clinical preceptor(s) using an assessment rubric (see appendix). The student presentations and evaluations took place in person during a scheduled presentation date. The NMT program director reviewed the completed evaluations and used section "D. Preparation and Presentation" on the grading rubric to assess the communication skills of the students. Per the assessment rubric of this assignment, students who score a 3 or less are not well prepared and their presentation is faulty. Therefore, the program director identified students scoring 4 or greater in this section as achieving the ranking of "application" or higher.

NMT 4410 and NMT 4910 Clinical Practicum/Final evaluation questions regarding effective communication in patient interaction

The NMT program faculty conduct oral, comprehensive evaluations of each NMT student during the last month of the program. During this evaluation, the students are required to convey effective communication skills for patient interactions in the field of nuclear medicine. The NMT faculty provide a pass/fail status for this evaluation.

The program director consulted the NMT faculty to identify a way to ensure this is done consistently in the future. The development of a rubric will be part of the process in changing the NMT curriculum during the 2022-2023 academic year.

PLO #3
NMT 4350 Nuclear Medicine Information Systems / Case Study Project (Written)

Each of the student projects were evaluated by the course instructor using an assessment rubric (see appendix). The instructor provided a summary of the student scores to the program director. After reviewing the rubric for this assignment, the program director identified students scoring >80% as achieving the ranking of "knowledge" or higher. Per the assignment rubric, a score of 80% puts the students in the category of "Complete, good detail". Using the assessment rubric, "knowledge" ranking indicates the ability to "identify errors in an imaging study." This course provides the first opportunity for NMT students to review imaging studies, therefore "knowledge" is an appropriate ranking.

NMT 4430 Emerging Technologies / Case Study Presentation (Oral)

Each of the student projects were evaluated by the course instructor using an assessment rubric (see appendix). The instructor provided a summary of the student scores to the program director. After reviewing the rubric for this assignment, the program director identified students scoring $\geq 8/10$ for each case as achieving the ranking of "application" or higher. Using the assessment rubric, "application" ranking indicates the ability to "interpret data presented in an imaging case study." This course provides the opportunity for NMT students to practice the connection of didactic knowledge with clinical practice presenting normal and abnormal nuclear medicine imaging cases and identifying why each case is a such, therefore "application" is an appropriate ranking.

PLO #4
NMT 4340 Clinical Nuclear Medicine / Clinical Simulation/Role Playing

Each of the student projects were evaluated by the course instructor using an assessment rubric (see appendix). The instructor provided a summary of the student scores to the program director. After reviewing the rubric for this assignment, the program director identified students scoring $\geq 11/15$ as achieving the ranking of "knowledge" or higher. Using the assessment rubric, "knowledge" ranking indicates the ability to "recall facts and theories relating to nuclear medicine technology." This course provides the first opportunity for NMT students to practice the connection of didactic knowledge with clinical practice by simulating the technologist/patient roles, therefore "knowledge" is an appropriate ranking.

NMT 4910 Clinical Practicum / Clinical visit evaluation during last month of clinical practicum

The NMT program faculty conduct oral, comprehensive evaluations of each NMT student during the last month of the program. During this evaluation, the students are required to translate didactic knowledge into clinical practice. The NMT faculty use a pass/fail status for this evaluation.

Do the NMT faculty use a consistent measure? There is not a rubric for the evaluation currently. Development of such rubric will be done during the NMT curriculum change in the 2022-2023 academic year.

PLO #5
NMT 4410 Clinical Practicum / Clinical visit evaluation during the second month of clinical practicum

The NMT faculty collected the visit forms (see appendix) and notes from the first rotation visits which occur in February of each year for the students enrolled in this course. The program director reviewed the data, including the pass/fail status of the visit. The comments were reviewed to assess each students' ability to convey the concepts discussed during the visit. In addition, the program director sought comments/noted which relate to professional characteristics on each of the visit forms. If such comments were identified this was marked as achieving the raking of "application" or higher.

NMT faculty members make notes and document items that may reflect the professional characteristics when performing clinical visits.

NMT 4910 Clinical Practicum / Clinical visit evaluation during the 7th month of clinical practicum

The NMT faculty collected the visit forms (see appendix) and notes from the first rotation visits which occur in February of each year for the students enrolled in this course. The program director reviewed the data, including the pass/fail status of the visit. The comments were reviewed to assess each students' ability to convey the concepts

discussed during the visit. In addition, the program director sought comments/noted which relate to professional characteristics on each of the visit forms. If such comments were identified this was marked as achieving a ranking of "synthesis" or higher.

NMT faculty members make notes and document items that may reflect the professional characteristics when performing clinical visits. There is not a rubric for the evaluation currently. Development of such rubric will be done during the NMT curriculum change in the 2022-2023 academic year.

4. **Data/Results**

What were the results of the assessment of the learning outcome(s)? Please be specific. Does achievement differ by teaching modality (e.g., online vs. face-to-face) or on-ground location (e.g., STL campus, Madrid campus, other off-campus site)?

PLO #1
NMT 4410 Clinical Practicum / Critical Reflection Assignment #1

An average of >85%, 3/4 (75%) of the NMT students scored >10/15 on the critical reflection assignment. This was after the course instructor gave the students the opportunity to rewrite their reflection based in instructor feedback. The 1 student (25%) that did not meet the benchmark of >10/15 decided not to rewrite their reflection to better their score and understanding of the assignment.

In digging deeper, the program director reviewed the examples of "cura personalis" and found that indeed all students could appropriately identify aspects of this Jesuit value. However, they missed points in other areas, for example, "incorporate perspectives." While previous examples were shared with the students prior to the completion of this assignment, the course instructor may spend more time explaining the rubric and the importance of all aspects within this assignment.

The target was not met for this artifact.

NMT 4910 Clinical Practicum / Program faculty observation during fifth month of rotation clinical visits

An average of >85%, 4/4 (100%) of the NMT students did identify aspects of the Jesuit value "cura personalis" during their clinical visit with NMT faculty.

After this assessment review cycle, the program director did confirm that NMT faculty made notes on the visit form about aspects of "cura personalis" discussed with the student and clinical supervisors. Although the specific "cura personalis" term may not have been used, other terms, such as, "technologists are helpful", "student is good with patients" were noted. A question regarding the use of "cura peronalis" will be added to the standardized questions that are used by NMT program faculty when visiting students in the clinic.

The target was met for this artifact.

PLO #2
NMT 4960 Capstone in Nuclear Medicine / Capstone Presentation

An average of >85% 3/4 (75%) of the students scored >4 in section D. Preparation and Presentation of the assessment rubric. One student (25%) scored 2.5/5 in section D. Based on the rubric, the presentation was marginal, subject matter obscure, images were not relevant, and the audience was restless and confused.

The target was met not for this artifact. However, the small number of students in this cohort make this look more extreme. It is noted that this is only one student, and it may not be something to cause big changes at this point. NMT program faculty will continue to monitor this to look for trends in the future.

NMT 4410 and NMT 4910 Clinical Practicum/Final evaluation questions regarding effective communication in patient interaction

An average of 100% (4/4) of the students could convey effective communication skills for patient interactions in the field of nuclear medicine. This fact is based on patient care and communication questions asked by the NMT faculty member who performed the oral evaluation.

Based on previous assessment of this benchmark, the NMT faculty developed patient care and communication-based questions (examples included below) which were chosen randomly for the student to respond to during the final evaluation. The faculty member who performed the final evaluation made notes on the observations and appropriate responses of the student.

PLO #3
NMT 4350 Nuclear Medicine Information Systems / Case Study Project (Writing Based)

An average of >85% 4/4 (100%) of the students received score of $\geq$80% ranking of "knowledge" or higher. Deficient areas identified by the instructor were exam preparation and defining terms. This information will be considered and shows areas which may be improved upon for the next time the course is offered.

NMT 4430 Emerging Technologies / Case Study Presentation (Presentation Based)

An average of <85% (3/4 or 75%) of the students received a score of $\geq$8/10 and achieved a ranking of "application" or higher. The one student (25%) who scored <8/10 did not follow this assignment instructions and missed the mark in every criterion outlined in the rubric.

The program target was not met, however, the course instructor indicated this to be a blatant misunderstanding of the assignment and rubric for this assignment.

PLO #4
NMT 4340 Clinical Nuclear Medicine / Clinical Simulation/Role Playing

An average of >85% (4/4 or 100%) of the students received a score of $\geq$11/15 and achieved a ranking of "application" or higher.
This exercise is developmental in nature and allows the students the opportunity to simulate the connection of didactic knowledge in the clinical setting. The course instructor spends time with each student reviewing the areas of weakness through the grading process. In addition, the students do not have to opportunity to complete this exercise again for the same nuclear medicine exam, therefore, progress within this course is not feasible. Progress should be noted from this course to the NMT practicum course where the PLO is measured once again, and a high ranking is expected.

NMT 4910 Clinical Practicum / Clinical visit evaluation during last month of clinical practicum

The >85% program target was met. An average of 100% (4/4) of the students could translate didactic knowledge into clinical practice in nuclear medicine. This fact is based on the passing option given by the NMT faculty member who performed the oral evaluation.

To address this further, while standard questions were developed, the program director consulted the NMT faculty to identify a way to ensure this is done consistently in the future. In addition, exploration of an assessment rubric would be helpful. Development of new rubrics will be done during the NMT curriculum change in the 2022-2023 academic year.

PLO #5
NMT 4410 Clinical Practicum / Clinical visit evaluation during 2 months of clinical practicum

The >85% program target was met. 4/4 (100%) of the students did identify examples of professional characteristics during the clinical visit with NMT faculty.

After this assessment review cycle, the program director did confirm that NMT faculty made notes on the visit form about aspects of professional characteristics discussed with the student and clinical supervisors. The following comments were noted on the visit form and identify professional characteristics, "student is working like a technologist", "student is catching on quickly", "student is good with patients" were noted.

To address this further, the program director consulted the NMT faculty to identify a way to ensure this is done consistently in the future. It may be helpful to be more specific about what professional characteristics are to be identified at this stage of the clinical practicum. The program director is adding a specific question to the visit form to ensure proper documentation.

NMT 4910 Clinical Practicum / Clinical visit evaluation during 7 months of clinical practicum

The >85% program target was met. 4/4 (100%) of the students did identify examples of professional characteristics during the clinical visit with NMT faculty.

After this assessment review cycle, the program director did confirm that NMT faculty made notes on the visit form about aspects of professional characteristics discussed with the student and clinical supervisors. The following comments were noted on the visit form and identify professional characteristics, "student is ready to work", "student feel like they are competent in many nuclear medicine procedures", "I would hire this student" were noted.

To address this further, the program director consulted the NMT faculty to identify a way to ensure this is done consistently in the future. It may be helpful to be more specific about what professional characteristics are to be identified at this stage of the clinical practicum. The program director is adding a specific question to the visit form to ensure proper documentation.
Development of new rubrics will be done during the NMT curriculum change in the 2022-2023 academic year.

5. **Findings: Interpretations & Conclusions**
   What have you learned from these results? What does the data tell you?

PLO #1

Critical Reflection Assignment #1

The additional information in the writing prompt has been helpful in specifically identifying the students' knowledge of the Jesuit value "cura personalis". The new assignment prompt provided the students direction as to what the NMT

faculty were wanting to see in the critical reflection writing assignment.

Faculty Observation during the fifth month of rotation clinical visits

While a specific question was not asked consistently about "cura personalis" in the clinic during this clinical visit. NMT faculty consistently noted terms/comments which identified the student and/or clinical supervisors saw aspects of this Jesuit value in the clinical setting. Therefore, this artifact shows progression into the ranking of "synthesis" as outlined in the attached rubrics.

PLO #2

Capstone in Nuclear Medicine Presentation

The analysis of the results from this artifact, the assignment prompt and rubric have provided the students ample information to complete the capstone presentation as expected at this point in the NMT program. The course instructor has identified a clinical supervisor who would like to take part in ensuring the students have ample projects and understanding of the desired outcomes of this assignment and how it relates to the clinical setting.

Final evaluation questions regarding communication in patient interaction

The analysis of this data is less subjective and inconsistent among NMT program faculty, due to creation of standard questions asked on each student based on the topic covered in the visit. The NMT curriculum and clinical assessments will be changing in 2022-2023 academic year and additional opportunities to assess this will be addressed. Development of new rubrics will be done during the NMT curriculum change in the 2022-2023 academic year.

PLO #3

Case Study Project (Writing Based)

The analysis of the data has shown that the assessment rubrics used to grade the assignments used in this PLO are appropriate; however, the score cutoffs may need to be reviewed in the future to ensure they are representative of the rankings. In addition, the course instructor will try to identify ways to pinpoint more specific areas of exam preparation and defining terms to provide additional instruction and support for the students in these areas.

Case Study Presentation (Presentation Based)

The results of this artifact show that the students have ample information to provide the necessary information about the cases they are presenting. However, additional information could be gathered to assist in identifying areas for improvement. More specifically, the course instructor may make comments about their presentation skills and provide constructive feedback to assist the students in becoming better presenters. The new NMT curriculum commencing in the 2022-2023 academic year, will provide additional opportunities for NMT students to present these types of cases, as they will begin NMT courses 1 semester earlier. Therefore, potential for 1-2 additional case studies may be possible and could demonstrate growth in their presentation skills.

PLO #4

Clinical Simulation/Role-Playing

The analysis of the results from this artifact, the assignment prompt and rubric have provided the students ample information to complete the clinical simulation exercise as expected at this point in the NMT program. The knowledge obtained through this exercise is the first opportunity the students must begin the correlation of didactic knowledge and clinical practice. The course instructor will continue to provide this information and answer questions about the assignment when it is assigned. The new NMT curriculum commencing in the 2022-2023 academic year, will provide additional opportunities for NMT students to complete additional clinical simulation exercises, as they will begin NMT courses 1 semester earlier. Therefore, potential for 1-2 additional exercises may be possible and could demonstrate

growth in the connection of didactic knowledge to clinical practice.

Clinical visit evaluation during the last month of clinical practicum

Through the analysis of this artifact, the program director has identified items to add to the visit form to ensure consistent use and comments from program faculty. The purpose of the clinical visits is to provide program faculty evidence of the student's ability to connect didactic knowledge to clinical practice through their experiences in the clinic. The NMT curriculum and clinical assessments will be changing in 2022-2023 academic year and additional opportunities to assess this will be addressed. Development of new rubrics will be done during the NMT curriculum change in the 2022-2023 academic year.

PLO #5

Clinical visit evaluation during the first 2 months of clinical practicum <u>AND</u> Clinical visit evaluation during 7 months of clinical practicum

The analysis of the data provided insight into potential changes in the use of the clinical visit forms and how the data/comments should be interpreted. The analysis of these artifacts is less subjective with the development and use of standard questions which are asked of every student during their visit based on the topic discussed. While subjective, the NMT faculty have identified terms/comments that are consistently documented that portray aspects of professional characteristics. In addition, progressive terms/comments were identified and show progression from "application" to "synthesis" The NMT curriculum and clinical assessments will be changing in 2022-2023 academic year and additional opportunities to assess this will be addressed. Development of new rubrics will be done during the NMT curriculum change in the 2022-2023 academic year.

6. **Closing the Loop: Dissemination and Use of <u>Current</u> Assessment Findings**
   A. When and how did your program faculty share and discuss these results and findings from this cycle of assessment?

   > Discussions between the NMT program director and program faculty were had during the data collection and analysis of all PLO's and the data associated with them. The report was reviewed and discussed by the NMT faculty prior to submission of the annual report in September 2022. The NMT program director and faculty worked together to create a new assessment plan to adjust to the 2022-2023 curriculum changes and the addition of CT specific competencies to meet JRCNMT accreditation standards. The 2023 report will provide an update on changes made and the outcomes of those changes in the next assessment cycle.

