IAEA
International Atomic Energy Agency

# RADIATION SAFETY CULTURE TRAIT TALKS

Handbook

ABOUT

# THIS HANDBOOK

## WHAT IS SAFETY CULTURE?

The International Atomic Energy Agency (IAEA) defines safety culture as: “The assembly of characteristics and attitudes in the organizations, its managers and workers which assures that, as an overriding priority, safety issues receive the attention warranted by their significance.”

## WHY IS SAFETY CULTURE IN HEALTHCARE IMPORTANT?

The number of early acute health effects and deaths attributed to radiation incidents in medicine exceeds the number from incidents in any other peaceful use of radiation including nuclear power.

There are a large number of incidents that have been reported and which resulted in detrimental patient effects from unintended exposure in interventional radiology, nuclear medicine, interventional cardiology, diagnostic imaging and radiation therapy. It has even been suggested that in some parts of the world, medical errors are a significant cause of patient death and injury. The need exists to prevent these detrimental effects that arise from medical errors or unintended exposure.

The incorporation of safety culture into healthcare settings can help prevent injuries and deaths, and help reduce unnecessary or unintended radiation dose to patients and staff overall. Despite the extensive safety management systems that currently exist at healthcare facilities around the world, these systems sometimes fail to fully integrate radiation safety into programs addressing overall safety.

The approach to Safety Culture in Healthcare presented here, brings together concepts from the “Just Culture” movement regarding personal accountability and respectful work environments; concepts from dose-reduction programs, such as Image Gently® and Image Wisely®, which emphasize conservative and thoughtful decision-making; and provides tools for applying the fundamental underpinnings of radiation protection – Justification, Optimization, and Limitation – in the context of healthcare.

## HOW IS THE IAEA HELPING?

The IAEA has a long history in the development of safety culture for nuclear power. The value of safety culture in medical applications has also been long-recognized.

The Bonn Call for Action specifically identifies the strengthening of radiation protection safety culture as one of its core ten actions to improve radiation protection in medicine until 2022.

This workbook is part of a series of efforts to bring the concept of Safety Culture in Healthcare to healthcare providers around the world, including those directly and indirectly involved in the administration of radiation to humans, as well as healthcare leadership, and all regulatory and non-governmental organization partners.

## TRAIT TALK OVERVIEW

The Safety Culture Trait Talks are based on work done by the United States Nuclear Regulatory Commission and were adapted here to offer a better understanding of the ten safety culture traits developed by IAEA and how they apply to work in healthcare.

Ten individual Trait Talks are included in the following pages. Each Trait Talk contains information on why the trait is important and what it looks like. In addition, each Trait Talk includes a fictional scenario based on the variety of uses of radiation in healthcare and a concluding digital presentation of how medical facilities address improvements in safety culture. These digital presentations were produced by your colleagues from around the world as an example of what can be done to improve each of these traits.

## WHAT IS A TRAIT?

A trait, in safety culture is a personal or organizational presence such as a pattern of thinking, feeling, and behaving that prioritises safety.

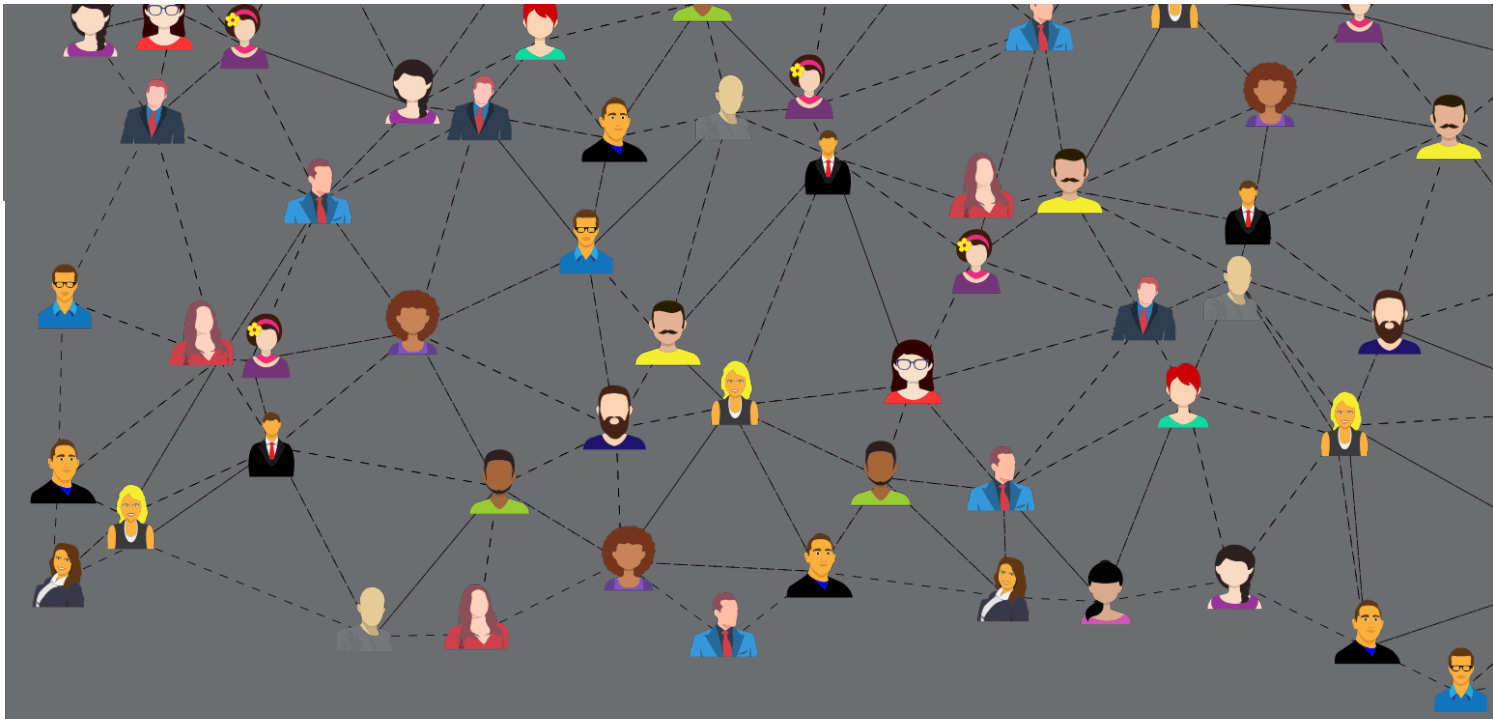


It is important to remember that a scenario that depicts a certain type of use of radiation in healthcare is still applicable to all other uses. The important piece to understand is how the presence or absence of safety culture traits can mitigate the consequences of, or contribute to, an event or incident. Reflection on these scenarios should focus on how the safety culture traits are visible in your own organization and what traits might be weak or missing. For example, don't assume that "this can't happen here" because your organization doesn't have the same work processes. Rather, consider how your organization's work processes could potentially allow an event or accident to occur because of a lack of focus on safety culture.

