**Your Name: Heather Dorrell**

**Project Title**: **Radiation Safety Guide for Patient Care Staff in a Hospital Setting**

**Task Analysis**

Patient care staff in a hospital setting will adhere to radiation safety regulations by applying knowledge after participating in training focusing on radiation safety resources, policies, and procedures. The audience for this training is any staff member or contractor who must wear a dosimeter. This training is currently given as a slide deck in Workday. The revision will be a course designed in Articulate.

To determine the components of this training, content was categorized into five content structures: facts, concepts, principles and rules, procedures, resources, and attitudes. Please, refer to the Mind Map for a visual reference. Cognitive, psychomotor, and affective domains were considered for each content component, as well. This training has aspects in the cognitive and affective domains. Psychomotor was ruled out, because training on the physical use of personal protective equipment is not in the scope of this module.

Topic analysis is used for both domains. Topics under these categories include Health Effects of Radiation, Attitudes, ALARA, Radiation Protection Methods, and Resources. These are listed in more detail below in the Topic Analysis. Many of the topics will be analyzed under the cognitive domain. The affective domain plays a role and will cover attitudes on training, wearing a dosimeter and PPE, and reporting safety concerns. The cognitive and affective content structures lend themselves to the topical form analysis.

Although the laws and policies are an important aspect of why this training is taking place, staff do not need to know the level of detailed information included. They are, however, included in the Mind Map for future reference. Management prefers that references to the laws and policies that govern the content be listed in the footnotes or inconspicuously on the visual materials presented. The reasoning for this is twofold; staff can access the laws and policies as an additional resource and regulations can confirm that training meets the requirements of the regulations.

**Topical Task Analysis (Cognitive and Affective):**

1. **Health Effects of Radiation**
2. Radiation can damage the DNA in our cells.
3. High doses of radiation can lead to cancer later in life.
4. **Attitudes**
5. Importance of Training: Prevent unnecessary radiation exposure and keep exposure low. Training allows individuals to make informed decisions regarding the acceptance of risk as part of the job.
6. Wearing a Dosimeter: Dosimeters provide a measurement of the dose received and can alert the team that an equipment performance or work practice needs review.
7. Wearing Personal Protective Equipment: PPE is part of the principle of shielding. Lead aprons, thyroid collars and goggles are part of shielding.
8. Reporting a Radiation Concern: Reporting assures the proper response is taken to minimize personnel exposure, contain radioactive contamination, and address any injury from overexposure to sources of radiation.
9. **ALARA- “As Low** **As Reasonably Achievable”**
10. Facts: The guiding of radiation safety principle is ALARA.
11. The way that ALARA is achieved is by using three radiation protection methods:

Time, distance, and shielding.

1. **Radiation Protection Methods and Concepts**
2. Time
3. Fact: A dose received over an extended period of time is less harmful than the safe dose received all at once.
4. Scatter Radiation: A secondary radiation that occurs when the beam from a machine intercepts an object, causing X-rays to be scattered.
5. Procedure: Minimize time in proximity to the radiation source by stepping out of the room when possible and minimizing the area being treated by the beam.
6. Distance
7. Fact: The intensity of the radiation goes down by the square of the distance from the source. For instance, if you move twice as far from the source, the intensity of the radiation will decrease by a factor of four.
8. Figure of Inverse Square Law (Picture)
9. Procedure: Maximize distance from the radiation source when possible.
10. Shielding
11. Fact: There is a difference between exposure to radiation and radiation contamination.
12. Radiation Exposure is when a person has been exposed to radioactive waves or particles that can penetrate the body. Minimizing Time and Distance decreases radiation exposure.
13. Radiation Contamination occurs when radioactive material is spread where it is not wanted. External contamination occurs when radioactive material meets a surface in the form of dust, powder, or liquid. Internal contamination occurs when people swallow or breathe in radioactive materials, when it is absorbed through the skin, or when radioactive materials enter the body.
14. Dosimeters are used to gauge Radiation Exposure.
15. Personal Protective Equipment assists in decreasing radiation exposure and contamination.
16. Procedure: Wear dosimeters and PPE and report concerns about unwanted radiation exposure and contamination.
17. Scenario-TBD by SME
18. **Dosimeters**
19. Facts: Dosimeters provide a personal measurement of the dose received and can alert the team of equipment performance concerns or work practices that need review.
20. Radiation Sources: Radiography, Mammography, DEXA Scans (bone density), CT scans, Fluoroscopy, and Nuclear Medicine (patient)
21. How to Wear: Wear the badge on the outside of your lead apron at collar level and facing the radiation source.
22. Photo Example
23. When: Wear the badge whenever you are working around a radiation source.
24. Care: Keep the badge in a place not exposed to radiation when not in use and protect it from contamination.
25. Issues: Call Environmental Health and Safety if lost, damaged, or accidentally exposed to radiation when you are not wearing it.
26. Against Protocol: Do not share badges, intentionally expose yourself to radiation, take it home, leave a badge on an apron or wear a badge for personal medical examination.
27. Pregnancy: A badged worker can voluntarily “Declare Your Pregnancy” to limit exposure. Refer to Radiation Guide 8.13
28. Dose Limit: Chart
29. Dosimeter Report: Workers receive an annual report that measures in rem their dose equivalent to determine their dose limit.
30. The dose equivalent measures how much energy is absorbed in the body.
31. Workers’ dosimeter reports are reviewed regularly. If a worker’s report has an anomaly, the radiation safety staff will contact you with questions.
32. Dosimeter Report: Example on how to find pertinent information on the report and what it means in comparison to the Dose Limit Chart
33. Scenario One-TBD by SME
34. Scenario 2: TBD by SME
35. **Personal Protective Equipment**
36. Lead Aprons: Double wrapped in 0.35mm (about 0.01 in) light weight composite/separate top and