   B. How specifically have you decided to use these findings to improve teaching and learning in your program? For example, perhaps you've initiated one or more of the following:

Changes to the Curriculum or Pedagogies	• Course content	• Course sequence
	• Teaching techniques	• New courses
	• Improvements in technology	• Deletion of courses
	• Prerequisites	• Changes in frequency or scheduling of course offerings

Changes to the Assessment Plan	• Student learning outcomes	• Evaluation tools (e.g., rubrics)
	• Artifacts of student learning	• Data collection methods
	• Evaluation process	• Frequency of data collection

Please describe the actions you are taking as a result of these findings.

Because of the findings described in this report, the NMT program director and faculty will continue to discuss potential additions and changes to the assessment PLO's, artifacts, and rubrics within the NMT courses. There are substantive changes happening to the NMT curriculum which began in Spring 2022. An updated plan for AY 2022-2023 was created to address these changes and provided a rich environment for additional review of the course content, course assignments, assessment artifacts and the development of assessment rubrics. The updated plan is included in the assessment materials submitted.

If no changes are being made, please explain why.

7. **Closing the Loop: Review of <u>Previous</u> Assessment Findings and Changes**
    A. What is at least one change your program has implemented in recent years as a result of assessment data?

    Previous assessment identified the need for specific questions to be added to clinical visit forms. New questions were developed and useful in objectively identifying professional characteristics and communication from students and clinical supervisors that are consistently noted on the visit forms.

    B. How has this change/have these changes been assessed?

    The NMT faculty had detailed discussions and found that the targets were being met and the objectively met by using the standard questions developed for the clinical visit evaluations.

    C. What were the findings of the assessment?

    PLO #4

    Clinical visit evaluation during the last month of clinical practicum
    Through the analysis of this artifact, the program director has identified items to add to the visit form to ensure consistent use and comments from program faculty. The purpose of the clinical visits is to provide program faculty evidence of the student's ability to connect didactic knowledge to clinical practice through their experiences in the clinic. The NMT curriculum and clinical assessments will be changing in 2022-2023 academic year and additional opportunities to assess this will be addressed. Development of new rubrics will be done during the NMT curriculum change in the 2022-2023 academic year.

    PLO #5
    Clinical visit evaluation during the first 2 months of clinical practicum <u>AND</u> Clinical visit evaluation during 7 months of clinical practicum
    The analysis of the data provided insight into potential changes in the use of the clinical visit forms and how the data/comments should be interpreted. The analysis of these artifacts is less subjective with the development and use of standard questions which are asked of every student during their visit based on the topic discussed. While subjective, the NMT faculty have identified terms/comments that are consistently documented that portray aspects of professional characteristics. In addition, progressive terms/comments were identified and show progression from "application" to "synthesis" The NMT curriculum and clinical assessments will be changing in 2022-2023 academic year and additional opportunities to assess this will be addressed. Development of new rubrics will be done during the NMT curriculum change in the 2022-2023 academic year.

D. How do you plan to (continue to) use this information moving forward?

Moving forward, the NMT program will continue to evaluate all five PLO's each assessment cycle, as required by the NMT program accreditation agency, the Joint Review Committee on Nuclear Medicine Technology Education Programs (JRCNMT). The assessment process and outcomes will be used in to inform changes within the courses and the overall NMT program. The NMT assessment plan and report are also shared with the NMT advisory committee to provide discussion and input from the committee regarding changes to the NMT program curriculum and its courses.

PLO #1
NMT 4410 Clinical Practicum / Critical Reflection Assignment #1

A written critical reflection assignment served as an artifact to assess this PLO. Each student is given a prompt to respond the Jesuit values and how they are reflected in the clinical setting (see Appendix for assignment prompt and grading rubric).

SAINT LOUIS UNIVERSITY
Nuclear Medicine Technology Program
Critical Self-Reflection Journaling Assignment

Critical self-reflection refers to the most important learning experience. It means reassessing the way we have posed problems, our own meaning perspectives, and reassessing our own orientation to perceiving, knowing, believing, feeling, and acting.

What happened (describe the experience)?

Why/how did it happen? What factors contributed? How do you feel about it?

What is your new interpretation of the experience? What is the significance? What did you learn about yourself and others?

What will you do as a result of this experience? How will you used it to inform your future?
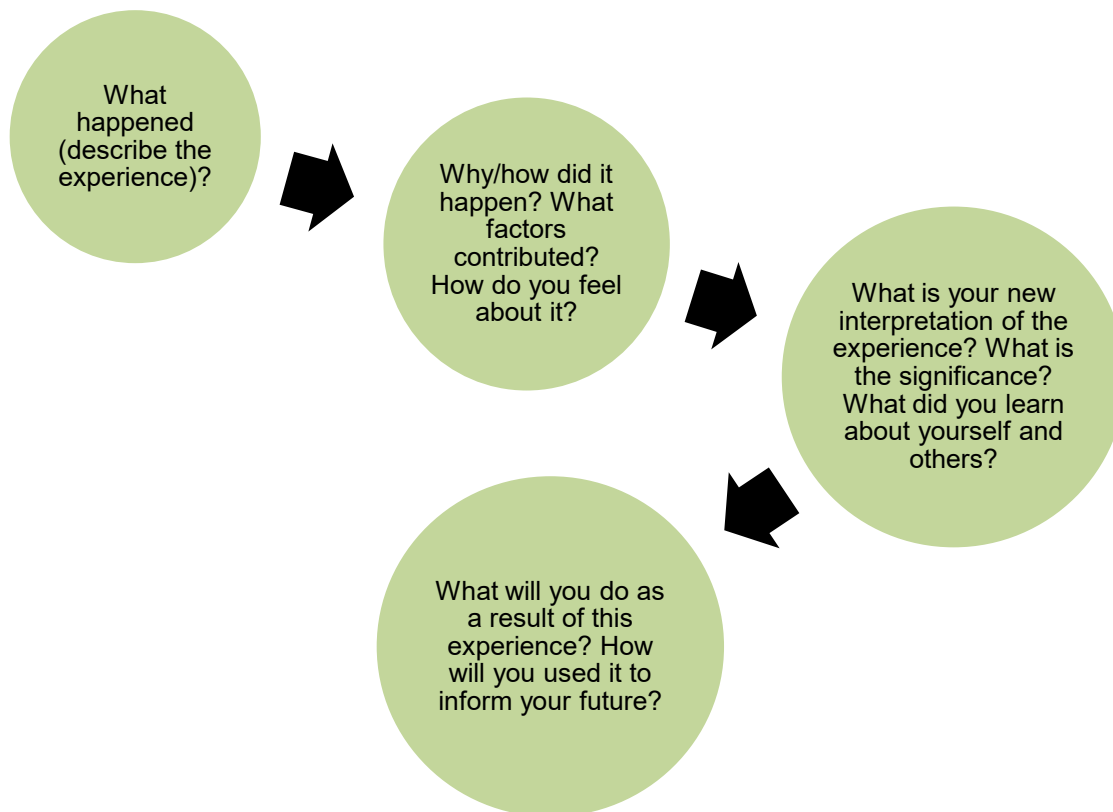
As another form of communication between faculty and student, NMT students are required to make regular written comments and reflections on experiences in the clinical areas in a critical reflection/journal entry. **The student is required to turn in one entry per rotation**. These reflections

are to describe experiences in the clinic. They are not designed to be written about personal topics or issues.

The entries should be emailed to Crystal Botkin at crystal.botkin@health.slu.edu by 5pm on the due date found in eValue Program Calendar.

Entries are to be 1-2 pages in length. Please use template provided on Blackboard to type these entries. They should be singled spaced and in 14pt Arial font.

Rotation #1: **Due 2/7/2022**

Jesuit values
What are the Jesuit Values?
How have you seen "Cura Personalis" reflected in the clinical setting?

Rotation #2: Due 4/4/22

Professional characteristics of a nuclear medicine technologist Provide examples of portrayal (good and bad) of the professional characteristics mentioned in your reflection.

Rotation #3: Due 5/31/22

Ethical Dilemma
Have you witnessed an ethical dilemma or been involved in one personally during your time in the clinic?

Rotation #4: Due 7/25/22

Professional Development
Describe your progress as an NMT. Think back to the first rotation and how you felt and compare to the fourth rotation as you are finishing the program.

These entries should NOT be written during clinical time.
These entries will not be shared with the clinical personnel.

Critical Self-Reflection Journal Form/Rubric

Student Name:
Date:
Rotation:
Clinical Site:

	0- Beginner	1-Developing	2-Accomplished	3-Advanced
Identifies and Summarizes Issue(s)	Does not identify or summarize issue(s).	Minimally identifies and summarizes issue(s).	Identifies and summarizes issue(s). Explores some aspects of the issue(s).	Identifies and summarizes issue(s) comprehensively. Explores all aspect of the issue(s).
Gathers facts and evidence related to issue(s)	Only uses facts or evidence present at the onset of the issue. Does not seek out additional information. Considers all information as factual.	Seeks and gathers minimal information related to issue from one or fewer sources, or inappropriate sources. Understands the difference between facts and opinions.	Seeks and gathers ample additional information from a variety of sources. Seeks both facts and opinions.	Generates comprehensive set of facts/evidence based information from a variety of sources. Distinguishes between facts and opinion when presenting evidence
Incorporates perspectives	Does not consider the other points of view when approaching issue(s)	Approaches issue(s) based off of personal perspective and majority/popular points of view	Approaches issue(s) based off of other people's perspectives and consulting a few resources	Utilizes all resources and perspectives available when approaching issue(s)
Draws Conclusions	Does not draw conclusions or formulates conclusions inconsistent with evidence and perspectives	Formulates some conclusions consistent with some evidence but lacking in depth and scope	Formulates conclusions consistent with most evidence	Formulates conclusions consistent with a wide range of evidence
Identifies impact on future	Does not identify implications or consequences to self or others. Does not acknowledge impact of issue on future.	Identifies implications and consequences of issue(s) to self. Identifies potential effect on future.	Identifies implications and consequences of issue(s) to self and others. Identifies concrete examples of change in future.	Comprehensively identifies implications and consequences of issue(s) to self and others and makes connections to specific ways in which the future will be affected.
Total:				

Nuclear Medicine Technology

Critical Self-Reflection Grading Rubric

	0- Beginner	1-Developing	2-Accomplished	3-Advanced
Identifies and Summarizes Issue(s) [3]	Does not identify or summarize issue(s).	Minimally identifies and summarizes issue(s).	Identifies and summarizes issue(s). Explores some aspects of the issue(s).	Identifies and summarizes issue(s) comprehensively. Explores all aspect of the issue(s).
Gathers facts and evidence related to issue(s) [3]	Only uses facts or evidence present at the onset of the issue. Does not seek out additional information. Considers all information as factual.	Seeks and gathers minimal information related to issue from one or fewer sources, or inappropriate sources. Understands the difference between facts and opinions.	Seeks and gathers ample additional information from a variety of sources. Seeks both facts and opinions.	Generates comprehensive set of facts/evidence based information from a variety of sources. Distinguishes between facts and opinion when presenting evidence
Incorporates perspectives [2]	Does not consider the other points of view when approaching issue(s)	Approaches issue(s) based off of personal perspective and majority/popular points of view	Approaches issue(s) based off of other people's perspectives and consulting a few resources	Utilizes all resources and perspectives available when approaching issue(s)
Draws Conclusions [3]	Does not draw conclusions or formulates conclusions inconsistent with evidence and perspectives	Formulates some conclusions consistent with some evidence but lacking in depth and scope	Formulates conclusions consistent with most evidence	Formulates conclusions consistent with a wide range of evidence
Identifies impact on future [3]	Does not identify implications or consequences to self or others. Does not acknowledge impact of issue on future.	Identifies implications and consequences of issue(s) to self. Identifies potential effect on future.	Identifies implications and consequences of issue(s) to self and others. Identifies concrete examples of change in future.	Comprehensively identifies implications and consequences of issue(s) to self and others and makes connections to specific ways in which the future will be affected.

remember
→ use tool
→ join of
note

Total: 14 /15

- good examples
- why we SPECT/CT in some cases & why not in others → individual to each patient → what would change this for you in future?

Nuclear Medicine Technology

Critical Self-Reflection Grading Rubric

	0- Beginner	1-Developing	2-Accomplished	3-Advanced
Identifies and Summarizes Issue(s) [3]	Does not identify or summarize issue(s).	Minimally identifies and summarizes issue(s).	Identifies and summarizes issue(s). Explores some aspects of the issue(s).	Identifies and summarizes issue(s) comprehensively. Explores all aspect of the issue(s).
Gathers facts and evidence related to issue(s) [3]	Only uses facts or evidence present at the onset of the issue. Does not seek out additional information. Considers all information as factual.	Seeks and gathers minimal information related to issue from one or fewer sources, or inappropriate sources. Understands the difference between facts and opinions.	Seeks and gathers ample additional information from a variety of sources. Seeks both facts and opinions.	Generates comprehensive set of facts/evidence based information from a variety of sources. Distinguishes between facts and opinion when presenting evidence
Incorporates perspectives [2]	Does not consider the other points of view when approaching issue(s)	Approaches issue(s) based off of personal perspective and majority/popular points of view	Approaches issue(s) based off of other people's perspectives and consulting a few resources	Utilizes all resources and perspectives available when approaching issue(s)
Draws Conclusions [3]	Does not draw conclusions or formulates conclusions inconsistent with evidence and perspectives	Formulates some conclusions consistent with some evidence but lacking in depth and scope	Formulates conclusions consistent with most evidence	Formulates conclusions consistent with a wide range of evidence
Identifies impact on future [2]	Does not identify implications or consequences to self or others. Does not acknowledge impact of issue on future.	Identifies implications and consequences of issue(s) to self. Identifies potential effect on future.	Identifies implications and consequences of issue(s) to self and others. Identifies concrete examples of change in future.	Comprehensively identifies implications and consequences of issue(s) to self and others and makes connections to specific ways in which the future will be affected.

Total: 13 /15

Next, get to perspective in "Cur Persona" the topic of people

Be more deliberate in your words

Much Better!

Critical Self-Reflection Journal Form

Student Name: Bailey Wood

Date: 1/25/2022

Rotation: 1

Clinical Site: Barnes-Jewish Hospital

Jesuit Values

There are 8 core Jesuit values that SLU promotes for its students and faculty to help guide them in their daily life, at work and home. The first one is service, which to me means that we should aim for doing everything in our power to best serve the patient. Next, leadership, which can apply to fellow coworkers or to patients. You should aim to be a leader to your coworkers, assisting them when needed and helping to guide in a good direction. You should also be a leader to patients by helping advocate for the best care they can receive. Then we have unity, meaning that we work best as a unit. Some tasks would be impossible without others to help and there is always something to learn from others. Moving on, we have compassion. Personally, I think this is one of the most important values. When dealing with patients or coworkers, it is important to be kind and help with what they need. Some days people will be struggling, but you want to help lift them up, and make a patient as comfortable and welcome as they can be.

Moving on to the next four values, we start with accountability. I have learned the importance of this while being in the clinic. If something did not go right or you think you messed up, ask for help. Take responsibility and learn from your behavior for next time. Since we are still learning there will be some hiccups during our time in the clinic, and I have 2 that stand out to me. One patient I was beginning his scan and moving him into the camera. I was not carefully watching his hands on the arm boards and ended up smashing his hands into the gantry. I still feel horrible, but now I am extra careful when moving patients around because I do not want to make an incautious mistake again. The second time, I was scanning a patient for an MPI. This patient had gotten sick before her scan and had a hot stomach. I went to the computer to set my limits, but after the scan we noticed that this threw off my limits and I cut off the top half of the heart. This moment sticks

with me every time I perform a CT scan now, because I think of this moment and how I felt when I realized my error. I gave this patient extra radiation dose for no diagnostic value and sacrificed some image quality because her images had no attenuation correction. This could have really messed up her scan but luckily it did not have to be redone. These mistakes remind me to slow down and ensure that I am doing my best for every step of the patient's scan.