## TRAIT TALKS

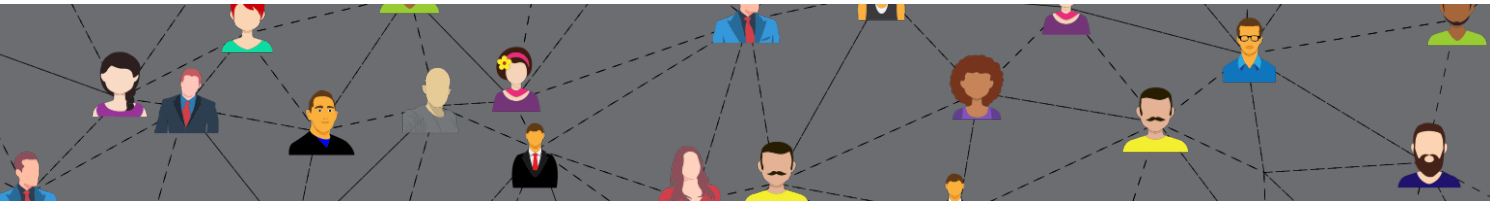
1. INDIVIDUAL RESPONSIBILITY — *FLUOROSCOPY*
2. QUESTIONING ATTITUDE — *RADIOTHERAPY*
3. EFFECTIVE SAFETY COMMUNICATION — *NUCLEAR MEDICINE*
4. LEADERSHIP RESPONSIBILITY — *RADIOLOGY*
5. DECISION-MAKING — *NUCLEAR MEDICINE*
6. RESPECTFUL WORK ENVIRONMENT — *WORKER SAFETY*
7. CONTINUOUS LEARNING — *RADIOTHERAPY*
8. PROBLEM IDENTIFICATION AND RESOLUTION — *RADIOTHERAPY*
9. ENVIRONMENT FOR RAISING CONCERNS — *RADIOLOGY*
10. WORK PROCESSES — *NUCLEAR MEDICINE*

# LET'S GET STARTED

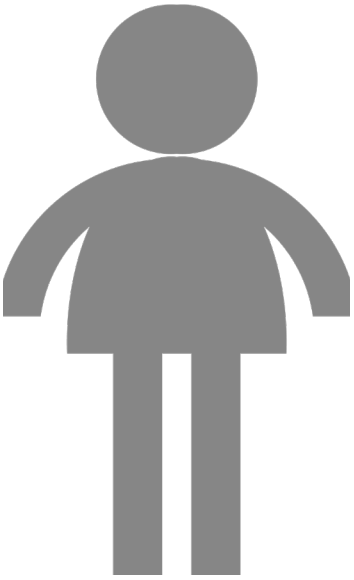


# INDIVIDUAL RESPONSIBILITY

**All individuals take personal responsibility for safety. Responsibility and authority for safety are well defined and clearly understood. Reporting relationships, positional authority, and team responsibilities emphasize the overriding importance of safety.**



# TRAIT 1



## WHY IS THIS TRAIT IMPORTANT?

Personal accountability reflects the belief that both leaders and employees are individually responsible for their performance and the roles they play in radiation protection. Personal accountability means taking radiation protection values seriously and taking responsibility for upholding radiation protection standards.

In organizations with positive safety cultures, individuals have a strong sense of accountability for the safe operation of the facility, their own safety, and for the safety of their coworkers and the public. In medical settings, this includes accountability at all levels for the safety of the patients, and their family members.

Leaders can develop personal accountability within their organization by empowering employees. They must give employees the skills and training needed to communicate, explain, and do their jobs well. They must set performance objectives with specific behaviors and outcomes and evaluate performance and give timely feedback.

Furthermore, leaders should encourage accountability through rewards rather than discourage through punishment. When leaders model, acknowledge, and reward positive accountability behaviors, employees are more likely to be motivated to invest in safe operations personally.

Everyone must take personal ownership for his or her actions and decisions for accountability to become a fundamental part of an organization's safety culture. Positive reinforcement can come from supervisors and managers, but also from coworkers, and even the patients, and patients' family members. Accountability can motivate mindfulness, attention to detail, and self-assessment, and can result in fewer accidents and incidents.

An ongoing challenge in fostering personal accountability is to identify who is responsible for the factors that affect safety within an organization and how to make appropriate accountability assignments. For example, responsibility can be assigned to ensure that training is completed, procedures are updated, and decisions are made.

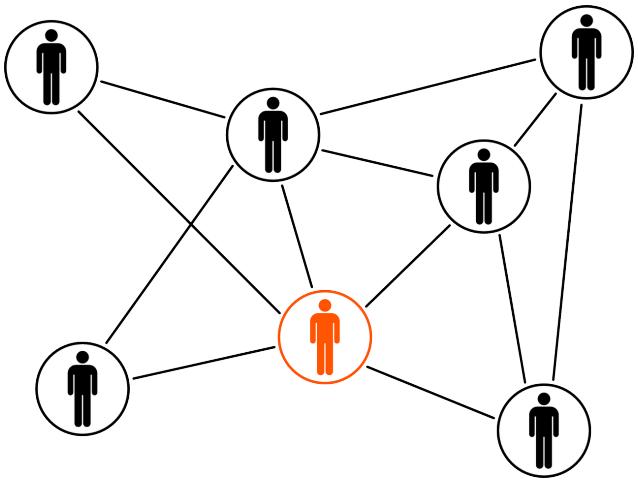
Accountability systems in an organization involve identifying who is held accountable for which actions and by whom. Alignment in these accountability systems within an organization can create effective communications, teamwork, strong safety performance, and motivated employees and can lead to a positive safety culture.

## WHAT DOES THIS TRAIT LOOK LIKE?

**High Standards:**

Individuals understand the importance of adherence to radiation protection standards. All levels of the organization exercise accountability for shortfalls in meeting standards.

Individuals encourage each other to adhere to high standards. They demonstrate a proper focus on radiation protection and reinforce this focus through peer coaching and discussions. Individuals hold themselves personally accountable for modeling behaviors that enhance radiation protection and individuals across the organization apply radiation protection standards consistently. Individuals actively solicit and are open to feedback and they help supplemental personnel understand and practice expected behaviors and actions.



**Job Ownership:**

Individuals understand and demonstrate personal responsibility for the behaviors and work practices that support radiation protection.

Individuals understand their personal responsibility to foster a professional environment, encourage teamwork, and identify challenges to radiation protection and safety. They understand their personal responsibility to raise radiation protection and safety issues, including those identified by others. Individuals take ownership for the preparation and execution of assigned work activities. They actively participate in pre-job briefings, understanding their responsibility to raise radiation protection and safety concerns before work begins. Individuals ensure that they are trained and qualified to perform assigned work and understand the objective of the work activity, their role in the activity, and their personal responsibility for safely accomplishing the overall objective.

**Teamwork:**

Individuals and work groups communicate and coordinate their activities within and across organizational boundaries to ensure radiation protection is maintained.

Individuals demonstrate a strong sense of collaboration and cooperation in connection with projects and operational activities. They work as a team to provide peer-checks, verify certifications and training, ensure detailed safety practices, actively peer coach new personnel, and share tools and publications. Individuals strive to meet commitments.

## WHAT IS A SCENARIO IN WHICH THIS TRAIT COULD PLAY A ROLE?

*Please read the scenario and answer the questions on the next page:*

A patient was scheduled for an emergency interventional radiology procedure.

Although they had obtained the long medical history from two other hospitals prior to his procedure, the radiological medical practitioner had not specifically requested or reviewed the data regarding the radiation dose related to the patient's prior interventional procedures.

The current interventional procedure was long, with over 60 minutes of imaging, and a cumulative air kerma of about 4 gray. At the time, the radiological medical practitioner did not take note of the radiation dose associated with the procedure. The medical radiation technologist recorded the dose in the surgical log, but did not report it to anyone, as he assumed the radiological medical practitioner would follow-up with the patient regarding the dose.

The procedure was successful, and the patient was ultimately discharged to home to be seen again in one month.

Within about two weeks, the patient experienced intense itching on his back. He asked a family member to look at it, and his wife told him it was red, and looked like a rash, so he made an appointment with a medical practitioner. The medical practitioner suspected that this might be related to the interventional procedure and advised the patient to contact his medical radiation practitioner. When he called for an appointment, without reviewing the patient's total radiation exposure, he was told the medical radiation practitioner would check it at the appointment he already had scheduled in about 10 days.

By the time the patient arrived for the appointment, there was now some swelling and discoloration in the area. At this point, the medical radiation practitioner recognized that this was a radiation injury, reviewed the dose from the procedure, and was surprised to see this intense a reaction from the approximately 4 Gy cumulative dose, which was delivered over several different areas of the skin.