Bottom (wraparound style).

1. Thyroid Shields: There should not be a gap between your thyroid shield and lead apron.
2. Goggles: Recommended for those involved in long procedures.
3. Example of PPE being worn properly
4. **Resources**
5. Reporting Radiation Safety Concerns: Reporting ensures the proper response is taken to minimize personnel exposure, contain radioactive contamination, and address any injury from overexposure to sources of radiation.
6. The Virginia Department of Health inspects institutions for fines and violations.
7. For Diagnostic X-Rays, concerns that include X-Ray and CT Equipment, malfunctions must be reported to the Chief Diagnostic Medical Physicist.
8. Scenario and Contact Info
9. For Radioactive Material, report lost or stolen sources and radioactive spills to the Radiation Safety Officer.
10. Scenario and Contact Info
11. Resource: Radiation Safety Website
12. Tutorial on Use of Website
13. Answer Questions using the Website.

**Learning Objectives:**

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| --- | --- |
| **Objective 1:** Staff will identify the personal and institutional significance of radiation safety in a hospital setting. | **Domain:** Cognitive/Affective |
| **Level:** Understanding, Applying, Analyzing, Evaluating, Receiving, Responding, Valuing, Organizing, Characterized by a value complex. |

**Learning Objectives (Cont’d):**

|  |  |
| --- | --- |
| **Objective 2:** Staff will describe the use of three radiation protection methods (Time, Distance, and Shielding) and their significance in relation to the ALARA policy. | **Domain:** Cognitive/Affective |
| **Level:** Remembering, Understanding, Analyzing, Receiving |

|  |  |
| --- | --- |
| **Objective 3:** Staff will utilize their understanding of radiation safety concepts to practice ALARA. | **Domain:** Cognitive/Affective |
| **Level:** Remembering, Understanding, Applying, Analyzing, Evaluating, Receiving, Responding, Valuing, Organizing |

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| **Objective 4:** Staff will describe the proper care and use of a dosimeter and be able to read a personal exposure report as it relates to dose limits. | **Domain:** Cognitive/Affective |
| **Level:** Remembering, Understanding, Applying, Analyzing, Evaluating, Receiving, Responding |

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| **Objective 5:** Staff will successfully utilize the Radiation Safety website to locate resources and points of contact necessary for a given scenario. | **Domain:** Cognitive |
| **Level:** Remembering, Understanding, Applying, Analyzing, Evaluating |

**Performance Content Matrix**

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| --- | --- | --- |
| **Content** | ***Performance*** | |
| **Recall** | **Application** |
| Facts |  |  |
| Concepts | **Objective 2:** Staff will describe the use of three radiation protection methods (Time, Distance, and Shielding) and their significance in relation to the ALARA policy. | **Objective 3:** Staff will utilize their understanding of radiation safety concepts to practice ALARA. |
| Principles and Rules | **Objective 2:** Staff will describe the use of three radiation protection methods (Time, Distance, and Shielding) and their significance in relation to the ALARA policy. | **Objective 3:** Staff will utilize their understanding of radiation safety concepts to practice ALARA. |
| Procedure | **Objective 4:** Staff will describe the proper care and use of a dosimeter and be able to read a personal exposure report as it relates to dose limits. |  |
| Interpersonal Skills |  | **Objective 5:** Staff will successfully utilize the Radiation Safety website to locate resources and points of contact necessary for a given scenario. |
| Attitudes |  | **Objective 1:** Staff will identify the personal and institutional significance of radiation safety in a hospital setting. |

**Mind Map**

<https://www.mindmeister.com/app/map/2951851659?t=xbFBnsC8kB>

A diagram of a company

Description automatically generated with medium confidence