For the next value, we have respect. I think this is very important, especially with patients. Each patient has something different going on, and sometimes this leads to situations that cannot be controlled. It is important to remember that this is a person who has done many things in their life and served the community, so we want to do our best to not mock patients and be kind. Then we have excellence, which means that we want to give the best care possible, which is what they push at Barnes. They have survey cards for patients after their visit and want them to write that they had excellent care. Finally, there is stewardship. When I think of stewardship, I think of being entrusted to care about the community. That is a large responsibility and many, many people are depending on us for good, quality care. Overall, each value is unique, yet they all tie together to help us be the best person and healthcare worker we can be.

Moving on from the values, "Cura Personalis" is another very important topic I have heard mentioned time and time again around SLU. Essentially, "Cura Personalis" means to care for the entire person, including physically, mentally, and spiritually. In the clinic, I have seen a mixed viewpoint on this. For instance, at Barnes they call the attending radiologist after every scan to make sure it is a good picture. There is one attending that would like to order a SPECT/CT quite often for patients to gain some extra information or clarify things that they did not think were clearly seen in the scan. He did this to ensure that the patient had the best study they could receive and could feel confident when dictating the images. However, some of the technologists felt that a SPECT/CT was unnecessary sometimes, with some even trying to talk him out of it. In some cases this was because the technologist thought that there was adequate information in the images already taken and did not want to have to spend time taking more images. Another reason was that the technologists knew how expensive adding a SPECT/CT onto the order is

and did not want the patients to have to pay for the scan if unnecessary. This created conflicting thoughts in my brain because I could see both sides of the argument. Taking more images would take longer and be costly, however the patient already has our radioactive tracer, and the extra images could only increase certainty in the diagnosis. I think that a SPECT/CT could be justified most of the time, however there was one highly claustrophobic patient where a SPECT/CT was ordered. The technologist did not feel like it would be good for the patient's well-being to spend another 30 minutes in the scanner. The technologist and the doctor had a conversation to weigh the pros and cons, and ultimately decided that it would not be best for the patient to do more images and the ones taken will be sufficient.

CT adds additional radiation

When considering this issue, I lean with the point of view of the radiologist for the most part. I think that if there is any doubt on what the diagnosis is, a SPECT/CT provides the information that could lead the doctor to be more confident in a diagnosis and set the patient on the correct path for treatment. I also agree with the technologists to a certain point. You are the one spending time with patient and gathering their history, the radiologist only knows what they see in the chart. If you see a reason to not perform the SPECT/CT that would be best for the patient's mental well-being and does not sacrifice the diagnosis for their physical health, I think you need to be an advocate for your patient. Do not just argue against the extra images because you'd have to stay late or don't feel like taking more images, but because it would be in the best interests of the patient. Overall, I think this has helped me to realize to be an advocate for my patient and do not be afraid to have a conversation with the doctor on what would be best for the patient.

References

"Saint Louis University." *SLU*, http://www.slu.edu/.

PLO #1
NMT 4910 Clinical Practicum / Program faculty observation during fifth month of rotation clinical visits

The NMT program faculty complete a form (see appendix) for each student clinical visit during 3rd rotation in the clinical phase of the NMT program. The form is completed bases on notes, observations, and discussion with clinical preceptors about Jesuit values. These visits occur in May each year.

Saint Louis University
Nuclear Medicine Technology Program Site Visit Evaluation Form

Student:_____   Clinical site: _____

Date:_____   Arrival time: _____

Rotation number: _____   Visit number: _____

Student comments:
Procedures and comments on tasks at the clinical site:

Site Visitor's Report:
Assessment of student's progress and performance:

Competency Evaluation:

Issues with teaching and supervision:

Recommendations for next visit:

Grade   PASS / FAIL
___   Student brought books and organized notes for visit.
___   Student was able to locate information in notes and/or books.
___   Student was prepared to discuss any exams they had observed, participated or performed. ___

Student illustrates understanding of exams discussed **___**   Student paperwork is up to date.

Signatures:
Clinical Supervisor: _____ Site Visitor: _____

Student: _____ Departure time: _____

Saint Louis University
Nuclear Medicine Technology Program Site Visit Required Questions
Topic: Bone Scans

Student: _____   Clinical site: _____

Date: _____

1. What is the prep for a whole body bone scan?

2. What are the indications for doing a whole body bone scan? What are the indications for doing a 3-phase bone scan?

3. What radiopharmaceutical(s) are injected for a general nuclear medicine bone scan? What radiopharmaceutical(s) are injected for a PET bone scan? Add what is the method of localization?

4. What does 'SPECT' stand for? Discuss the pros and cons of a SPECT bone scan?

5. What is the main reason (or a few of the main reasons) for doing a 3-phase bone scan? What do all the images show if a bone scan is positive in a 3-phase bone scan?

Only need to ask these questions ONCE per visit:

    A. Ask for a response to the following statement of ALL students:
             Give an example of how you portray "cura personalis" in the clinical setting.

    B. Complete a visit form including evidence of <u>effective communication</u> (i.e. How does the student explain the particular exam to the patient?) and <u>understanding of "cura personalis"</u> in the details of the form.
             (Give thought to the level of communication and understanding of "cura personalis" based on when this visit is done. i.e. Rotation 1 vs. Rotation 4)

I confirm that the student answered these questions appropriately. Any questions or concerns about these questions was discussed and addressed with the student during this visit.

_____   _____   _____
         PD and/or CC Signature   **PD and/or CC Printed Name**   **Date**

    C. Ask for a response to the following statement of ALL students:
             Give an example of how you portray "cura personalis" in the clinical setting.

    D. Choose at least 3 others from the list below to assess patient communication in the clinical setting.
             (Pay attention to eye contact, confidence, and response to consider students ability to communicate
             effectively as an entry-level technologist)

    E. Complete a visit form including evidence of <u>effective communication</u> and <u>understanding of "cura personalis"</u> in the details of the form.
             (give thought to the level of communication and understanding of "cura personalis" based on this being the FINAL assessment)

Saint Louis University
Nuclear Medicine Technology Program Site Visit Evaluation Form

Student: _____

Clinical site: Belleville/SLUH PET/CT

Date: 3-25-2021   Arrival time: 1300

Rotation number: 2   Visit number: 2

Site Visitor's Report:
Assessment of student's progress and performance:

Jake continues to do well academically & clinically. He will begin his rotation @ Barnes next week.

Student comments:
Procedures and comments on tasks at the clinical site:

- Was able to see a variety of PET/CT studies at SLUH. (FDG, Cu 64, Flucyclovine)
- Christine had great things to say about Jake. He is a rock star!

Observed or participated:

Proficiency: @ Belleville 10-11 proficiency   PET/CT @ SLUH - 4

Competency Evaluation: Jake did really well today. We completed discussion of ALL Cardiac exams (including PET)

Issues with teaching and supervision:

No issues to report.

Recommendations for next visit:

(PET/CT) or Basic Instrumentation

Grade   (PASS)/ FAIL

✓ Student brought books and organized notes for visit.
✓ Student was able to locate information in notes and/or books.
✓ Student was prepared to discuss any exams they had observed, participated or performed.
✓ Student illustrates understanding of exams discussed
___ Student paperwork is up to date. — Did not review eValue
     eValue

Signatures:
Clinical Coordinator: Talked to ChristineBeth   Site Visitor: _____
     & Theo Mentler via phone

Student: _____   Departure time: 1445

SAINT LOUIS
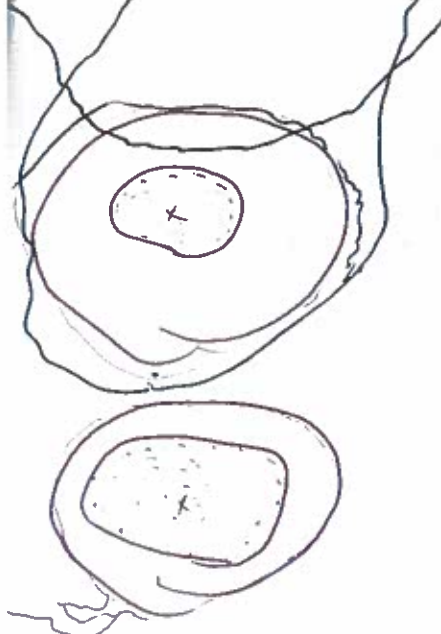
$$\frac{50}{100} = 50\%$$
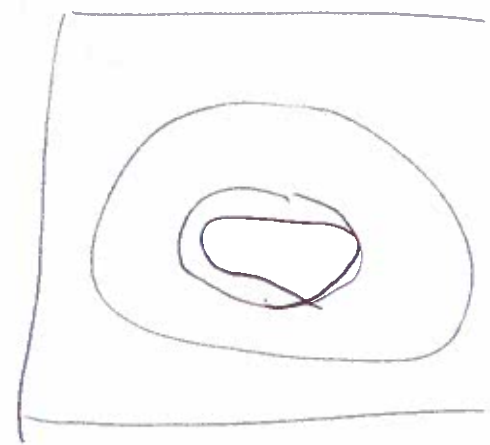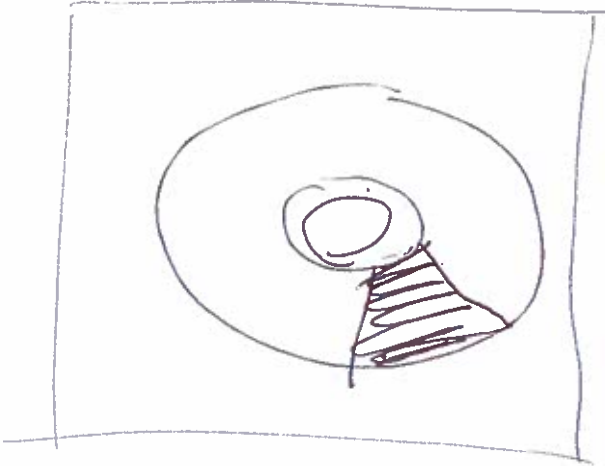
Edge detection

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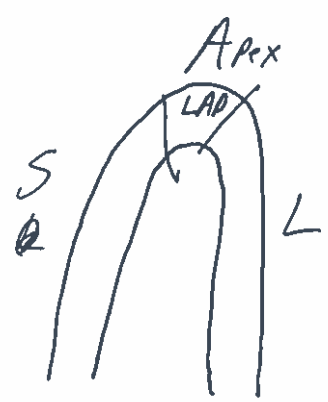
Horizontal
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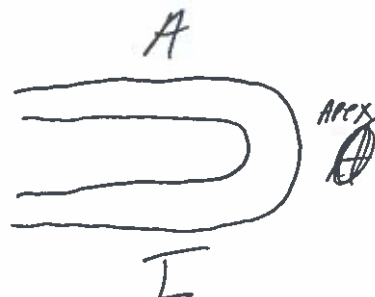
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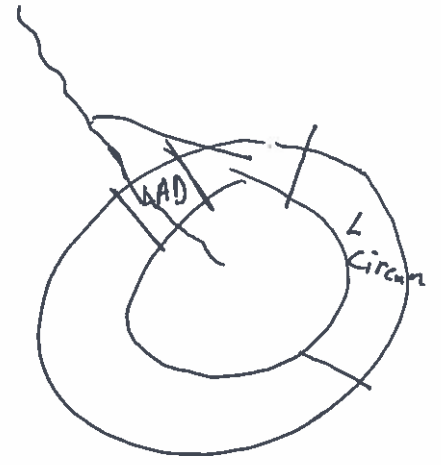
Saint Louis University
Nuclear Medicine Technology Program Site Visit Required Questions

Topic: Positron Emission Tomography / Computed Tomography (PET/CT)

~~SLU H~~ospital

Date: ___04/29/2021___

1. What is the main PET/CT tracer used in oncology studies? How does this tracer localize in cancer in the body? What are the indications for doing an oncology PET/CT study?

2. What is the prep for an FDG-PET scan? Why is the prep important?

3. Tell me about PET and CT QC including but not limited to: normalization scan (performed weekly or monthly), uniformity (blank scan) (performed daily), CT phantom, air calibrations. How do you know the daily PET uniformity scan passes QC?

4. What are the names of the imaging sets that are made during a PET/CT study? How are these made?

5. Name the different PET tracers that are used for dementia studies.

6. Why is Ga68 used in PET?

7. What is the purpose of the CT scan in PET/CT? What are common mAs and keV used for CT as part of a PET/CT scan?

I confirm that the student answered these questions appropriately. Any questions or concerns about these questions was discussed and addressed with the student during this visit.

(signature)	Crystal Botkin	04/29/2021
PD and/or CC Signature	**PD and/or CC Printed Name**	**Date**

NMT Artifact Descriptions and Rubrics for PLO 2

PLO #2
NMT 4960 Capstone in Nuclear Medicine / Capstone Presentation

The NMT capstone is a basic research assignment which includes both oral presentation and paper. The presentation portion of this assignment is used to assess this PLO (see Appendix for assignment prompt and grading rubric).

NMT Student Presentations and Papers

When: TDB

Time: 1:30 PM

Where: DCHS

Each student is to write a 4-5 page paper (cover the topic) and also summarize the paper in a ***10-15 minute*** presentation on the above date. ***Papers are not to be read***! The audience assembled for the paper presentation will be the clinical supervisors and physicians from each of the affiliated hospitals. Students should dress business casual for the presentation. **PowerPoint's must be submitted to Crystal Botkin by TBD, 2022.**

Topics should not be a rehashing of what was presented during the first semester. The topics should include some form of **investigative research** related to nuclear medicine technology. The topic should be of interest to you. Topics will be assigned on a first come, first serve basis. No topic will be duplicated. You must clear your topic through Crystal Botkin before charging ahead with your research. Please confirm your topic by March 2020.

PowerPoint or Prezi should be utilized to get your points and ideas across. Please be prepared to answer questions by our audience. Your ability to convey your knowledge of the approved topic will be considered in the grading process. Handouts are suggested and work should be your own. Papers should be typed and include any references and bibliographies. The format of the papers is not dictated. Many students choose to write in journal article format.

Any questions please contact Crystal Botkin at 977-8592.

NMT INVESTIGATIVE PAPERS SCORE SHEET

STUDENT:_____

Paper should be investigative; with the student gathering data, analyzing it and coming to a conclusion.
If the paper is informative only, take points off. Length should be 4-5 pages and should have a
bibliography. If no bibliography, no research was done – take points off.

Did writer define objective of paper?   1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Adequate research done   1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Was the paper investigative?   1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Was data documented?   1 2 3 4 5 6 7 8 9 10

Was rationale based on data collected?   1 2 3 4 5 6 7 8 9 10

Was conclusion based on data?   1 2 3 4 5 6 7 8 9 10

Grammar / punctuation / neatness   1 2 3 4 5

Length of paper   1 2 3 4 5

Bibliography   1 2 3 4 5

Overall interest of subject   1 2 3 4 5 6 7 8 9 10

Comments:

_____

_____

_____

Total Score: _____

NMT Student Capstone Presentation Evaluation:

1) Note: scoring methodology: Grade on criteria as indicated below, from 5 to 1. Use whole numbers.
2) *Scoring is as follows: 5 = excellent; 4 = very good; 3 = good or average; 2= below average, 1 = poor.*
3) Evaluation categories below are listed in descending merit: 5 is highest, 1 is least.

   A. Project, global:

   5 Project was a basic or primary scientific analysis of a subject important to nuclear medicine performed using background, hypothesis, methods, data acquisition, analysis, discussion, conclusion.

   4 Project involved data gathering or surveys and involved analysis, but lacked one or more of background, hypothesis, methods, data acquisition, analysis, discussion, conclusion.