He then reviewed the history of the prior procedures and found that over four prior procedures at two different hospitals, within the prior three months, the actual cumulative air kerma was approximately 12 Gy. The patient was referred to a radiation oncologist, as they have familiarity with these injuries, with very detailed information regarding the past dose history, and the patient ultimately recovered without surgical intervention, but with some permanent skin changes.

There were multiple opportunities to identify the potential effects of the multiple procedures, but no one person in the chain of care from the medical radiation practitioners at the prior two hospitals, to the current medical radiation practitioner, to the medical radiation technologist, took it upon themselves to make a thorough review of the record as a whole, or to make a point of ensuring the next person in the chain of care understood the full history of this patient.

While the procedures were all necessary, the use of fluoroscopy found to be appropriate, and the patient ultimately recovered, he could have been spared pain, discomfort and fear if he had advance notice of what to expect; and, the situation could have been far worse had the dose been higher yet.

## SCENARIO: QUESTIONS

Thinking about the scenario on the previous page, consider the following questions:

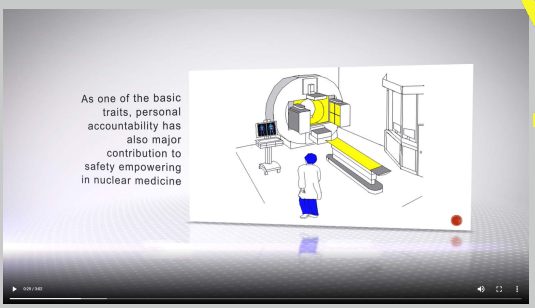
1. List actions and behaviors that would have reinforced safety culture as a priority on this case:

2. What does it mean?

3. How does it look like?

4. List ideas on how this situation could have been prevented:

Digital presentation:




Video by Rodanthi Karavelaki won first place in the trait Personal Accountability in the IAEA competition Towards a Strong Radiation Safety Culture in Medicine.

You can access it **here**.

## TRAIT QUESTIONS

Now that you have read this Trait Talk on Individual Responsibility, consider the following questions:

1. Does my practice/group/department have overall Individual Responsibility?

2. If yes, list actions/ideas to improve the Individual Responsibility in your practice/group/department:

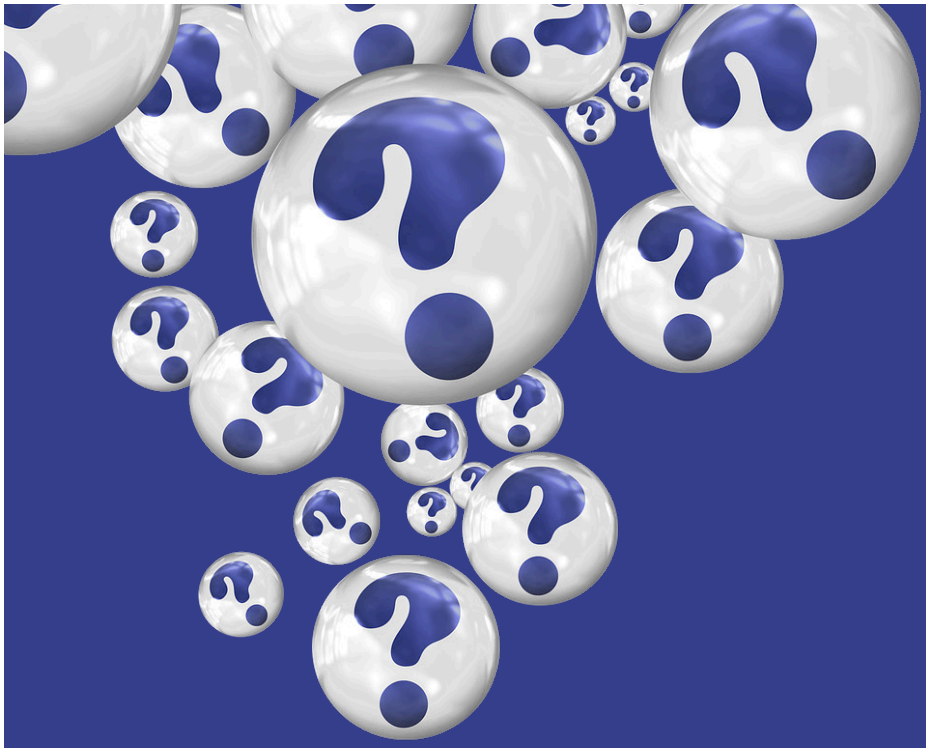
3. List potential barriers to improve the Individual Responsibility in your practice/group/department:

### REMEMBER

The characteristics of this trait are:

- ✓ High Standards
- ✓ Teamwork
- ✓ Job Ownership

4. Select and share one or two ideas that you would like work on to improve the Individual Responsibility when you come back to your practice/group/department:



# QUESTIONING ATTITUDE

**Individuals avoid complacency and continuously challenge existing conditions and activities in order to identify discrepancies that might result in error or inappropriate action. All employees are watchful for assumptions, anomalies, values, conditions, or activities that can have an undesirable effect on facility safety.**

# TRAIT 2

## WHY IS THIS TRAIT IMPORTANT?

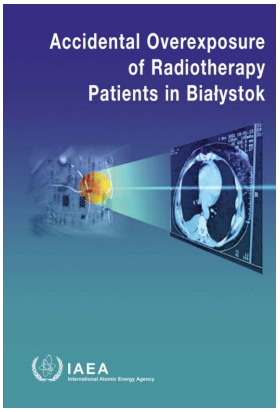
Complacency may be a key contributor to many incidents involving radiation sources, such as the accidental overexposure of radiotherapy patients in Bialystok, Poland. Avoiding complacency is essential to ensuring radiation protection of workers and patients and can be achieved by instilling a questioning attitude in every employee. From the medical radiation technologist questioning an anomalous data point, to the medical radiation practitioner questioning an unexpected change in treatment parameters, having a questioning attitude is vital for the safe use of radiation sources and a positive safety culture.

It is everyone's responsibility to continuously assess his or her duties, procedures, and job site to identify inconsistencies or abnormalities. Challenging assumptions, stopping work in the face of uncertainty, and proactively anticipating what may go wrong during a pre-job brief reflect a questioning attitude and a positive safety culture.

Employees should routinely and actively ask the following questions as they perform their jobs: Am I doing the right thing? How could we do this better? Are we using the right assumptions? Are we putting our people, facility, or patients at risk? What new practices could we implement that would minimize complacency and encourage a questioning attitude?

Recognizing that external and internal conditions change over time, leaders must also continuously assess the organization or operation in its entirety, look beyond the individual task, and ask questions to ensure they understand what is currently happening and what might go wrong. As leaders ask questions and encourage others to do the same, the importance of having a questioning attitude will be reinforced throughout the organization. Leaders should consistently reward employees for asking questions and routinely discuss actual situations where a questioning attitude helped achieve a positive outcome.

A positive safety culture requires the collective commitment by both leaders and employees to emphasize safety over competing goals. A questioning attitude supports that commitment.




IAEA publication Accidental Overexposure of Radiotherapy Patients in Białystok (2004)

## WHAT DOES THIS TRAIT LOOK LIKE?

**Radiation Sources are Special:**

Individuals understand that complex technologies can fail in unpredictable ways.

The organization ensures that activities that could affect radiation protection or safety are conducted with particular care, caution, and oversight. Individuals recognize the special characteristics and unique hazards of radiation and radiation sources, and the importance of features designed to maintain nuclear safety. Leaders ask probing questions to understand the implications and consequences of anomalies, and challenge employees to ensure degraded conditions are fully understood and appropriately resolved, especially those involving equipment important to radiation protection of workers and patients.