   3 Subject examined in only a descriptive manner, but discussed new methods or materials AND subject is relevant to nuclear medicine.

   2 Subject was a review of previous material familiar to the audience.

   1 Subject had little relevance to nuclear medicine and of little merit.

   6 Content:

   5 Excellent scientific paper, student demonstrates good understanding of nuclear medicine science. Has hypothesis/premise, methods, results, analysis, conclusion, all with good merit.

   4 Project reflects an understanding of science of nuclear medicine, has a good knowledge of the subject, presentation has hypothesis (or premise), methods, results, analysis, conclusion.

   3 Project shows some understanding of subject matter relevant to nuclear medicine, but only average in respect to methods, results, analysis, conclusion.

   2 Project has minimal relationship to nuclear medicine science, had minimal discussion or analysis hence, minimal understanding of subject matter.

   1 No discernable science presented, little understanding of nuclear medicine science, little or no discussion or analysis or rational conclusion.

   7 Scientific Merit

   5 Project is of significant scientific merit and worthy of submission for publication.

   4. Project shows good merit, but lacks in complete novelty. Yet, worthy of presentation at a local or regional meeting.

   3. Project demonstrates some originality and attempt at discovery, but somewhat lacks in its achievement due to effort or complexity of subject.

   2 Project was a good idea at the start, but failed to achieve its goals and better luck next time.

   1 Project unoriginal, generally plagiarized, lacking rational thought and best kept in a locked file.

   D. Preparation and Presentation

   5 Student is well-prepared, understands the subject matter, focused on the relevant material.

   4 Student is prepared but presentation is weak, i.e. rushed, too jocular, marginally educates audience.

   3 Student is somewhat prepared but presentation is faulty (slides out of order, computer problems).

2   Presentation is marginal, subject matter obscure, images not relevant, audience restless and confused.

1   Presentation put together with minimal effort, material uncoordinated, slides show unorganized.

Promising ^{177}Lu-PSMA-617 Therapy Results in Patients with Metastatic Castration-Resistant Prostate Cancer

Doisy College of Health Sciences, Saint Louis University

NMT 4960: Capstone in Nuclear Medicine

May 13, 2021

Promising ^{177}Lu-PSMA-617 Therapy Results in Patients with Metastatic Castration-Resistant Prostate Cancer

For years, nuclear medicine has been an important aspect in the detection of cancers in the human body. The use of a radioactive element bound to a pharmaceutical allows us to visualize where tumors are located in the human body. However, there is so much more to just diagnosing diseases in the field of nuclear medicine. There are some radiopharmaceuticals that can be used for therapeutic treatment. These therapeutic radiopharmaceuticals specifically bind to the diseased cells and destroy them. ^{177}Lu-PSMA-617 (^{177}Lu-PSMA) is a therapeutic drug currently awaiting FDA approval. It's effectiveness against metastatic castrate-resistant prostate cancer (mCRPC) is quite impressive and the medical community should be aware of its potential. The goal of this investigative essay is to educate the medical community of the efficacy and safety of this drug by reviewing the hematological toxicities and overall survival reports in clinical trials back in 2016.

Men have a 1 in 8 chance of having prostate cancer. Prostate cancer is the second leading cause of death for men in the United States; about 1 in 41 men will die from it (American Cancer Society, 2021). Prostate cancer is most commonly treated with hormone therapy to prevent metastasis. For localized prostate cancer chemotherapy, radiation therapy, and surgery are used (Michaelson et al., 2008). Unfortunately, mCRPC is unresponsive to the typical hormonal therapy treatments and chemotherapy drugs (Sun et al., 2020). About 1.6 – 2.1% of those who are diagnosed with prostate cancer will have mCRPC (Neal et al., 2020). However, mCRPC (along with most prostate cancers) express Prostate-specific membrane antigen (PSMA) up to 1000 times higher than in normal prostate cells (Emmett et al., 2017). Patients with this type of cancer are ideal candidates for ^{177}Lu-PSMA if the malignant cancer cells are PSMA avid.

Physicians should perform ^{68}Ga-PSMA-11 PET scans to determine if the prostate cancer is PSMA avid prior to evaluating if the patient is a good candidate for ^{177}Lu-PSMA.

PSMA is a type II transmembrane protein located in prostate cells. It is involved in nutrient uptake, cell migration, cell survival, and proliferation (Emmett et al., 2017). This protein has an internalization process and allows for endocytosis of bound proteins on the cell surface (Emmett et al., 2017). However, it's important to note that PSMA is not entirely prostate specific, and it is expressed in the salivary glands, small intestine, and in the proximal renal tubules (Emmett et al., 2017). Therefore, if PSMA radioligand therapy is used, there is a radiation dose delivered to those cells as well.

^{177}Lu is becoming more and more popular in radionuclide therapy because it is a medium-energy β-emitter with a maximum energy of 0.498 MeV and a maximum water/tissue depth of 1.6 mm. The short β range makes it better for cancer irradiation. Furthermore, its 6.73-day half-life is important for cancer irradiation because the PSMA avid cells will receive a high radiation dose for a long period of time. ^{177}Lu also emits low-energy γ-rays at 113 keV and 208 keV (Emmett et al., 2017). These γ-rays allow for imaging under scintillation detectors by placing a 20% window around 113 and 208 keV and using a low energy all-purpose collimator. According to Medhat Osman, MD, PhD., a nuclear medicine physician at SSM Health Saint Louis University Hospital, the imaging of ^{177}Lu would be compared to ^{68}Ga-PSMA-11 PET scans to ensure that the therapeutic drug went to all of the PSMA avid tumors. The PET scan is important in determining if the mCRPC is PSMA avid, because if it is not PSMA avid but is FDG avid, then ^{177}Lu-PSMA cannot be given. By having ^{177}Lu bound to PSMA-617, a peptide that binds to the PSMA receptor, treatment can be performed on prostate cancers with an overexpression of PSMA. The specificity of this therapy can result in the mCRPC slowing down

in progression which could lead to a longer survival period compared to the basic standard of care (BSC).

Safety is an important aspect for any drug seeking approval from the United States Food and Drug Administration (FDA). Radiopharmaceutical drugs, just like any drug, need to pass the rigorous expectations the FDA sets out. ^{177}Lu-PSMA is no exception, even though it is approved for use in Australia and Europe, the FDA still wants to ensure that the drug is, most importantly, safe and effective at what it's meant to treat. Reviewing its safety is important because the β emission from ^{177}Lu also kills red blood cells (RBC), white blood cells (WBC), and platelets which could result in hematological toxicities if enough are killed.

The following study used the Common Terminology Criteria for Adverse Events (CTCAE) version 4.0 to classify their hematological toxicities. Grade 1 is "Mild; asymptomatic or mild symptoms; clinical or diagnostic observations only; intervention not indicated", Grade 2 is " Moderate; minimal, local or noninvasive intervention indicated; limiting age-appropriate instrumental activities of daily living", Grade 3 is "severe or medically significant but not immediately life-threatening; hospitalization or prolongation of hospitalization indicated; disabling; limiting self-care activities of daily living", and Grade 4 is "life-threatening consequences; urgent intervention indicated" (US Department of Health and Human Services et al., 2009).

A study conducted by Hojjat Ahmadzadehfar and colleagues in 2016, observed the hematological effects of ^{177}Lu-PSMA by itself and in conjunction with [223]Ra-dichloride (Xofigo). Group 1 was composed of 20 patients who had previously received Xofigo for bone metastases. Group 2 was composed of 29 men who have not received bone-targeted radionuclide therapy. An equal percentage of individuals in each group have been treated with chemotherapy,

hormone therapy, and external radiation. Figures 1 and 2 show the baseline blood values and the hematotoxicity results of both groups after receiving 3 cycles of ^{177}Lu-PSMA, respectfully. Figures 3 and 4 are visual bar graphs of Figures 1 and 2 that show the baseline values and post-therapy values for group 1 (values are in % of patients in the group). After 3 weeks of RLT, there is a 10% shift in the white blood cells (WBC) grades from grade 0 to grades 1 and 2 toxicity. The patients' hemoglobin also improved with there being 25% more patients with grade 0 toxicity. In addition, 24% more patients had no platelet toxicities. Figures 5 and 6 are visual bar graphs of Figures 1 and 2, it shows the baseline values and post-therapy values for group 2 (values are in % of patients in the group). There is a 4% jump in those that had no WBC toxicities after the RLT. There was an impressive 62% increase in those with no hemoglobin toxicities. The number of patients with no platelet toxicities surprisingly dropped by 19%, however those patients mainly developed a mild grade 1 toxicity. The study concluded, "more than 60% of the patients did not show any hematological toxicities"(Ahmadzadehfar & Zimbelmann., 2017). ^{177}Lu-PSMA not only has low hematological toxicity by itself, but it also can be used in conjunction with Xofigo because it has such low toxicity.

When it comes to cardiotoxicity, ^{177}Lu-PSMA has a big advantage over chemotherapy medications. According to a study done by Jafari and colleagues, ^{177}Lu-PSMA did not have any significant cardiotoxicity. The study was conducted by monitoring patients' troponin I serum values before and after treatment. All troponin I values were within the normal range (Jafari et al., 2021). However, the study did state that more trials needed to be performed in order to verify their conclusion.

In order to test the efficacy of the drug, data analysis was conducted in several different groups. The patients were reorganized into various groups for analysis after the clinical trials

were completed. The analysis done was focused on the median overall survival of patients. The median overall survival is " the length of time from either the date of diagnosis or the start of treatment for a disease, such as cancer, that half of the patients in a group of patients diagnosed with the disease are still alive. In a clinical trial, measuring the median overall survival is one way to see how well a new treatment works" (National Cancer Institute).

From 2014 - 2017 Ahmadzadehfar and colleagues monitored 100 patients over the course of 347 cycles of ^{177}Lu-PSMA. Figure 7 shows the median survival graph of those who had the RLT. The green line shows patients who did not have a good response to therapy, while the blue line represents a good response to therapy. The response to therapy was measured by comparing the PSA levels prior and after treatment cycles. Those who responded well to the therapeutic drug experienced lowered PSA levels after the cycle. The median overall survival of those with no good response (green line) to the first cycle is 29 weeks. The median overall survival of those who had a good response to the first cycle (blue line) is 71 weeks. The calculated overall median survival is 60 weeks for those that are on ^{177}Lu-PSMA (Ahmadzadehfar & Wegen, 2017).

This is much longer than the basic standard of care (BSC) of just chemotherapy, radiation therapy, and hormone therapy. Rahbar and colleagues measured the median overall survival of patients on 28 patients ^{177}Lu-PSMA and 20 patients who just received BSC. Figure 8 shows us the comparison of BSC to ^{177}Lu-PSMA with the dotted line representing BSC and the solid line representing ^{177}Lu-PSMA. The median overall survival for BSC is 19 weeks and ^{177}Lu-PSMA is 29 weeks. It's important to note that 30% of the population were still alive in the ^{177}Lu-PSMA group meanwhile the whole entire BSC group were deceased (Rahbar, 2016).

In conclusion, the hematological toxicities of ^{177}Lu-PSMA are low; it can also be used in conjunction with another radioactive therapy, like Xofigo, in treatment plans for patients. This

allows for doctors to slow the progression of mCRPC and improve the quality of life for the patient during their time on the treatment cycle because of how minimal the toxicities are. The median overall survival reports further prove how effective this drug is in slowing the progression, by increasing the survival time by at least 10 weeks from today's basic standard of care. For those that show good response on the first cycle, the survival time can increase by up to 60 weeks. This drug has lots of potential in the fight against prostate cancer, and hopefully, men in the United States who suffer from prostate cancer can soon benefit from its effects.

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Figure 1

Baseline WBC, Hemoglobin, and Platelet Toxicity Grades for Groups 1 and 2.

	Group 1 (Hx of Ra-223)			Group 2			
	CTC 0° (%)	CTC 1°–2° (%)	CTC 3° (%)	CTC 0° (%)	CTC 1°–2° (%)	CTC 3° (%)	*p*-value
WBC	17 (85)	3 (15)	0 (0)	26 (89.7)	2 (6.9)	1 (3.4)	0.47
Hb	3 (15)	17 (85)	0 (0)	4 (13.8)	23 (79.3)	2 (6.9)	0.48
Plt	14 (70)	6 (30)	0 (0)	27 (93)	2 (7)	0 (0)	0.04

WBC: white blood cells, Hb: hemoglobin, Plt: platelets

Figure 2

WBC, Hemoglobin, and Platelet Toxicity Grades for Groups 1 and 2 After 3 Cycles of RLT.

	Group 1 (Hx of Ra-223)				Group 2				
	CTC 0° (%)	CTC 1° (%)	CTC 2° (%)	CTC 3° (%)	CTC 0° (%)	CTC 1° (%)	CTC 2° (%)	CTC 3° (%)	*p*-value
WBC	15 (75)	3 (15)	2 (10)	0 (0)	27 (93.1)	2 (6.9)	0 (0)	0 (0)	0.12
Hb	8 (40)	1 (05)	10 (50)	1 (05)	22 (75.8)	2 (6.9)	2 (6.9)	3 (10.4)	0.008
Plt	16 (93.8)	2 (10)	1 (5.0)	1 (5.0)*	21 (72.4)	5 (17.2)	1 (3.4)	2 (7.0)+	0.88

Abbreviations: WBC: white blood cells, Hb: hemoglobin, Plt: platelets
* This patient has grade 0 anemia
+ One patient with grade 3 anemia and one with grade 0

Figure 3

Bar Graph Showing Baseline WBC, Hemoglobin, and Platelet Toxicity Grades for Group 1.
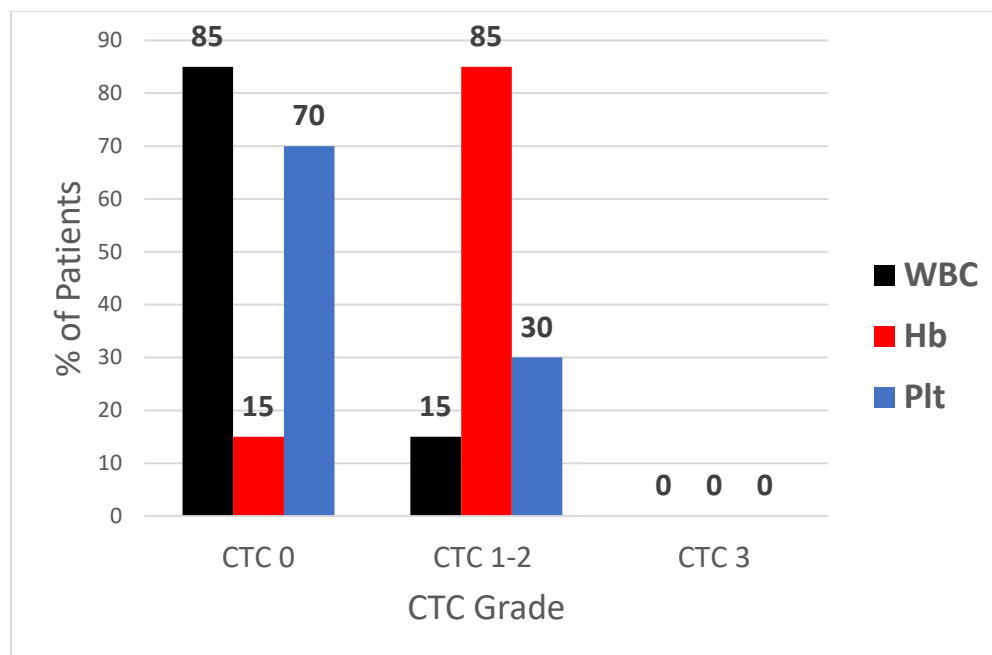
Figure 4