**Avoid Complacency:**

Individuals recognize and plan for the possibility of mistakes, latent problems, and inherent risk, even while expecting successful outcomes.

The organization is aware that latent conditions can exist, addresses them as they are discovered, and considers the extents of the conditions and their causes. Prior to authorizing work, individuals verify procedure prerequisites are met rather than assuming they are met based on general work site conditions. Individuals perform a thorough review of the work site, equipment, and the planned activity every time work is performed rather than relying on past successes and assumed conditions, and they consider potential undesired consequences of their actions prior to performing work and implement appropriate error reduction tools. Leaders ensure specific contingency actions are discussed and understood during job planning and pre-job briefings.safety sufficiently.

**Challenge the Unknown:**

Individuals stop when faced with uncertain conditions. Risks are evaluated and managed before proceeding.

Leaders reinforce expectations that individuals take the time to do the job right the first time, seek guidance when unsure, and stop if an unexpected condition or equipment response is encountered. Individuals maintain a questioning attitude during pre-job briefings and job-site reviews to identify and resolve unexpected conditions. Individuals challenge unanticipated test results rather than rationalizing them. For example, abnormal indications are not automatically attributed to indication problems but are thoroughly investigated before activities can continue. Individuals stop work activities when confronted with an unexpected condition, communicate with supervisors, and resolve the condition prior to continuing work activities. When appropriate, individuals consult system and equipment experts. If a procedure or work document is unclear or cannot be performed as written, individuals stop work until the issue is resolved.

**Challenge Assumptions:**

Individuals challenge assumptions and offer opposing views when they think something is not correct.

Leaders solicit challenges to assumptions when evaluating radiation protection or safety issues. Individuals ask questions to fully understand the bases of operational and management decisions that appear to be contrary to radiation protection or safety, and managers question assumptions, decisions, and justifications that do not appear to consider impacts to radiation protection and safety sufficiently.

## WHAT IS A SCENARIO IN WHICH THIS TRAIT COULD PLAY A ROLE?

*Please read the scenario and answer the questions on the next page:*

A hospital was conducting a cancer treatment with a high-dose rate brachytherapy remote after-loading system using an iridium-192 source. Just prior to the cancer treatment, the hospital had replaced the source and upgraded the software.

When entering the data into the treatment system, the qualified operator was unable to electronically transfer the patient's treatment plan from the planning system to the treatment system due to an error message.


After several failed attempts, the qualified operator entered the treatment plan manually into the treatment systems control console, rather than question why he was seeing the error message. Due to a bug in the software upgrade, the treatment system software created an unexpected change in the treatment parameters.

When the qualified operator entered the data manually, the software automatically changed the entered data to the default parameters. The qualified operator faced an unexpected condition with the software error and failed to recognize the change to the treatment parameters.

The patient was then treated with a mis-positioned source. The qualified operator failed to verify that the treatment computer system was correct after software upgrade and prior to treatment.

As a result, the patient received a radiation dose to tissue outside the treatment area and an under-dose to the treatment site. In addition, the hospital failed to follow its procedure of performing an independent review of the treatment plan prior to patient treatment.

This scenario illustrates equipment (software) errors as the initial precipitating event. Had the qualified operator used a questioning attitude, he could have identified the equipment failure and the hospital could have corrected this failure before treating the patient.

## SCENARIO: QUESTIONS

Thinking about the scenario on the previous page, consider the following questions:

1. List actions and behaviors that would have reinforced safety culture as a priority on this case:

2. What does it mean?

3. How does it look like?

4. List ideas on how this situation could have been prevented:

Digital presentation:


Video by Darin OKeeffe won first place in the trait Questioning Attitude in the IAEA competition Towards a Strong Radiation Safety Culture in Medicine.

You can access it **here**.

## TRAIT QUESTIONS

Now that you have read this Trait Talk on Questioning Attitude, consider the following questions:

1. Does my practice/group/department have overall Questioning Attitude responsibilities?

2. If yes, list actions/ideas to improve the Questioning Attitude in your practice/group/department:

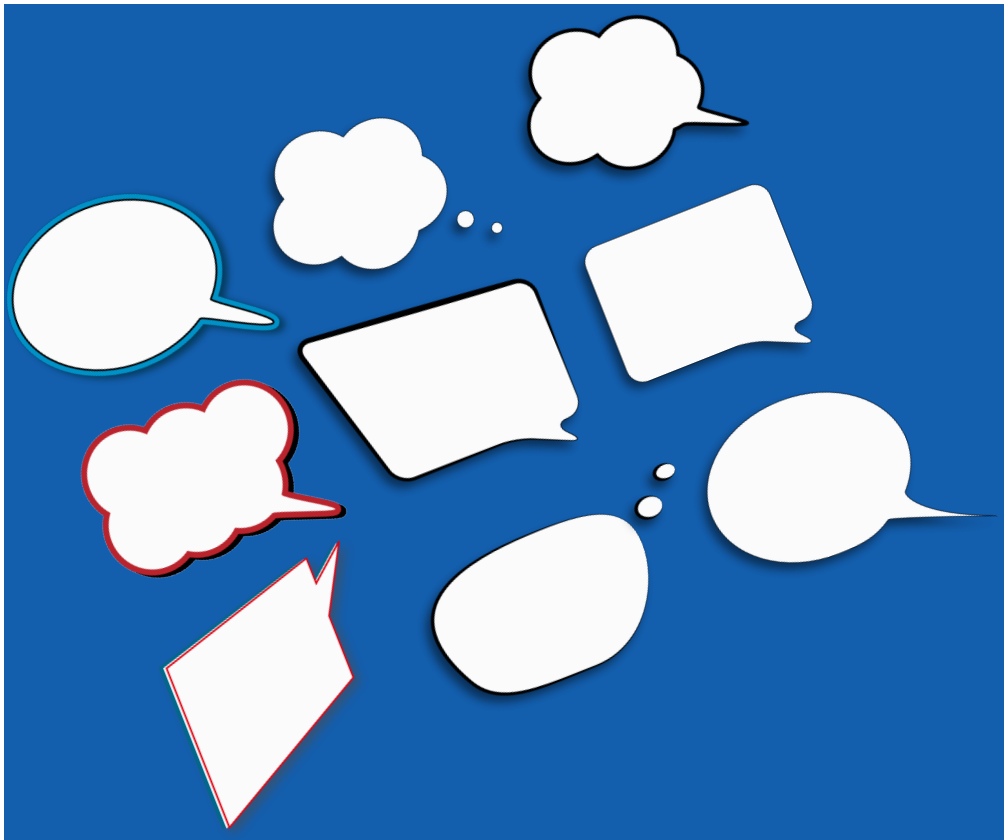
3. List potential barriers to improve the Questioning Attitude in your practice/group/department:

### REMEMBER

The characteristics of this trait are:

- ✓ Radiation sources are special
- ✓ Avoid complacency
- ✓ Challenge the unknown
- ✓ Challenge assumptions

4. Select and share one or two ideas that you would like work on to improve the Questioning Attitude when you come back to your practice/group/department:



# EFFECTIVE SAFETY COMMUNICATION

**Communications maintain a focus on safety. Safety communication is broad and includes facility level communication, job-related communication, worker-level communication, equipment labelling, operating experience, and documentation. Leaders use formal and informal communication to convey the importance of safety. The flow of information up the organization is seen as being just as important as the flow of information down the organization.**

# TRAIT 3

## WHY IS THIS TRAIT IMPORTANT?

Effective safety communication is vital to maintaining a safety culture. When employees regularly communicate with each other in an open, respectful manner, they are also more willing to give and receive feedback. Effective communication also supports teamwork and coordination between groups.

Employees learn about, and become part of, an organization's safety culture through communication. Lack of clear communication from management can create unclear expectations. Employees then spend time and energy trying to interpret the confusing or conflicting messages. Mismatches between formal and informal communications can lead employees to disregard or develop a cynical view of formal communications. This can lead to ineffective formal communications from management and a weakened safety culture.

Top-down communication is most effective when senior managers communicate directly with immediate supervisors and immediate supervisors communicate with their staff. Ensuring that supervisors are informed about organizational issues, and then allowing them to communicate these issues to their staff, helps create and reinforce the supervisor's power. Research shows that when employees perceive their supervisor as having power, employees have greater trust in their supervisor, greater desire to communicate with their supervisor, and are more likely to believe the information coming from their supervisor.

Upward communication from workers to managers, and information exchange among workers, is essential for organizational learning and safe operations. An employee's perceptions about support for safety can strongly influence his or her willingness to speak up.

Some common barriers to upward communication include fear of retaliation, concerns that the communication will be filtered as it goes up the chain of command, perceptions that management is resistant to critical feedback, and fear of creating interpersonal conflict. These communication barriers, if unaddressed, can have a negative impact on information exchange, organizational learning, and ultimately safe performance.

To facilitate effective upward communication, it is important for managers to create an environment that is supportive, encouraging, and accepting of both positive and negative feedback, so employees always feel free to speak up.

## WHAT DOES THIS TRAIT LOOK LIKE?

**Work Process Communications:**

Individuals incorporate safety communications in work activities.

Communications within work groups are timely, frequent, and accurate. Work groups and supervisors communicate with other work groups and supervisors during the performance of their work activities. Individuals communicate with each other such that everyone has the information necessary to accomplish work activities safely and effectively. Communications during shift turnovers and pre-job briefings provide information necessary to support radiation protection and safety. Work groups integrate radiation protection and safety messages into daily activities and meetings.

**Bases for Decisions:**

Leaders ensure that the bases for operational and organizational decisions are communicated in a timely manner.

Leaders promptly communicate expected outcomes, potential problems, planned contingencies, and safety time-out criteria for important decisions. Leaders share information on a wide range of issues with individuals and periodically verify their own, and their employees' understanding of the information. Leaders take steps to avoid unintended or conflicting messages that may be conveyed by decisions. Leaders encourage individuals to ask questions if they do not understand the basis of a decision. Executives and senior managers communicate the reasons for resource allocation decisions, organizational changes, and other decisions affecting the organization as a whole, including the safety implications of those decisions.

**Free Flow of Information:**

Individuals communicate openly and candidly, both up, down, and across the organization and with oversight, audit, and regulatory organizations.

Leaders encourage the free flow of information. Individuals share information openly and candidly. Leaders respond to individuals in an open, honest, and non-defensive manner. Individuals provide complete, accurate, and forthright information to oversight, audit, and regulatory organizations. Leaders actively solicit feedback, listen to concerns, and communicate openly with all individuals. Leaders candidly communicate the results of monitoring and assessments throughout the organization and with independent oversight organizations.

**Expectations:**

Leaders frequently communicate and reinforce the expectation that radiation safety is the organization's overriding priority.

Leaders communicate expectations regarding radiation protection and safety so that individuals understand that safety is the highest priority. Leaders implement a strategy of frequent communication using a variety of tools to communicate more effectively. Leaders reinforce the importance of radiation protection and safety by clearly communicating its relationship to strategic issues, including budget, workforce planning, equipment reliability, and business plans. Leaders communicate desired safety behaviors to individuals, providing examples of how behaviors positively or negatively affect radiation protection and safety. Leaders routinely verify that communications on the importance of radiation protection and safety have been heard and understood. Leaders ensure supplemental personnel understand expected behaviors and actions necessary to maintain radiation protection and safety.

## WHAT IS A SCENARIO IN WHICH THIS TRAIT COULD PLAY A ROLE?

*Please read the scenario and answer the questions on the next page:*

A patient with metastatic thyroid cancer was evaluated post-surgery by a medical radiation practitioner to determine a course of iodine 131 (I-131) therapy.

Typically, post-surgery patients at this hospital are given approximately 7.5 gigabecquerel (GBq) of I-131; however, due to the presence of extensive lung metastases, the physician prescribed 5.5 GBq, so as to ensure protection of healthy lung tissue.

The handwritten prescription was difficult to read, and only expressed the activity prescribed numerically (not also written out as “five and five/tenths GBq”). The medical radiation technologist, knowing that the typical dosage prescribed was 7.5 GBq, ordered 7.5 GBq, without verifying the dosage with the medical radiation practitioner.

When the dosage was received, a different medical radiation technologist assayed the dosage, without checking the prescription, and since the dosage received matched the dosage ordered, she delivered the dosage to the medical radiation practitioner to administer to the patient.

Prior to the administration, the medical radiation practitioner checked both the prescription and the activity on the dosage, and noted the error before administration to the patient.

In this case, there was poor written communication on the part of the medical radiation practitioner, and a lack of communication between the first medical radiation technologist and medical radiation practitioner when the prescription appeared ambiguous; finally, the second medical radiation technologist failed to take note of the written communication (in the form of the prescription), and accepted the dosage as ordered.

CLEAR, UNAMBIGUOUS AND REDUNDANT COMMUNICATIONS ARE ONE OF THE CORNERSTONES OF SAFETY.

IN THIS CASE, THE PATIENT WAS NOT HARMED, EXCEPT THAT HER TREATMENT WAS DELAYED.

## SCENARIO: QUESTIONS

Thinking about the scenario on the previous page, consider the following questions:

1. List actions and behaviors that would have reinforced safety culture as a priority on this case:

2. What does it mean?

3. How does it look like?

4. List ideas on how this situation could have been prevented:

Digital presentation:


Video entitled “Communication in Safety Culture” by Anastasia Sarchosoglou won first place in the trait Effective Safety Communication in the IAEA competition Towards a Strong Radiation Safety Culture in Medicine.

You can access it **here**.

## TRAIT QUESTIONS

Now that you have read this Trait Talk on Effective Safety Communication, consider the following questions:

1. Does my practice/group/department have overall Effective Safety Communication responsibilities?

2. If yes, list actions/ideas to improve the Effective Safety Communication in your practice/group/department:

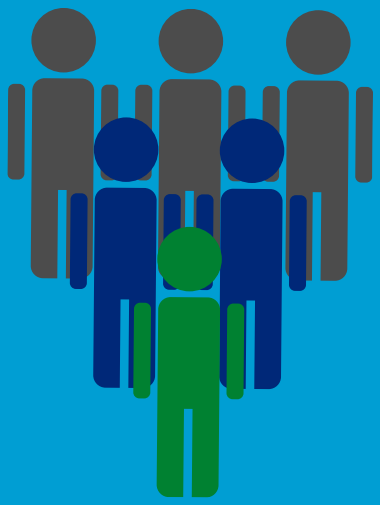
3. List potential barriers to improve the Effective Safety Communication in your practice/group/department:

## REMEMBER

The characteristics of this trait are:

- ✓ Work process communications
- ✓ Bases for Decisions
- ✓ Free flow of Information
- ✓ Expectations

4. Select and share one or two ideas that you would like work on to improve the Effective Safety Communication when you come back to your practice/group/department:



# LEADERSHIP RESPONSIBILITY

**Leaders demonstrate a commitment to safety in their decisions and behaviours. Executive and senior managers are the leading advocates of radiation safety and demonstrate their commitment both in word and action. The radiation safety message is communicated frequently and consistently, occasionally as a stand-alone theme. Leaders throughout the organization set an example for safety. Corporate policies emphasize the overriding importance of radiation safety.**

# TRAIT 4

## WHY IS THIS TRAIT IMPORTANT?

Leaders perform essential functions in organizations.