Bar Graph Showing Baseline WBC, Hemoglobin, and Platelet Toxicity Grades for Group 2.
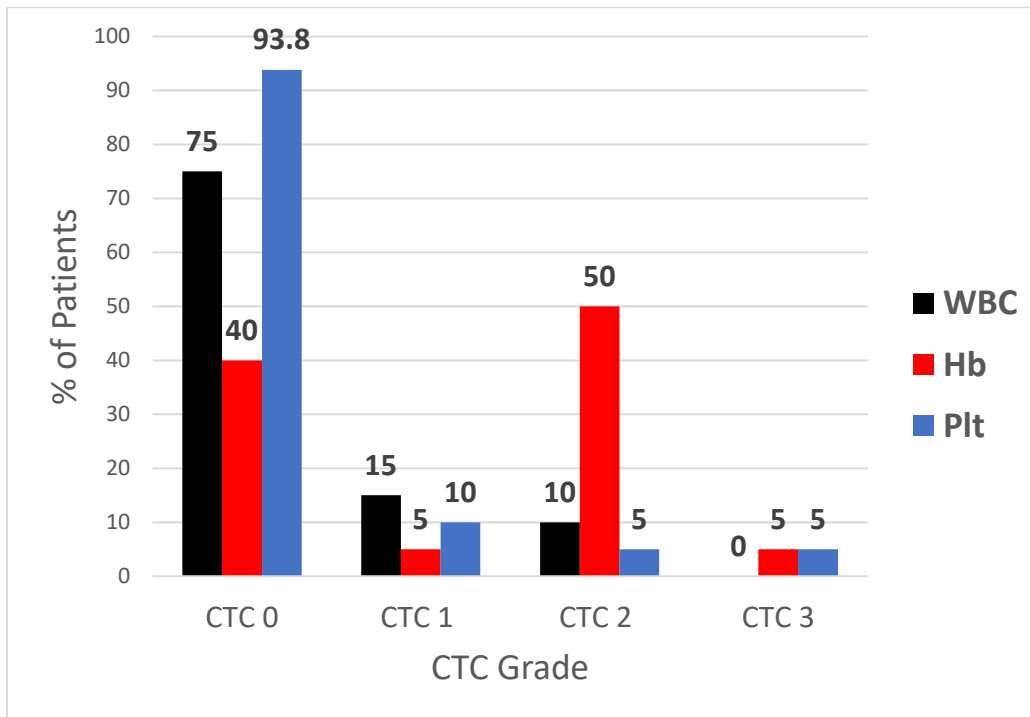
Figure 5

Bar Graph Showing Baseline WBC, Hemoglobin, and Platelet Toxicity Grades for Group 2.
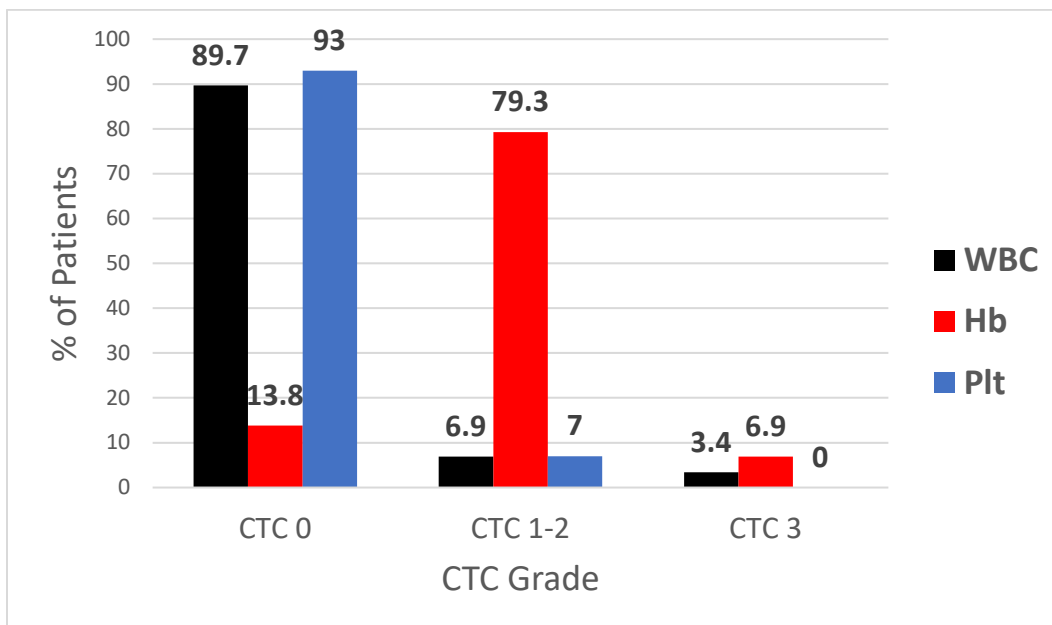
Figure 6

Bar Graph Showing WBC, Hemoglobin, and Platelet Toxicity Grades for Group 2 After 3 Cycles of RLT.
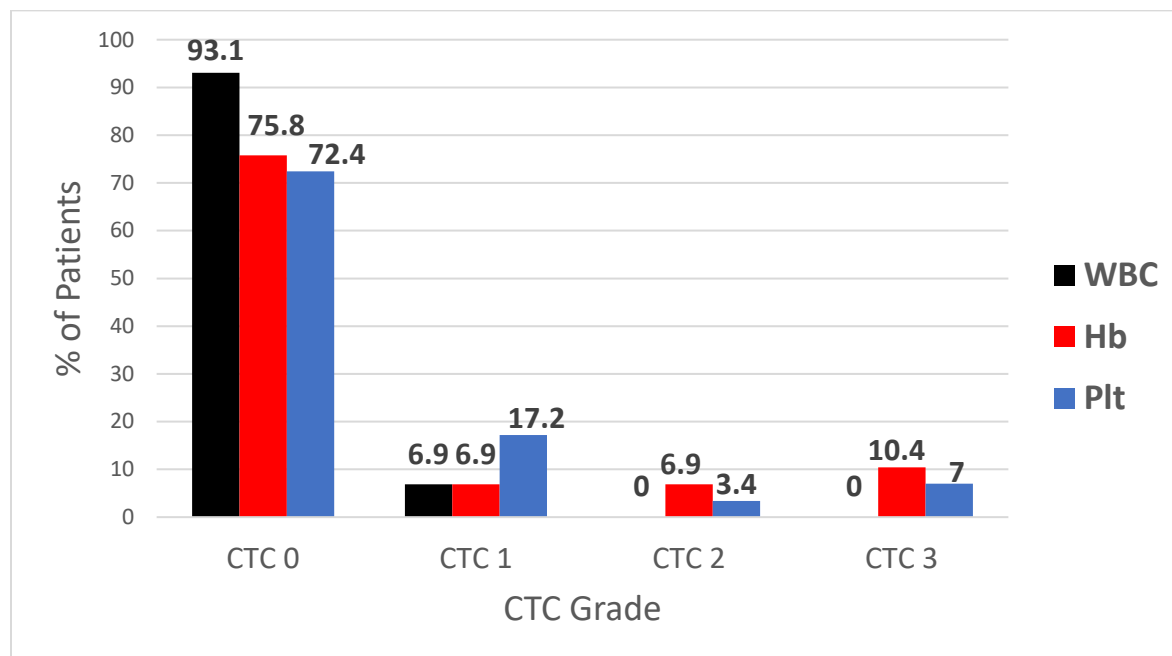
Figure 7

Line Graph Comparing Median Overall Survival in Patients with Poor and Good Response to the First Cycle of ^{177}Lu-PSMA.

Median OS

All patients: 60 weeks
Responder to the first cycle: 71 weeks
Non-responder to the first cycle: 29 weeks

***P*<0.0001**
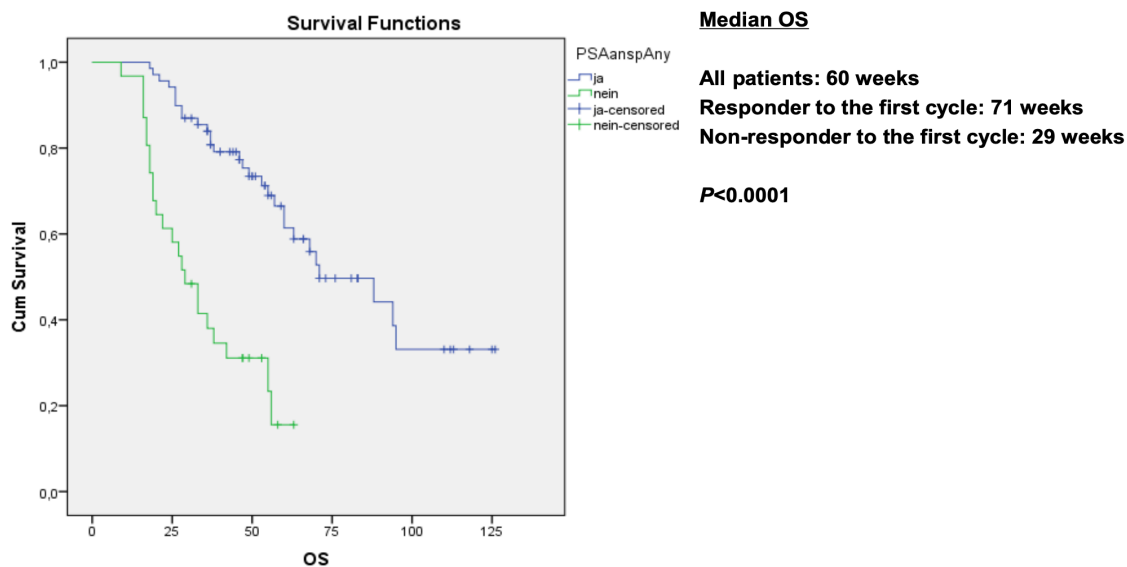
Figure 8

Line Graph Comparing Median Overall Survival in Patients Undergoing Basic Standard Care

and ^{177}Lu-PSMA.

NMT INVESTIGATIVE PAPERS SCORE SHEET

STUDENT : _____ _____ _____

Paper should be investigative; with the student gathering data, analyzing it and coming to a conclusion. If the paper is informative only, take points off. Length should be 4-5 pages and should have a bibliography. If no bibliography, no research was done – take points off.

Did writer define objective of paper?   1 2 3 4 5 6 7 8 9 10 11 12 13 14 (15)

Adequate research done   1 2 3 4 5 6 7 8 9 10 11 12 13 14 (15)

Was the paper investigative?   1 2 3 4 5 6 7 8 9 10 11 12 13 14 (15)

Was data documented?   1 2 3 4 5 6 7 8 9 (10)

Was rationale based on data collected?   1 2 3 4 5 6 7 8 9 (10)

Was conclusion based on data?   1 2 3 4 5 6 7 8 9 (10)

Grammar / punctuation / neatness   1 2 3 4 (5)

Length of paper   1 2 3 4 (5)

Bibliography   1 2 3 4 (5)

Overall interest of subject   1 2 3 4 5 6 7 8 9 (10)

Comments:

good paper & graphs
interesting subject since we are starting soon!

Total Score: ___100%___

<u>PLO #2</u>
NMT 4410 and NMT 4910 Clinical Practicum/Final evaluation questions regarding effective communication in patient interaction

The NMT program faculty conduct oral, comprehensive evaluations of each NMT student during the last month of the program. During this evaluation, the students are assessed for the ability to provide effective communication skills regarding patient interactions.

Example patient communication questions/scenarios

1. What do you do if you suspect one of your patients who is in a nursing home, long-term care facility, or in-home care facility is experiencing neglect or abuse?
   a. Report it to the Missouri department of health and Senior services and notify your immediate supervisor.

2. I read that I am getting the same thing that is in rat poison from Tl-201. How will this affect me?

3. Will this injection give me cancer?

4. How is this different than an X-ray or CT scan?

5. What do you do when you think someone might be suicidal?
   a. Be sensitive but ask direct questions
   b. How are you coping with what's been happening in your life?
   c. Do you ever feel like just giving up?
   d. Are you thinking about dying?
   e. Are you thinking about hurting yourself?
   f. Are you thinking about suicide?
   g. Have you ever thought about suicide before, or tried to harm yourself before?
   h. Have you thought about how or when you'd do it?
   i. Do you have access to weapons or things that can be used as weapons to harm yourself?
   j. Social work is a great hospital resource want you get their answers.

6. How do you ask an underage girl if she's pregnant while her parents are in the room?

7. A patient has a CT with contrast and a PET/CT ordered on the same day which exam do you do first and why?

8. A patient has a bone density and a nuclear medicine scan the same day which one do you do first?
   a. Bone density first then nuclear medicine

9. A patient receives an order for two nuclear medicine scans on the same day a lung scan and a HIDA what do you do first?

10. A patient is scared about the total radiation from a diagnostic nuclear medicine exam. How do you calm their fears? Roleplay this with the students and pretend you are the scared patient make them explain it to you.

11. A parent of a 20-year-old patient demands to be told the results of a nuclear medicine study, what do you do?

12. What do you do if a patient refuses to tell you pregnancy status before exam?

13. What are your options if you notice your boss is willfully violating regulations?
    a. If it's an NRC violation you can contact the local RSO or call the NRC directly
    b. If it's a joint commission violation you can report it to the joint commission.
    c. If it's a hospital policy, you can go above your boss.
    d. "Doin' the right thing is never wrong" Ted Lasso

14. How do you respond to a patient when they question you about the syringe shield or pig, they see you carrying their dose in? i.e. "Are you sure this is safe for you to inject into me?"

15. How do you respond when the patient askes you what you see on their scan? i.e. "What is that I see on the screen?" "Does the scan show that everything is ok with me?"

16. How would you respond to a patient that asks you the risks vs. benefits of having the scan they are scheduled for?

17. What would you do if a patient told you they may be pregnant after already injecting them with the radiopharmaceutical?

Saint Louis University
Nuclear Medicine Technology

Trainee Evaluation

Once submitted this evaluation will be available for review and for comments to be added by the following roles: Clinical Supervisor and Student.

Evaluator:	Sarah Frye - Administrator	**Subject:**	Professional Phase Student
Activity:	2022 Rot 4 Week 6	**Site:**	Mercy Hospital St. Louis
Evaluation Type:	Site Visit	**Completion Date:**	07/13/2022
Request Date:	07/13/2022		
Period:	2022 Rot 4 Week 6	**Dates of Activity:**	07/11/2022 **To** 07/15/2022
Subject Participation Dates:	07/11/2022 **To** 07/15/2022		

Please select the option that best matches your level of agreement with this evaluation.

○ Agree   ○ Disagree

If you disagree, please explain your reasons below.

Comments entered above may be viewed by your program director or advisor and may be a part of a printed report.

(Question 1 of 9 - Mandatory)

Student Comments	
List of procedures the student has received proficiencies:	STUDENT s currently in his 6th week at Mercy Saint Louis. He has signed off on 12 studies including: 3-phase bones, WB bones, Bones SPECT, gastric emptying, hepatobiliary, lung perfusion, MPI rest and stress, QC flood, QC resolution, renal with Lasix, and RVG.
Issues with teaching and supervision:	none

Site Visitor's Report

(Question 2 of 9 - Mandatory)

Site Visitor Comments	
Assessment of student's progress and performance:	Andy Cooke stated that: "Student has been doing a great job! I asked around the department and nobody had any areas of concern for him, keep up the good work!! He has been picking up on things quickly and able to work as an independent tech at most times. Very impressive."
Competency Evaluation:	Student did great for his final evaluation visit. He had a "day in the lift of" final exam where he discussed all aspects of Nuclear Medicine including specific studies, equipment, patient interactions, safety, physics, radiopharm, etc. We finished his evaluation with 5 role playing questions in which he had to discuss why and how he would do things in one way over another way.
Recommendations for next visit:	None. This was the final evaluation visit.