The quality and actions of leadership have widespread consequences for an organization's safety culture and its performance. Leaders have significant power to affect an organization's safety culture through the priorities they establish, the behaviors and values they model, the reward systems they administer, the trust they create, and the context and expectations they establish for interpersonal relationships, communication, and accountability. Leaders also exert significant influence on change initiatives.

They have the power and responsibility to set strategy and direction, align people and resources, motivate and inspire people, and ensure that problems are identified and solved in a timely manner. A lack of commitment or clear communication about what is important to the organization can create a conflict for employees who must then decide between competing messages. This leads employees to their own interpretations, thereby potentially negatively affecting the organization's safety culture. Behavior matters and leadership behaviors that support a positive safety culture are critical.

Leaders at all levels play an important role in establishing the organization's environment and safety culture. This is evident in the way competing goals that occur at every level of the organization are managed.

There may be conflicting demands from a cost and schedule perspective versus safety and quality. The organization's members may face these competing goals daily. These decisions may occur at all levels of the organization, not just at the top. Each employee may encounter his or her version of these conflicts and will be faced with making decisions as he or she engages in activities to resolve them.

The organization's safety culture plays a significant role in guiding employees' decisions; in other words, what they view as the organization's priorities. Is the organization's priority safety or profit? This is one of the important junctions where leadership at the top of the organization is critical in setting the standards and establishing overarching safety priorities that all employees understand take precedence over all competing demands.



## WHAT DOES THIS TRAIT LOOK LIKE?

**Resources:**

Leaders ensure that personnel, equipment, procedures, and other resources are available and adequate to support safety.

Leaders ensure that staffing levels are sufficient, and personnel are qualified for the work they are performing. Leaders ensure that facilities are maintained, and tools, equipment, procedures, and other resources are readily available to support work performance. Finally, leaders ensure that sufficient corporate resources are allocated for maintenance, equipment, and personnel to ensure safe and reliable operation.

**Field Presence:**

Leaders are commonly seen in working areas of the organization observing, coaching, and reinforcing standards and expectations.

Leaders ensure enough oversight of work activities. They practice visible leadership in the field by coaching, mentoring, reinforcing standards, and reinforcing positive decision-making practices and behaviors. Leaders discuss their observations in detail with the group they observed and provide useful feedback about how to improve individual performance. They model safe behaviors and high standards of accountability to encourage others.

**Incentives, Sanctions, and Rewards:**

Leaders ensure incentives, sanctions, and rewards are aligned with safety policies and reinforce behaviors and outcomes that reflect safety as the overriding priority.

Leaders ensure disciplinary actions are appropriate, consistent, and support safety and a safety conscious work environment. They reward individuals who identify and raise issues affecting safety and praise behaviors that reflect a positive safety culture. Leaders foster an environment that promotes accountability and hold individuals accountable for their actions. Leaders consider potential chilling effects when taking disciplinary actions and other personnel actions, and they take compensatory actions when appropriate.


**Strategic Commitment to Safety:**

Leaders ensure priorities are aligned to reflect safety as the overriding priority.

Leaders develop and implement cost and schedule goals in a manner that reinforces the importance of safety. Information from independent oversight organizations is used to help establish priorities that align with safety. Leaders establish strategic and business plans that reflect safety as the overriding priority and ensure that business priorities also align with safety priorities.

**Change Management:**

Leaders use a systematic process for evaluating and implementing change so that safety remains the overriding priority.

Leaders use a systematic process for planning, coordinating, and evaluating the safety impacts and potential negative effects on the willingness of individuals to raise safety concerns, when making major changes. This includes decisions concerning changes to organizational structure and functions, leadership, policies, programs, procedures, and resources. Leaders ensure safety is maintained when planning, communicating, and implementing change and ensure that significant unintended consequences are avoided. Leaders ensure that individuals understand the importance of, and their role in, the change management process.

**Roles, Responsibilities, and Authorities:**

Leaders clearly define roles, responsibilities, and authorities to ensure safety.

Leaders ensure roles, responsibilities, and authorities of executives, senior managers, and managers are clearly defined, understood, and documented. They appropriately delegate responsibility and authority to promote ownership and accountability. Leaders ensure that recommendations from review boards and independent oversight organizations do not override senior leaders' ultimate responsibility for decisions affecting safety.

## WHAT IS A SCENARIO IN WHICH THIS TRAIT COULD PLAY A ROLE?

*Please read the scenario and answer the questions on the next page:*

Senior leadership at an imaging facility determined that their computed tomography (CT) services could be greatly expanded if they offered imaging in the evening and on weekends, in addition to the normal daily business hours.

In order to accommodate these expanded hours with the least expense, they sought to bring in medical radiation technologists from an outside service, rather than hiring an additional medical radiation technologists.

The lead medical radiation technologist objected to this decision, noting that outside technologists would still require training on the use of the specific equipment at this facility, and on the implementation of the written protocols, as well as supervision for some period of time to ensure they were competent, and expressed concern that there could be multiple technologists provided by the service, making adequate training and supervision yet more difficult.

Senior leadership stated the outside service is responsible for training and educating their technologists and suggested the lead technologist simply write up short descriptions of how to initiate the most commonly used protocols and leave the oversight to them.

After about three weeks of this new arrangement, the medical radiation practitioner contacted the lead technologist to inquire why two pediatric patients had been scanned using adult imaging protocols; he also complained that several images included artifacts rendering them non-diagnostic and said these patients would need to be re-imaged.
The lead technologist contacted senior leadership to inform them that one of the outside technologists had improperly imaged two pediatric patients, and to report that several patients would need to be re-imaged at no charge due to the artifacts in the images. Senior leadership blamed these events on the lead technologist, who they then fired.

The lead technologist contacted the regulatory authority, who performed a reactive inspection, asking to review the training and continuing education records for all radiation medical technologists that had worked at the site. Initially, senior leadership only produced the records for the full-time medical radiation technologists, and when pressed for records for the outside technologists, they stated that the lead technologist was instructed to provide the training, but failed to do so, so they fired him.

After extensive interviews with both the full-time and outside medical radiation technologists, and the medical radiation practitioner, the regulatory agency determined that senior leadership had made false statements to them and revoked the registration of their facility.

## SCENARIO: QUESTIONS

Thinking about the scenario on the previous page, consider the following questions:

1. List actions and behaviors that would have reinforced safety culture as a priority on this case:

2. What does it mean?

3. How does it look like?

4. List ideas on how this situation could have been prevented:


Digital presentation:


Video by Leah Kayomi Schubert won first place in the trait Leadership Values and Actions in the IAEA competition Towards a Strong Radiation Safety Culture in Medicine.

You can access it **here**.

## TRAIT QUESTIONS

Now that you have read this Trait Talk Leadership Responsibility consider the following questions:

1. Does my practice/group/department have overall Leadership Responsibility responsibilities?

2. If yes, list actions/ideas to improve the Leadership Responsibility in your practice/group/department:

3. List potential barriers to improve the Leadership Responsibility in your practice/group/department:

4. Select and share one or two ideas that you would like work on to improve the Leadership Responsibility when you come back to your practice/group/department:

## REMEMBER

The characteristics of this trait are:

- ✓ Resources
- ✓ Field Presence
- ✓ Incentives, Sanctions, and Rewards
- ✓ Strategic Commitment to Safety
- ✓ Change Management
- ✓ Roles, Responsibilities, and Authorities


# DECISION-MAKING

**Decisions that support or affect safety are systematic, rigorous, and thorough. Operators are vested with the authority and understand the expectation, when faced with unexpected or uncertain conditions to place the facility in a safe condition. Senior leaders support and reinforce conservative decisions.**

# TRAIT 5

## WHY IS THIS TRAIT IMPORTANT?

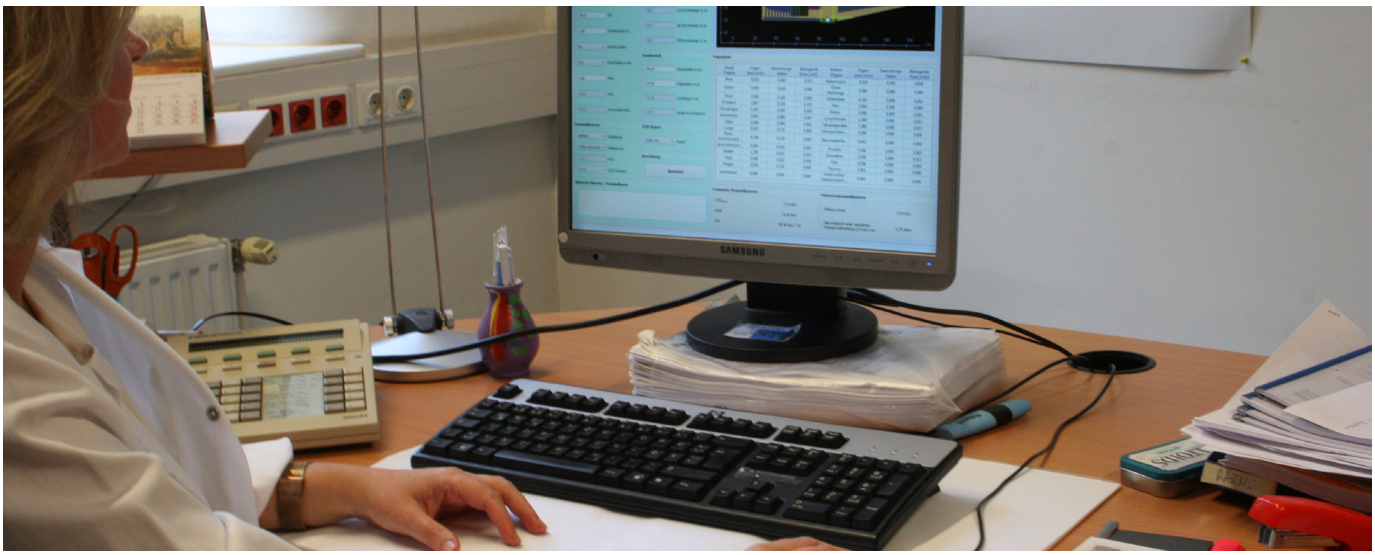
Leadership must provide appropriate resources and a respectful environment to debate complex questions. Staff must be afforded appropriate authority to make decisions in their area of expertise.

Leadership should communicate their expectations, such as that when faced with uncertainty, conservative decisions should prevail.

Radiation protection and safety often entail complex or multi-step decisions to ensure adequate protection for workers, patients and members of the public. These decisions should not be taken lightly, and appropriate tools, expertise, and time must be made available to support systematic, rigorous, and thoroughly vetted decision-making.

Even routine decision-making should be thoughtful and deliberate when potentially impacting radiation protection or safety issues.

In the medical field, decision-making takes on special importance, since this is the only field using radiation that intentionally exposes humans to radiation. The general precepts of radiation protection: Justification, Optimization, and Limitation should frame decision-making whether in the context of worker safety or patient safety.



## WHAT DOES THIS TRAIT LOOK LIKE?

**Systematic, rigorous and thorough:**

Leaders ensure that personnel have the tools available to support complex decisions, and provide an environment that allows open debate to thoroughly vet decisions.

The tools necessary for making systematic, rigorous, and thoroughly vetted decisions include not only computational tools, such as appropriate, validated software, but also adequate expertise, and time to allow any necessary measurements, analysis, and discussion. Staff should ensure that computational software is up-to-date, and from a reliable verified source. Leadership should recognize that in the face of complex decisions, it may be necessary to enlist the assistance of appropriately qualified experts outside the organization. Adequate time must be provided for making thoroughly vetted decisions, in a respectful environment with open discussion of the options.

**Authority:**

Leaders provide authority to those with appropriate qualifications to make decisions in their field of expertise.

Leaders ensure staff have the authority to make final decisions within their area of expertise, and communicate that authority to all team members. In this way, it is clear who has the responsibility for making a decision. Such responsibility is only effective with an appropriate level of authority to make and enforce a decision, as necessary. Staff with decision-making responsibility and authority should seek out opinions from stakeholders, such as colleagues in their own or other departments, who may be affected by a decision to help guard against unintended consequences. Once a final decision is made, it should be clearly communicated to all persons affected.

**Expectations:**

Leaders ensure their expectations are clearly communicated to all staff. Where there is a high degree of uncertainty surrounding a decision, leaders must be clear that they support conservative decision-making.

Leaders communicate expectations that decisions involving many or large uncertainties should take a conservative path, even if that means implementing the decision may take more time or other resources. Conservative decisions consider the three foundational principles of radiation protection: justification, optimization, and limitation. A conservation decision may not always mean the lowest possible radiation dose to those involved as other safety considerations may play a role, such as when treating a contaminated patient with life-threatening injuries; in such a case, the conservative decision is to treat and stabilize the patient, and then address the contamination.

## WHAT IS A SCENARIO IN WHICH THIS TRAIT COULD PLAY A ROLE?

*Please read the scenario and answer the questions on the next page:*

Many patients undergoing post-thyroidectomy treatment with iodine 131 (I-131) may be released to go home with appropriate instructions to protect other people from excessive radiation exposure. There are guidance and calculating tools available to assist in the decision to release a patient to home.

At one hospital, a standard dosage of 5.5 gigabecquerel (GBq) is used to treat these patients, and they are routinely released to home with instructions to stay at a distance of two meters from other family members for three days, as well as some simple contamination control instructions.

A new nuclear medicine physician joined the staff and was concerned that instructions were not individually tailored to the patient and the patient's circumstances, as she had been trained to do. She introduced a computer program, which provides individualized instructions, based on the activity delivered, the residual thyroid tissue in the patient, and the extent of metastases.

Initially, the other staff physicians were reticent to implement a change to their process, as the computer program was indicating that certain patients should remain separated from family members for longer periods of time than they had previously been instructing, and in some cases the length of time seemed unreasonable, with non-compliance by the patient likely.

One physician suggested that in addition to the computer-aided calculation that actual measurements be taken when the patient returned for their three-day follow-up, and that adjustments could be made to the instructions based on these measurements, and the calculation of the actual effective half-life in the patient's body.

The combination of these individual decision-making tools – computer-aids, initial measurements, and measurements during follow-up, provided additional tools for complex decision-making.

## SCENARIO: QUESTIONS

Thinking about the scenario on the previous page, consider the following questions:

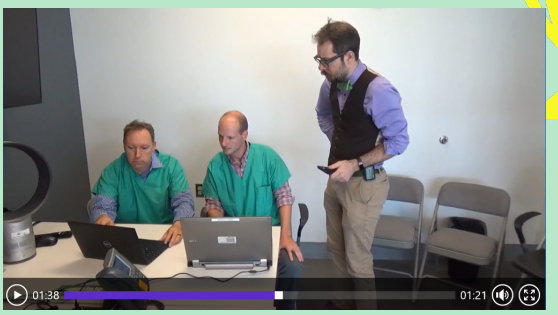
1. List actions and behaviors that would have reinforced safety culture as a priority on this case:

2. What does it mean?

3. How does it look like?

4. List ideas on how this situation could have been prevented:

Digital presentation:




Video of role play by Ashley Cetnar won first place in the trait Decision-Making in the IAEA competition Towards a Strong Radiation Safety Culture in Medicine.

You can access it **here**.