Site Visit Grading   *(Question 3 of 9 - Mandatory)*

Student brought books and organized notes for visit.

NO	YES	
0	>> 1 <<	2

Student was able to locate information in notes and/or books.   *(Question 4 of 9 - Mandatory)*

NO	YES	
0	>> 1 <<	2

Student was prepared to discuss any exams they had observed, participated or performed.   *(Question 5 of 9 - Mandatory)*

NO	YES	
0	>> 1 <<	2

Student illustrates understanding of exams discussed.   *(Question 6 of 9 - Mandatory)*

NO	YES	
0	>> 1 <<	2

Student's eValue record is up to date.   *(Question 7 of 9 - Mandatory)*

NO	YES	
0	>> 1 <<	2

Pass/Fail Site Visit Grade

(Question 8 of 9 - Mandatory)

Did this student complete 4 of the 5 items above?

If so, mark: PASS
If not, mark: FAIL

FAIL	PASS	
0	>> 1 <<	2

Additional comments?   *(Question 9 of 9)*

He continues to impress and do a great job in the clinic and in discussions, Keep up the great work, Omar.

Additional Evaluation Comments
Clinical Supervisor Has Not Posted Comments
Student Has Not Posted Comments

PLO #3
NMT 4350 Nuclear Medicine Information Systems / Case Study Project (Written)

This case study project serves as an artifact for this PLO. Each student is given an assignment prompt to evaluate an assigned case study. This assignment is used to demonstrate the ability to apply the skills and knowledge of processing and evaluating nuclear medicine exams based on the knowledge and skills learned in this course. (See appendix for assignment prompt and assessment rubric)

Nuclear Medicine Information Systems Mid Term Project Prompt

Group work: **You will need to include the following items for each examination. You will answer the questions included in the prompts below based on the .pdf images that are given to you for each assignment. These will most likely be sent via email. You will need to use what you have learned in this course and your other Nuclear Medicine courses so far to answer the questions.**

- Indications and contraindications for the examination ordered
- Alternate and/or complementary imaging choices (e.g., ultrasound, CT, etc.)
- Normal and abnormal organ function
- Patient preparation
- Radiopharmaceutical choice, dose, and route of administration
- Adjunctive medications used for this procedure, dose, and route of administration (e.g., CCK, Morphine, etc.)
- Equipment selection (e.g., camera, collimator, etc.)
- Patient positioning
- Acquisition protocol parameters
  - Please list in detail the acquisition protocol for your assigned patient examination.
- Processing protocol parameters
  - All processing protocol parameters should be complete and detailed. (e.g., matrix, type of images acquired, time per frame, etc.)
  - Content should describe the procedure for processing the acquired data for your assigned patient. This includes what images you process, what ROI are used, how the ROI are drawn (this is like what you will be doing individually for each assignment)
- Report critique & analysis – include what is wrong with the study is anything (could be in acquisition or processing)
  - Your critique & analysis should be clearly articulated and specific.
  - It should be concise, accurate, and include any issues, problems or corrections that would be necessary to properly interpret the report.
- Diagnostic findings (what you think is normal or wrong with the patient from this exam)
  - Must be complete and accurate.

- Findings must be described in clear and specific terms.

<mark>Hepatobiliary group assignment due Tuesday 09/15/2020 by 11:59pm</mark>

Individual Work: For each exam used for the group work .pdf images, you will be assigned one to two individual processing assignments to be completed during class time and reviewed by the instructor. These will be completed using the Philips IntelliSpace software.

<mark>Hepatobiliary individual assignment due TBD by 12:15pm</mark>

Rubric for Capstone NMIS Case Study Evaluation

Points Achievable	Complete, Excellent detail	Complete, Good detail	Incomplete, Some or no detail
Indications & Contraindications	(5)	(4-3)	(2-0)
Alternate and/or Complimentary Imaging Choices	(5)	(4-3)	(2-0)
Normal & Abnormal Organ Function	(5)	(4-3)	(2-0)
Patient Preparation	(5)	(4-3)	(2-0)
Radiopharmaceutical Selection & Administration	(5)	(4-3)	(2-0)
Augmented Drugs	(5)	(5)	(0)
Equipment Selection	(5)	(5)	(0)
Patient Positioning	(5)	(5)	(0)
NMIS Image Acquisition Parameters	(5)	(4-3)	(2-0)
NMIS Processing Protocol Parameters	(10-9)	(8-7)	(6-0)
NMIS Report Critique & Analysis	(25-19)	(18-16)	(15-0)
NMIS Diagnostic Findings	(10-9)	(8-7)	(6-0)
Organization of Case Study & Formatted Correctly	(10-9)	(8-7)	(6-0)

Re: NMIS Final Project

Sarah Frye <sarah.frye@health.slu.edu>
Fri 12/3/2021 2:44 PM
To: Chloe Reichardt <chloe.reichardt@slu.edu>
Cc: Bailey Wood <bailey.wood@slu.edu>

📎 1 attachments (41 KB)
NMIS final project grade BW-CR 2021.pdf;

Hi Chloe and Bailey,

You both did a good job on this assignment. I have very few comments.

- you wrote a nice paper
    - you used appropriate grammar and punctuation
    - you correctly sited your references
- in the second paragraph, you should define COPD
- in the third paragraph, you should say Tc99m instead of Tc
- in the eighth paragraph, you should define what you mean by reducing the number of particles
- for normal/abnormal function or image critique, I would have like to have what it means to have matched and mismatched defects on a ventilation and perfusion study
- I also did not see where you had alternative studies. I saw that you have CT and XRay. There are others also.
- I am also impressed with your image interpretation skills.
    - the only other thing I was looking for point wise was that the ventilation background is also wrong (you noticed that the perfusion was wrong)
    - an aspect that you may have 'missed' was that the technologist actually missed the breath in for the ventilation. this is hard to tell. (there are no points taken off for this)

Final grade: 91/100

Nicely done!

Sarah

From: Chloe Reichardt <chloe.reichardt@slu.edu>
Sent: Tuesday, November 30, 2021 1:42 PM
To: Sarah Frye <sarah.frye@health.slu.edu>
Cc: Bailey Wood <bailey.wood@slu.edu>
Subject: NMIS Final Project

Professor Frye,
Attached is a PDF of Baily Wood and my final project. I shared the google doc with you like usual but also wanted to send a PDF version to ensure you received it (both forms are exactly the same). I did not see a way to upload it into canvas.
Thank you,

Chloe Reichardt

Bailey + Chloe

Rubric for Capstone Case Study Evaluation for NMIS Final Grade

Points Achievable	Complete, Excellent detail	Complete, Good detail	Incomplete, Some or no detail
Indications & Contraindications	(5)	(4-3)	(2-0)
Alternate and/or Complimentary Imaging Choices	(5)	(4-3) 3	(2-0)
Normal & Abnormal Organ Function	(5)	(4-3) 3	(2-0)
Patient Preparation	(5)	(4-3)	(2-0)
Radiopharmaceutical Selection & Administration	(5)	(4-3)	(2-0)
Augmented Drugs	(5)	(5)	(0)
Equipment Selection	(5)	(5)	(0)
Patient Positioning	(5)	(5)	(0)
NMIS Image Acquisition Parameters	(5)	(4-3)	(2-0)
NMIS Processing Protocol Parameters	(10-9)	(8-7)	(6-0)
NMIS Report Critique & Analysis	(25-19) 20	(18-16)	(15-0)
NMIS Diagnostic Findings	(10-9)	(8-7)	(6-0)
Organization of Case Study & Formatted Correctly	(10-9)	(8-7)	(6-0)

Final 91/100

Final Project - Ventilation and Perfusion Scan

Nuclear Medicine is a realm of medicine that gives essential physiologic information that may be difficult, or impossible, to determine using other imaging modalities. One test that can be done is a V/Q scan, or a ventilation and perfusion scan, that provides quantitative information of the lungs. The ventilation portion of the scan shows how the air is flowing and the perfusion portion shows how blood is flowing throughout the lungs. These scans are done in conjunction because they both provide needed information to help doctors determine a correct prognosis for the patient. There are multiple uses for this test and they are all very important for imaging the physiology of the lungs.

The ventilation part of this exam uses Xe-133 gas inhalation through mouth apparatus 10-20 mCi, or Tc-99m DTPA aerosol inhalation through mask 25-40 mCi. One of the most common indications for a VQ scan with Xe-133 is for the evaluation and detection of acute or recurrent pulmonary embolism or evaluation of COPD in conjunction with lung perfusion. Patients with chest pain, low blood oxygen saturation, lung carcinoma, and bronchial obstruction are also candidates for a lung ventilation exam (Shackett, 2020).

There are some contraindications that may interfere with this study, like other exams such as a recent Nuclear Medicine cardiac exam or other Tc-based scans. Females that are pregnant or nursing should be evaluated to determine necessity, but this exam is not completely ruled out from being performed on these individuals (Shackett, 2020).

A normal study using Xe-133 would show uniform and symmetric wash-in, equilibrium, and wash-out pictures in both lungs with the left lung having the typically light cardiac notch. The wash-out will be fairly complete with no retention of gas. A normal study using Tc-99m DTPA aerosol would show a bright pharynx from inhalation. The stomach and gut may also show from swallowed contaminated saliva, but this can be reduced by having the patient expectorate into a tissue as soon as the mouthpiece is removed and disposed to reduce this phenomenon. Trachea and bronchi show branching nicely with this method as well (Shackett, 2020).

An abnormal study with Xe-133 will show areas of decreased activity occur where the lung was not ventilated. Mismatching areas of activity with two or more segmental defects in the perfusion study are indicators for pulmonary embolism (PE). COPD and emphysema show as inhomogeneous wash-in, patchy equilibrium, and areas of trapping delaying wash-out. Xe-133 is fat soluble and partially soluble in blood so localization and retention in liver with ventilation indicates liver fatty filtrates prevalent with alcoholics and obese patients. One lung not presenting or presenting very poorly indicates atelectasis, complete or partial bronchial obstruction, or surgery to lungs (Shackett, 2020).

To proceed with the ventilation part of this study there should be a doctor's order and it should be verified. Patient history and any prior exams should be checked, especially a chest x-ray or CT scan to assist the technician. If a chest x-ray or CT has not been acquired, suggesting an order within 24 hours would assist with diagnostics procedures. The patient's identity must be confirmed by asking them their full name and date of birth. The equipment used will be a gamma camera with a large field of view and a collimator that is low energy, all purpose or low energy, high resolution for both Tc-99m DTPA and Xe-133 (Shackett, 2020). The patient should be in a

preferred sitting position with the camera posterior, or in supine position, camera posterior. This is unless perfusion is done first, then use the best projection that will show visualized defects. For Xe-133, the room should have negative pressure with appropriate exhaust.

For the ventilation using Xe-133 we will set a 20% window at 81 keV with a 128 x 128 matrix. We will start with one dynamic image that is the first breath which will last as long as the patient can hold their breath. Next we acquire a flow study for 20-60 seconds a frame where the patient will breath in the Xe-133 through a mouth apparatus for about 3 minutes for the wash-in phase, 60 second posterior and two oblique. The equilibrium portion will consist of 4 frames at 45 seconds a frame, the wash-out will contain 5 -20 frames at 15-60 seconds a frame 2 minutes posterior and two posterior obliques that last about 4 minutes. The whole acquisition time will last a total of about 7-8 minutes. When using Tc-99m DTPA, we will set a 20% window at 140 keV with 128 x 128 matrix and acquire static images (500,000- 1 million counts). The patient will breath in the aerosol with a face mask for about 3 minutes and then posterior, left posterior oblique, left lateral, anterior, right posterior oblique and right lateral images will be collected. For Single Photon Emission Computed Tomography (SPECT) or SPECT/CT we can do a circular or non circular orbit, step and shoot or continuous with a 128 x 128 matrix at 360 degree with 128 stops at 10 seconds a stop. The technician should follow manufacturers recommendations for CT acquisition (Shackett, 2020).

Next, the perfusion scan would be performed. This exam uses 2-6 mCi of Tc99m via IV. The indications for performing this exam are similar to those for the ventilation. Perfusion imaging is indicated for evaluation of a pulmonary embolism, evaluating pulmonary perfusion and perfusion affected by asthma or inflammatory disease, evaluating chest pain, and evaluation of a lung transplant (Shackett, 2020). This exam is contraindicated in patients with pulmonary

hypertension, a right-to-left shunt, or patients that are pregnant/nursing. In these patients, sometimes you may be able to reduce the number of particles in the Tc99m MAA and still perform the exam. Another contraindication is in patients that are hypersensitive to human serum albumin.

To prepare for this exam is almost the same as for the ventilation portion, except after identifying patient, explaining the exam and obtaining their recent chest x-ray, you should also obtain a list of their medications and have the patient take several deep breaths before and during the injection of the tracer to help with even distribution. The patient will be lying supine for the injection as well as for the images, ensuring the lungs are in the field of view. The tracer will be the only drug that this patient will receive during the exam.

After the injection, it is time to begin the images. Since we are using a Tc99m radiopharmaceutical, the computer will be set to a 140 keV energy peak with a 20% window. We will also use a low energy, high resolution collimator or a low energy, all purpose collimator on a large field of view camera. We will start with a perfusion flow, dynamic image, beginning acquisition just prior to injection. We will acquire images for 1-3 sec/frame for 60-120 sec, using a 64x64 or 128x128 matrix. Next, we will acquire static images to 500,000-1 million counts, or to protocol, and use a 128x128 or 256x256 matrix. The patient will remain supine and we will acquire anterior, right lateral, right anterior oblique, right posterior oblique, posterior, left lateral, left anterior oblique, and left posterior oblique images, or per protocol. A whole body image can also be acquired at 10-14 cm/min, using a 256x1024 matrix, dual head acquisition of anterior and posterior images if wanting quantitation. A final option is to acquire a SPECT or SPECT/CT image. This would be done using a circular or non-circular orbit, step and shoot or continuous acquisition with a 128x128 matrix. You would acquire 360 degrees around the patient with 60-64

stops for 20-30 sec a stop. If doing SPECT/CT, use manufacturers recommendations for CT acquisition (Shackett, 2020).

Normal results for these images should show homogenous uptake in the lungs, except there may be normal attenuation from the breasts, heart and skeletal structures surrounding the lungs. An abnormal image would show a wedge-shape or segmental defect of decreased activity. This would indicate a high probability of a pulmonary embolism if this defect is not matched on the ventilation scan (Waterstram-Rich et al., 2017). If the defect does match a defect on the ventilation scan, it can indicate COPD, bullae, emphysema, lung dysfunction or tumors.

When processing both ventilation and perfusion, the flow and the static should be scaled so you can best see the regions of interest. For quantitation, a region of interest can be drawn around the lungs, even divided into lobes or segments if needed. This is a way to identify the function in each region, as well as determine feasibility of a lung reduction. A normal ratio of right:left lung is 55:45 (Waterstram-Rich et al., 2017). If SPECT or SPECT/CT images are acquired, transverse, sagittal and coronal images should be processed and displayed.

When examining the images that were sent to us, the first thing we noticed was that there was no x-ray taken in the last 24 hours, the last x-ray this patient had was taken 8 years ago. There should have been a recent x-ray acquired, or an attempt at ordering one. Another thing that stood out to us was that the background differs image to image, and that the background overlaps the region of interest on the perfusion images. Also, one of the larger errors is that the lungs are labeled correctly left and right for the perfusion images, but when looking at the ventilation images they are labeled backwards. This makes us unsure if we can trust the numbers from the quantitation. When looking at the collimators, it says a VXGP collimator was used, however

both studies require a LEAP or LEHR collimator. For the matrix sizes, the correct size was used for the perfusion, but the ventilation should also have had a 128x128 matrix size. A good thing with this study is that the proper doses of radiopharmaceuticals were used and the patient was positioned supine, if that was for perfusion. For Xe-133 ventilation the patient should be sitting upright.

What we first noticed was that the images showed a definite even distribution with a normal wash-in phase and wash-out phase. The statistics on the graph for the wash-out phase show that the Left lung T ½ (sec) is 30 and the Right lung T ½ (sec) is 60. The right lung showed to have higher uptake in a 69:30 ratio when normal uptake ranges should be 55:45 (Waterstram-Rich et al., 2017), but it was hard to find these numbers totally significant considering the improper labeling for these images. For the inferior section of the right lung it seemed to be that there was a lack of perfusion and seemed to be a matching defect on the ventilation study.

Given both the ventilation and perfusion portions of this study was necessary to find matching defects in the lungs. The human error that occurred due to improper labeling and background along with inconsistency in matrix size and collimators were all considered when determining the diagnostic results and reviewing the quantification. The addition of current x-ray images and other studies would be beneficial for a proper diagnosis considering these errors. Overall, this shows the importance of properly processing a study.

References

Shackett, P. (2020). Lung Perfusion and Lung Ventilation. In *Nuclear medicine technology: Procedures and Quick Reference* (pp. 157–175). essay, Wolters Kluwer.

Waterstram-Rich, K. M., Gilmore, D., Hubble, W. L., & Botkin, C. (2017). Respiratory System. In Nuclear medicine and PET/CT: Technology and techniques (pp. 469–488). essay, Elsevier.

PLO #3
NMT 4430 Emerging Technologies / Case Study Presentation (Oral)

The presentation of interesting nuclear medicine exams is used as an artifact for this PLO. Each student is given an assignment prompt to identify 2 different nuclear medicine exams to present in class. One if the cases is assigned by the course instructor and the other is chosen by the student. The oral presentations are completed toward the end of the semester and are used to demonstrate the students' ability to build on the knowledge obtained in class, by providing "real" cases seen in the clinic and conveying knowledge to their peers in the class.

NMT Student Case Study Grade Sheet

Student Name:_____   Date:_____

Graded By:_____

There is a total of 10 points possible for each case study. Please score based on the following criteria.

Case #1   Type of Exam _____

_____ Student explained the proper patient preparation for the exam discussed. (2 pts)
_____ Student explained the exam protocol and proper images that should be acquired for the exam discussed. (4 pts)
_____ Student presented at least 2 abnormal studies and explained why they are abnormal. (4 pts)

_____/10 Total Score

Case #2 Type of Exam _____

_____ Student explained the proper patient preparation for the exam discussed. (2 pts)
_____ Student explained the exam protocol and proper images that should be acquired for the exam discussed.(4 pts)
_____ Student presented at least 2 abnormal studies and explained why they are abnormal. (4 pts)

_____/10 Total Score

NMT Artifact Descriptions and Rubrics for PLO 4

PLO #4
NMT 4340 Clinical Nuclear Medicine / Clinical Simulation/Role-Playing

Based on the content covered in the course, the course instructor assigns each student nuclear medicine procedure(s) to portray a technologist and/or patient perspective. The assessment rubric (see appendix) is used to guide the students on the specific areas the students must explain during the role-playing exercise. The students are paired up and provide explanation to a classmate and/or course instructor. This exercise provides the opportunity for the students to begin to translate didactic knowledge into clinical practice before beginning clinical practicum rotations.

Clinical Nuclear Medicine Course

Technologist/Patient Clinical Simulation Rubric

15 pts. possible

Did the student portraying the technologist
1) Properly introduce themselves? 1 pt.   _____

2) Properly obtain patient identification? 1pt.   _____

3) Ask patient proper preparatory questions related to the exam? 4 pts.   _____
       Food
       Drink
       Pregnancy
       Medications
       History and Physical

4) Have the knowledge to explain the exam to the patient? 4 pts.   _____

5) Can answer patient questions? 3 pts.   _____

6) Respond well to feedback and constructive criticism? 2 pts.   _____

Clinical Nuclear Medicine Course

Technologist/Patient Clinical Simulation Rubric

15 pts. possible

Did the student portraying the technologist:

1) Properly introduced themselves? 1 pt. _1_

2) Properly obtain patient identification? 1pt. _1_

2) Ask patient proper preparatory questions related to the exam? 4 pts. _4_

    Food

    Drink

    Pregnancy *LMP*

    Medications

    Pertinent History ✓

3) Have the knowledge to explain the exam to the patient? 4 pts. _4_

    Good, explaining phrases
    will get better.

4) Have the ability to answer patient questions? 3 pts. _3_

    Yes, nice job

5) Respond well to feedback and constructive criticism? 2 pts. _2_

15/15

- Slow down. You talk fast
when you are nervous

- Ask question "Do you have any history of cancer?"
this is important for a bone scan.

9/27/21

Clinical Nuclear Medicine Course

Technologist/Patient Clinical Simulation Rubric

15 pts. possible

Did the student portraying the technologist:

1) Properly introduced themselves? 1 pt. $\frac{1}{}$

2) Properly obtain patient identification? 1pt. $\frac{1}{}$

2) Ask patient proper preparatory questions related to the exam? 4 pts. $\frac{}{4}$

      Food   ✓

      Drink   ✓

      Pregnancy ✗

      Medications

      Pertinent History ✗

3) Have the knowledge to explain the exam to the patient? 4 pts. $\frac{4}{}$

4) Have the ability to answer patient questions? 3 pts. $\frac{3}{}$

5) Respond well to feedback and constructive criticism? 2 pts. $\frac{2}{}$

$\boxed{15}$

9/27/21

Ave
12.5

Did the student portraying the technologist:

1) Properly introduced themselves? 1 pt. ✓   _1_

2) Properly obtain patient identification? 1pt.   _0_
   did not ask 2 identities
2) Ask patient proper preparatory questions related to the exam? 4 pts.   _4_

    Food ✓

    Drink ✓

    Pregnancy – *LMP - Started today - 2 wks ago*
               nursing
    Medications – *Birth Control*

    Pertinent History ✓

3) Have the knowledge to explain the exam to the patient? 4 pts.   _3_
    injection or pill
    return day were confusing –
4) Have the ability to answer patient questions? 3 pts.   _3_
    – return day or times
    – ed after an hr

5) Respond well to feedback and constructive criticism? 2 pts.   _2_

– *Always identify the pt.*
– *Pill/liquid not injection*   (13/15)

– *You will learn what questions*
  to repeat & which ones to skip

– *food volume & dye content*

9/27/21

Clinical Nuclear Medicine Course

Technologist/Patient Clinical Simulation Rubric

15 pts. possible

Did the student portraying the technologist:

1) Properly introduced themselves? 1pt.

2) Properly obtain patient identification? 1pt.

2) Ask patient proper preparatory questions related to the exam? 4 pts.

$$\frac{1}{0} \\ \overline{4}$$

      Food /

      Drink /

      Pregnancy /

      Medications /

      Pertinent History /

3) Have the knowledge to explain the exam to the patient? 4 pts.

0 2

4) Have the ability to answer patient questions? 3 pts.

3

5) Respond well to feedback and constructive criticism? 2 pts.

2

SF

(12)

demo/radiation

9/27/21

Ave
15

Clinical Nuclear Medicine Course

Technologist/Patient Clinical Simulation Rubric

15 pts. possible

Did the student portraying the technologist:

1) Properly introduced themselves? 1pt.　　　　　　　　_1pt._

2) Properly obtain patient identification? 1pt.　　　　　_1pt._

3) Ask patient proper preparatory questions related to the exam? 4 pts.　　_4pt._

　　　Food ✓

　　　Drink

　　　Pregnancy – LMP ?
　　　　　　Breast feeding
　　　Medications ✓

　　　Pertinent History ✓

4) Have the knowledge to explain the exam to the patient? 4 pts.　　_3_

　　　　Thyroid H high
　　Markers - imgs - time - very specific
5) Have the ability to answer patient questions? 3 pts.　　_3_
　　　　Side Effects

6) Respond well to feedback and constructive criticism? 2 pts.　　_2_

　　　　　　　　　　　　　　　　　　　　　　（15/15）

- Very good
　- imgs
　　　- be more concise

Good volume & eye contact

9/27/21

Clinical Nuclear Medicine Course

Technologist/Patient Clinical Simulation Rubric

15 pts. possible

Did the student portraying the technologist:

1) Properly introduced themselves? 1 pt. ✓   1

2) Properly obtain patient identification? 1pt. ✓   1

2) Ask patient proper preparatory questions related to the exam? 4 pts.   4

    Food ✓

    Drink

    Pregnancy ✓

    Medications ✓

    Pertinent History ✓

3) Have the knowledge to explain the exam to the patient? 4 pts.   4

4) Have the ability to answer patient questions? 3 pts.   3

5) Respond well to feedback and constructive criticism? 2 pts.   2

15

9/27/21

Ave -
14.5

Clinical Nuclear Medicine Course

Technologist/Patient Clinical Simulation Rubric

15 pts. possible

Did the student portraying the technologist:

1) Properly introduced themselves? 1 pt.   _1_

2) Properly obtain patient identification? 1pt.   _1_

2) Ask patient proper preparatory questions related to the exam? 4 pts.   _4_

    Food

    Drink

    Pregnancy

    Medications

    Pertinent History ✓
    Kidney problems

3) Have the knowledge to explain the exam to the patient? 4 pts.   _4_

    pick up what? → you started but ~~didn't~~ didn't finish

    H_2O, urinate   Time
4) Have the ability to answer patient questions? 3 pts.   _3_

    Help the pain?

5) Respond well to feedback and constructive criticism? 2 pts.   _2_

- Nervous

- Good volume & eye contact (until nerves kicked in)   *15/15*

- Ask about cancer history

9/27/21

Clinical Nuclear Medicine Course

Technologist/Patient Clinical Simulation Rubric

15 pts. possible

Did the student portraying the technologist:

1) Properly introduced themselves? 1 pt.   1

2) Properly obtain patient identification? 1pt.   1

2) Ask patient proper preparatory questions related to the exam? 4 pts.   3

      Food ⁄

      Drink ⁄

      Pregnancy ✗

      Medications ⁄

      Pertinent History ⁄   Cancer

3) Have the knowledge to explain the exam to the patient? 4 pts.   4

4) Have the ability to answer patient questions? 3 pts.   3

5) Respond well to feedback and constructive criticism? 2 pts.   2

[14]

9/27/21

<u>**PLO #4**</u>
NMT 4910 Clinical Practicum / Clinical visit evaluation during last month of clinical practicum

The NMT program faculty conduct oral, comprehensive evaluations of each NMT student during the last month of the program. During this evaluation, the students are required to translate didactic knowledge into clinical practice.

Only need to ask these questions ONCE per visit:

A. Ask for a response to the following statement of ALL students:
   Give an example of how you portray "cura personalis" in the clinical setting.

B. Complete a visit form including evidence of <u>effective communication</u> (i.e. How does the student explain the particular exam to the patient?) and <u>understanding of "cura personalis"</u> in the details of the form.
   (Give thought to the level of communication and understanding of "cura personalis" based on when this visit is done. i.e. Rotation 1 vs. Rotation 4)

I confirm that the student answered these questions appropriately. Any questions or concerns about these questions was discussed and addressed with the student during this visit.

_____   _____   _____
      PD and/or CC Signature   **PD and/or CC Printed Name**   **Date**

C. **Ask for a response to the following statement of ALL students:**
   Give an example of how you portray "cura personalis" in the clinical setting.

D. **Choose at least 3 others from the list below to assess patient communication in the clinical setting.**
   (Pay attention to eye contact, confidence, and response to consider students ability to communicate
   effectively as an entry-level technologist)

E. **Complete a visit form including evidence of <u>effective communication</u> and <u>understanding of "cura personalis"</u> in the details of the form.**
   (give thought to the level of communication and understanding of "cura personalis" based on this being the FINAL assessment)

PLO #5
NMT 4410 Clinical Practicum / Clinical visit evaluation during the second month of clinical practicum

The NMT faculty collected the visit forms (see appendix) and notes from the first rotation visits which occur in February of each year for the students enrolled in this course. The program director reviewed the data, including the pass/fail status of the visit. The comments were reviewed to assess each students' ability to convey the concepts discussed during the visit. In addition, the program director sought comments/noted which relate to professional characteristics on each of the visit forms. If such comments were identified this was marked as achieving the raking of "application" or higher.

<div align="center">

Saint Louis University
Nuclear Medicine Technology Program Site Visit Evaluation Form

</div>

Student:_____   Clinical site: _____

Date:_____   Arrival time: _____

Rotation number: _____   Visit number: _____

Student comments:
Procedures and comments on tasks at the clinical site:

Site Visitor's Report:
Assessment of student's progress and performance:

Competency Evaluation:

Issues with teaching and supervision:

Recommendations for next visit:

Grade   PASS / FAIL

___   Student brought books and organized notes for visit.
___   Student was able to locate information in notes and/or books.
___   Student was prepared to discuss any exams they had observed, participated or performed. **___**
Student illustrates understanding of exams discussed **___**   Student paperwork is up to date.

Signatures:
Clinical Supervisor: _____ Site Visitor: _____

Student: _____ Departure time: _____

Saint Louis University
Nuclear Medicine Technology Program Site Visit Required Questions

Topic: Positron Emission Tomography / Computed Tomography (PET/CT)

Student: _____   Clinical site: _____

Date: _____

1. What is the main PET/CT tracer used in oncology studies? How does this tracer localize in cancer in the body? What are the indications for doing an oncology PET/CT study?

2. What is the prep for an FDG-PET scan? Why is the prep important?

3. Tell me about PET and CT QC including but not limited to: normalization scan (performed weekly or monthly), uniformity (blank scan) (performed daily), CT phantom, air calibrations. How do you know the daily PET uniformity scan passes QC?

4. What are the names of the imaging sets that are made during a PET/CT study? How are these made?

5. Name the different PET tracers that are used for dementia studies.

6. Why is Ga68 used in PET?

7. What is the purpose of the CT scan in PET/CT? What are common mAs and keV used for CT as part of a PET/CT scan?

Only need to ask these questions ONCE per visit:

A. Ask for a response to the following statement of ALL students:
        Give an example of how you portray "cura personalis" in the clinical setting.

B. Complete a visit form including evidence of <u>effective communication</u> (i.e. How does the student explain the particular exam to the patient?) and <u>understanding of "cura personalis"</u> in the details of the form.

(Give thought to the level of communication and understanding of "cura personalis" based on when this visit is done. i.e. Rotation 1 vs. Rotation 4)

I confirm that the student answered these questions appropriately. Any questions or concerns about these questions was discussed and addressed with the student during this visit.

_____   _____   _____
          PD and/or CC Signature   **PD and/or CC Printed Name**   **Date**

NMT 4910 Clinical Practicum / Clinical visit evaluation during the 7th month of clinical practicum

The NMT faculty collected the visit forms (see appendix) and notes from the first rotation visits which occur in February of each year for the students enrolled in this course. The program director reviewed the data, including the pass/fail status of the visit. The comments were reviewed to assess each students' ability to convey the concepts discussed during the visit. In addition, the program director sought comments/noted which relate to professional characteristics on each of the visit forms. If such comments were identified this was marked as achieving a ranking of "synthesis" or higher.

Saint Louis University
Nuclear Medicine Technology Program Site Visit Evaluation Form

Student:_____   Clinical site: _____

Date:_____   Arrival time: _____

Rotation number: _____   Visit number: _____

Student comments:
Procedures and comments on tasks at the clinical site:

Site Visitor's Report:
Assessment of student's progress and performance:

Saint Louis University
Nuclear Medicine Technology

Trainee Evaluation

Once submitted this evaluation will be available for review and for comments to be added by the following roles: Clinical Supervisor and Student.

Evaluator:	Sarah Frye - Administrator	**Subject:**	Chloe Reichardt - Professional Phase Student
Activity:	2022 Rot 1 Week 8	**Site:**	Saint Louis University Hospital
Evaluation Type:	Site Visit	**Completion Date:**	02/11/2022
Request Date:	02/11/2022		
Period:	2022 Rot 1 Week 8	**Dates of Activity:**	02/07/2022 **To** 02/11/2022
Subject Participation Dates:	02/07/2022 **To** 02/11/2022		

Please select the option that best matches your level of agreement with this evaluation.

🔘 Agree   ⭕ Disagree

If you disagree, please explain your reasons below.

Comments entered above may be viewed by your program director or advisor and may be a part of a printed report.

(Question 1 of 9 - Mandatory)

Student Comments	
List of procedures the student has received proficiencies:	Chloe has performed 13 proficiencies including the following: bone scan, bone SPECT, CT QC, DaT scan, gastric emptying, lung perfusion, Breast and Melanoma Lymphos, MPI rest and stress, QC floods, and QC resolution. She will most likely also get signed off in PET by the end of the week.
Issues with teaching and supervision:	None

Site Visitor's Report

(Question 2 of 9 - Mandatory)

Site Visitor Comments	
Assessment of student's progress and performance:	Chelsea, Anna, and Chris stated that Chloe has done great. They have no suggestions for improvement at this point.
Competency Evaluation:	Chloe did a good job discussing VQs and Hepatos.
Recommendations for next visit:	Bones and one of the following: (A) endocrine - thyroid and parathyroid, (B) rest of GI, (C) renals, or (D) infection. Chloe needs to try to work on her nerves when possible and discuss with Sarah about upcoming visits if and when needed.

Site Visit Grading   *(Question 3 of 9 - Mandatory)*

Student brought books and organized notes for visit.

NO		YES
0	>> 1 <<	2

Student was able to locate information in notes and/or books.   *(Question 4 of 9 - Mandatory)*

NO	YES	
0	>> 1 <<	2

Student was prepared to discuss any exams they had observed, participated or performed.   *(Question 5 of 9 - Mandatory)*

NO	YES	
0	>> 1 <<	2

Student illustrates understanding of exams discussed.   *(Question 6 of 9 - Mandatory)*

NO	YES	
0	>> 1 <<	2

Student's eValue record is up to date.   *(Question 7 of 9 - Mandatory)*

NO	YES	
0	>> 1 <<	2

Pass/Fail Site Visit Grade

(Question 8 of 9 - Mandatory)

Did this student complete 4 of the 5 items above?

If so, mark: PASS
If not, mark: FAIL

FAIL	PASS	
0	>> 1 <<	2

Additional comments?   *(Question 9 of 9)*

> We discussed that a Capstone idea with tentative title will be due at the beginning of March. The goal is to have a plan for Capstone by the next clinical visit.
>
> We also discussed days off. She has 3.5 days she has taken off so far.

Additional Evaluation Comments
Clinical Supervisor Has Not Posted Comments
Student Has Not Posted Comments

Competency Evaluation:

Issues with teaching and supervision:

Recommendations for next visit:

Grade   PASS / FAIL
___   Student brought books and organized notes for visit.
___   Student was able to locate information in notes and/or books.
___   Student was prepared to discuss any exams they had observed, participated or performed. ___
Student illustrates understanding of exams discussed ___   Student paperwork is up to date.

Signatures:
Clinical Supervisor: _____ Site Visitor: _____

Student: _____ Departure time: _____

Saint Louis University
Nuclear Medicine Technology Program Site Visit Required Questions

Topic: Other procedure: ___ _____

Student: ____ _____   Clinical site: _____ _

Date: _____

8. What is the prep for this study?

9. What are the radionuclides and adjunct drugs used in this study?

10. What is the method of localization of the radiopharmaceutical?

11. What are the indications for dong this study? What is going on with the patient where this study may be warranted?

12. What are the imaging parameters for this study?

Only need to ask these questions ONCE per visit:

C. Ask for a response to the following statement of ALL students:
      Give an example of how you portray "cura personalis" in the clinical setting.

D. Complete a visit form including evidence of <u>effective communication</u> (i.e. How does the student explain the particular exam to the patient?) and <u>understanding of "cura personalis"</u> in the details of the form.
      (Give thought to the level of communication and understanding of "cura personalis" based on when this visit is done. i.e. Rotation 1 vs. Rotation 4)

I confirm that the student answered these questions appropriately. Any questions or concerns about these questions was discussed and addressed with the student during this visit.

_____   _____ _____
             PD and/or CC Signature   **PD and/or CC Printed Name**   **Date**

Nuclear Medicine Technology Assessment Rubrics for all PLO's

**IMPORTANT NOTES: The ratings, identified by the column headings below, are of increasing complexity moving across the table (from left to right). Students who can demonstrate Jesuit values as they perform diagnostic imaging procedures (that is, meet the "application" rating) must be able to first identify examples of Jesuit values (the "knowledge" rating). Likewise, in order for students to evaluate the use of Jesuit values (the "synthesis" rating), they must identify examples of Jesuit values (knowledge) and provide concrete evidence of the use of Jesuit values (application).

NUCLEAR MEDICINE TECHNOLOGY (NMT)		
Program Learning Outcome (PLO #1): Students will demonstrate the Jesuit value, "Cura Personalis" as they perform diagnostic imaging procedures.		
Knowledge**	**Application****	**Synthesis****
• Define the Jesuit value of Cura Personalis.	• Examine circumstances in which Cura Personalis has been portrayed in their experiences in the clinical setting.	• Develop alternative actions in the use and/or non-use of Cura Personalis in the clinical setting.

NUCLEAR MEDICINE TECHNOLOGY (NMT)		
Program Learning Outcome (PLO #2): Students will demonstrate effective communication when speaking with both patients and other healthcare professionals in the nuclear medicine department.		
Knowledge**	**Application****	**Synthesis****
• Recognize the need to adjust conversations and explanations based on the audience. (i.e. use lay terms for patients and technical terms for other healthcare providers)	• Apply knowledge during senior capstone presentation and with patients in the clinic.	• Revise communication with patients in as they progress in the clinical setting.

NUCLEAR MEDICINE TECHNOLOGY (NMT)		
Program Learning Outcome (PLO #3): Students will use knowledge, facts and data to assess problems and find solutions.		
Knowledge**	Application**	Synthesis**
• Identify errors in an imaging case study presented.	• Interpret data presented in an imaging case study.	• Propose solutions to errors found in an imaging case study presented.

NUCLEAR MEDICINE TECHNOLOGY (NMT)		
Program Learning Outcome (PLO #4): Students will demonstrate the ability to translate didactic knowledge into clinical practice as a nuclear medicine technologist.		
Knowledge**	Application**	Synthesis**
• Recall facts and theories relating to nuclear medicine technology.	• Relate facts and theory to the clinical practice of nuclear medicine technology.	• Evaluate the use of facts and theory of nuclear medicine technology in clinical practice.

NUCLEAR MEDICINE TECHNOLOGY (NMT)		
Program Learning Outcome (PLO #5): Students will exhibit professional characteristics expected of nuclear medicine technologists.		
Knowledge**	Application**	Synthesis**
• Define professional characteristics of a nuclear medicine technologist.	• Demonstrate professional characteristics of a nuclear medicine technologist.	• Integrate professional characteristics into practice as a nuclear medicine technologist.

Program Learning Outcome 1: Students will demonstrate the Jesuit value of "Cura Personalis" as they perform diagnostic imaging procedures.

Assessment Mapping/Tools: 1. NMT 4410 Clinical Practicum / Critical Reflection Assignment #1

Program Target: An average of 85% of the students will achieve a ranking of "knowledge" or higher using the corresponding assessment rubric.

Assessment Data Collection & Initial Data Analysis/Person(s) Responsible: Assignment grading rubric and corresponding assessment rubric will be used to identify "knowledge" of "cura personalis".   Responsible Person: NMT Program Faculty
Analysis Action Plan: Determined after all data is collected by the faculty and analyzed by the Program Director.

Timeline (any 12 month period is acceptable): Every academic year.

Instructor Instructions: Please enter the number of student artifacts assessment and the number of artifacts which met or exceed the target.

	n =	# meeting target									
AY 21/22	4	3	75%								

Program Learning Outcome: 1. Students will demonstrate the Jesuit value of "Cura Personalis" as they perform diagnostic imaging procedures.

Assessment Mapping/Tools: 2. NMT 4910 Clinical Practicum / Program faculty observation during fifth month of rotation clinical visits

Program Target: An average of 85% of the students will achieve a ranking of "application" or higher using the corresponding assessment rubric.

Assessment Data Collection & Initial Data Analysis/Person(s) Responsible: Data collected using the corresponding assessment rubric.   Responsible Person: NMT Faculty   Analysis Action Plan: Determined after all data is collected by the faculty and analyzed by the Program Director.

Timeline (any 12 month period is acceptable): Every academic year.

Instructor Instructions: Please enter the number of student artifacts assessment and the number of artifacts which met or exceed the target.

	n =	# meeting target									
AY 21/22	4	4	100%								

Program Learning Outcome 2: Students will demonstrate effective communication when speaking with both patients and other healthcare professionals in the nuclear medicine department.												
Assessment Mapping/Tools: 1. NMT 4960 Capstone in Nuclear Medicine / Capstone Presentation												
Program Target: An average of 85% of the students will achieve a ranking of "application" or higher using the corresponding assessment rubric.												
Assessment Data Collection & Initial Data Analysis/Person(s) Responsible: Data collected using the corresponding assessment rubric. Responsible Person: NMT faculty Analysis Action Plan: Determined after all data is collected by the faculty and analyzed by the Program Director.												
Timeline (any 12 month period is acceptable): Every academic year.												
Instructor Instructions: Please enter the number of student artifacts assessment and the number of artifacts which met or exceed the target.												
	n =		# meeting target									
AY 21/22	4	3	75%									

Program Learning Outcome 2: Students will demonstrate effective communication when speaking with both patients and other healthcare professionals in the												
Assessment Mapping/Tools: 2. NMT 4410 and NMT 4910 Clinical Practicum/Final evaluation questions regarding effective communication in patient interaction												
Program Target: An average of 85% of the students will achieve a ranking of "synthesis" or higher using the corresponding assessment rubric.												
Assessment Data Collection & Initial Data Analysis/Person(s) Responsible: Data collected using the corresponding assessment rubric. Responsible Person: NMT Faculty Analysis Action Plan: Determined after all data is collected by the faculty and analyzed by the Program Director.												
Timeline (any 12 month period is acceptable): Every academic year that ends with an **even** number.												
Instructor Instructions: Please enter the number of student artifacts assessment and the number of artifacts which met or exceed the target.												
	n =		# meeting target									
AY 21/22	4	4	100%									

Program Learning Outcome 3: Students will use knowledge, facts, and data to assess problems and find solutions at the relate to nuclear medicine imaging procedures.												
Assessment Mapping/Tools: 1. NMT 4350 Nuclear Medicine Information Systems/ Case Study Project Assignment												
Program Target: An average of 85% of the students will achieve a ranking of "knowledge" or higher using the corresponding assessment rubric.												
Assessment Data Collection & Initial Data Analysis/Person(s) Responsible: Data collected using the corresponding assessment rubric. Responsible Person: NMT faculty Analysis Action Plan: Determined after all data is collected by the faculty and analyzed by the Program Director.												
Timeline (any 12 month period is acceptable): Every academic year.												
Instructor Instructions: Please enter the number of student artifacts assessment and the number of artifacts which met or exceed the target.												
	n =		# meeting target									
AY 21/22	4	4	100%									

Program Learning Outcome 3: Students will use knowledge, facts, and data to assess problems and find solutions at the relate to nuclear medicine imaging procedures.												
Assessment Mapping/Tools: 2. NMT 4430 Emerging Technologies/ Case Study Presentation												
Program Target: An average of 85% of the students will achieve a ranking of "application" or higher using the corresponding assessment rubric.												
Assessment Data Collection & Initial Data Analysis/Person(s) Responsible: Data collected using the corresponding assessment rubric. Responsible Person: NMT Faculty Analysis Action Plan: Determined after all data is collected by the faculty and analyzed by the Program Director.												
Timeline (any 12 month period is acceptable): Every academic year.												
Instructor Instructions: Please enter the number of student artifacts assessment and the number of artifacts which met or exceed the target.												
	n =		# meeting target									
AY 21/22	4	3	75%									

Program Learning Outcome 4: Students will demonstrate the ability to translate didactic knowledge into clinical practice as a nuclear medicine technologist.

Assessment Mapping/Tools: 1. NMT 4340 Clinical Nuclear Medicine /
Clinical Simulation/Role Playing assignment

Program Target: An average of 85% of the students will achieve a ranking of "knowledge" or higher using the corresponding assessment rubric.

Assessment Data Collection & Initial Data Analysis/Person(s) Responsible: Data collected using the corresponding assessment rubric.
Responsible Person: NMT Faculty   Analysis Action
Plan: Determined after all data is collected by the faculty and analyzed by the Program Director.

Timeline (any 12 month period is acceptable): Every academic year.

Instructor Instructions: Please enter the number of student artifacts assessment and the number of artifacts which met or exceed the target.

	n =	# meeting target								
AY 21/22	4	4	100%							

Program Learning Outcome 4: Students will demonstrate the ability to translate didactic knowledge into clinical practice as a nuclear medicine technologist.

Assessment Mapping/Tools: 2. NMT 4910 Clinical Practicum / Clinical visit evaluation during last month of clinical practicum

Program Target: An average of 85% of the students will achieve a ranking of "synthesis" using the corresponding assessment rubric.

Assessment Data Collection & Initial Data Analysis/Person(s) Responsible: Data collected using the corresponding assessment rubric.
Responsible Person: NMT Faculty   Analysis Action
Plan: Determined after all data is collected by the faculty and analyzed by the Program Director.

Timeline (any 12 month period is acceptable): Every academic year.

Instructor Instructions: Students will demonstrate the ability to translate didactic knowledge into clinical practice as a nuclear medicine technologist.

	n =	# meeting target								
AY 21/22	4	4	100%							

Program Learning Outcome 5: Students will exhibit professional characteristics expected of nuclear medicine technologists.												
Assessment Mapping/Tools: 1. NMT 4410 Clinical Practicum / Clinical visit evaluation during the first 2 months of clinical practicum.												
Program Target: An average of 85% of the students will achieve a ranking of "application" or higher using the corresponding assessment rubric.												
Assessment Data Collection & Initial Data Analysis/Person(s) Responsible: Data collected using the corresponding assessment rubric. Responsible person: NMT faculty Analysis Action Plan: Determined after all data is collected by the faculty and analyzed by the Program Director.												
Timeline (any 12 month period is acceptable): Every academic year.												
Instructor Instructions: Please enter the number of student artifacts assessment and the number of artifacts which met or exceed the target.												
	n =		# meeting target									
AY 21/22	4	4	100%									

Program Learning Outcome 5: Students will exhibit professional characteristics expected of nuclear medicine technologists.												
Assessment Mapping/Tools: 2. NMT 4910 Clinical Practicum /Clinical visit evaluation during 7 months of clinical practicum.												
Program Target: An average of 85% of the students will achieve a ranking of "synthesis" using the corresponding assessment rubric.												
Assessment Data Collection & Initial Data Analysis/Person(s) Responsible: Data collected using the corresponding assessment rubric. Responsible person: NMT Faculty Analysis Action Plan: Determined after all data is collected by the faculty and analyzed by the Program Director.												
Timeline (any 12 month period is acceptable): Every academic year.												
Instructor Instructions: Please enter the number of student artifacts assessment and the number of artifacts which met or exceed the target.												
	n =		# meeting target									
AY 21/22	4	4	100%									