## TRAIT QUESTIONS

Now that you have read this Trait Talk on Decision-Making, consider the following questions:

1. Does my practice/group/department have overall Decision-making responsibilities?

2. If yes, list actions/ideas to improve the Decision-making in your practice/group/department:

3. List potential barriers to improve the Decision-making in your practice/group/department:

## REMEMBER

The characteristics of this trait are:

- ✓ Systematic, rigorous and thorough
- ✓ Authority
- ✓ Expectations

4. Select and share one or two ideas that you would like work on to improve the Decision-making when you come back to your practice/group/department:

# RESPECTFUL WORK ENVIRONMENT

**Trust and respect permeate the organization. A high level of trust is established in the organization, fostered, in part, through timely and accurate communication. Differing professional opinions are encouraged, discussed, and resolved in a timely manner. Employees are informed of steps taken in response to their concerns.**

# TRAIT 6

## WHY IS THIS TRAIT IMPORTANT?

Trust and respect are among the most frequently discussed concepts in studies of organizational and safety culture. Trust and respect are fundamental to positive interpersonal relationships and central components of effective working relationships.

The nature and level of trust and respect between workers and their managers and supervisors affect all aspects of their relationship and influence their attitudes and behaviors. Studies of organizations have found that trust in management is positively related to employee job performance, organizational citizenship behavior, and engagement in safety behaviors. Distrust of management tends to lower levels of engagement and reduce feelings of personal responsibility for safety.

At an individual level, trust involves the willingness of one person to depend on another person, with a relative sense of security. The perception that an individual is competent, has integrity, and is predictable increases the likelihood that he is trusted and respected.

Trust and respect affect the persuasive power of an individual. Efforts to influence others are more likely to succeed when those attempting to influence are trusted and respected. In addition, successful work groups, teamwork, and collaboration require respect for others' opinions and differing views. When differences are respected, they can be a source of motivation and innovation for an organization; lack of respect can destroy trust and weaken safety culture.

At an organizational level, trust and respect instill confidence that the organization is just and fair, which promotes open communication and accurate reporting, enhances organizational learning, and promotes the development of shared perceptions and norms. In studies of safety culture, higher levels of trust and respect are associated with positive safety attitudes, reduced risky behavior, and increased personal responsibility for safety.

Open communication, fairness, and management accountability are the most frequently identified mechanisms that build trust and respect in an organization. Leaders earn trust and respect when employees can see that they are fair, deal directly with problems and issues, and encourage and value all ideas and opinions. A strong safety culture requires mutually respectful, trusting relationships between and within workgroups and between all levels in the organization

## WHAT DOES THIS TRAIT LOOK LIKE?

**Respect is Evident:**

Everyone is treated with dignity and respect.

The organization regards individuals and their professional capabilities and experiences as its most valuable asset. Individuals at all levels of the organization, within and between workgroups, treat each other with dignity and respect. They do not demonstrate or tolerate bullying or humiliating behaviors. Leaders monitor for behaviors that can have a negative impact on the work environment and address them promptly. They ensure policies and expectations are enforced fairly and consistently for individuals at all levels of the organization. Individuals treat decision-makers with respect, even when they disagree with a decision. Leaders ensure facilities are conducive to a productive work environment and housekeeping is maintained.

**High Level of Trust:**

Trust is fostered among individuals and work groups throughout the organization.

Leaders promote collaboration among work groups. Leaders respond to questions and concerns in an open and honest manner. Leaders, sensitive to the negative impact of a lack of information, share important information in an open, honest, and timely manner such that trust is maintained. They ensure that status and important work milestones are communicated throughout the organization. Leaders acknowledge positive performance and address negative performance promptly and directly with the individual involved. Confidentiality is maintained as appropriate. Leaders welcome performance feedback from throughout the organization and modify their behavior when appropriate.

**Opinions are Valued:**

Individuals are encouraged to voice concerns, provide suggestions, and raise questions. Differing opinions are respected.

The organization encourages individuals to offer ideas, concerns, suggestions, differing opinions, and questions to help identify and solve problems. Leaders are receptive to ideas, concerns, suggestions, differing opinions, and questions. The organization promotes robust discussions, recognizing that differing opinions are a natural result of differences in expertise and experience. Individuals value the insights and perspectives provided by other departments and outside oversight organizations.

**Conflict Resolution:**

Fair and objective methods are used to resolve conflicts.

The organization implements processes to ensure fair and objective resolution of conflicts and differing views. Leaders ensure conflicts are resolved in a balanced, equitable, and consistent manner, even when outside of defined processes. Individuals have confidence that conflicts will be resolved respectfully and professionally.

## WHAT IS A SCENARIO IN WHICH THIS TRAIT COULD PLAY A ROLE?

*Please read the scenario and answer the questions on the next page:*

An in-patient in the Intensive Care Unit (ICU) had a CT scan of her head ordered. Due to her medical status, a nurse was always required to be with her during the transport and procedure.

This was late in the evening, and near the end of the medical radiation technologist's shift. The medical radiation technologist showed obvious irritation at having this last-minute scan added to her schedule, and spoke rudely to the transport nurse, who had been delayed in accompanying the patient to the imaging procedure room.

Once the patient was positioned, and just prior to the imaging, the nurse and medical radiation technologist were together at the control panel, when the intravenous (IV) pump signaled there was a problem. The nurse rushed into the imaging procedure room to adjust the IV pump, and ensure the patient was not in medical distress.

While the nurse was in the room, the medical radiation technologist initiated the pre-scanning procedure, which caused the bed to begin to move into the scanner. The nurse, believing that the scan had begun, quickly completed what he was doing, and tried to rush out of the room, but slipped and fell.

He was not seriously hurt, and got up on his own, and returned to the control panel with the technologist, accusing her of intentionally exposing him to radiation. The medical radiation technologist told him he didn't know what he was talking about and continued the procedure.

After the imaging was complete, the nurse returned the patient to her room, and filed an incident report in the hospital's reporting system. The hospital's human resources department and radiation safety office investigated the incident and found that the nurse was not exposed to radiation while in the imaging procedure room, but that the medical radiation technologist had acted inappropriately.

Since this was the first time such an incident had occurred with this technologist, her supervisor discussed the situation with her, and they agreed that she would be more understanding of the pressures on her colleagues, take the time to talk to them about what to expect during an imaging procedure, and listen to them regarding their concerns as well.

## SCENARIO: QUESTIONS

Thinking about the scenario on the previous page, consider the following questions:

1. List actions and behaviors that would have reinforced safety culture as a priority on this case:

2. What does it mean?

3. How does it look like?

4. List ideas on how this situation could have been prevented:

Digital presentation:


Video showing weekly Friday meeting of different medical professionals from Rebecca Schwartzmann won first place in the trait Respectful Work Environment in the IAEA competition Towards a Strong Radiation Safety Culture in Medicine.

You can access it **here**.

## TRAIT QUESTIONS

Now that you have read this Trait Talk on Respectful Work Environment, consider the following questions:

1. Does my practice/group/department have overall Respectful Work Environment responsibilities?

2. If yes, list actions/ideas to improve the Respectful Work Environment in your practice/group/department:

3. List potential barriers to improve the Respectful Work Environment in your practice/group/department:

## REMEMBER

The characteristics of this trait are:

- ✓ Respect is Evident
- ✓ High Level of Trust
- ✓ Opinions are Valued
- ✓ Conflict Resolution

4. Select and share one or two ideas that you would like work on to improve the Respectful Work Environment when you come back to your practice/group/department:

# CONTINUOUS LEARNING

**Opportunities to learn about ways to ensure safety are sought out and implemented. Operating experience is highly valued, and the capacity to learn from experience is well developed. Training, self-assessments, and benchmarking are used to stimulate learning and improve performance. Safety is kept under constant scrutiny through a variety of monitoring techniques, some of which provide an independent "fresh look."**

# TRAIT 7



## WHY IS THIS TRAIT IMPORTANT?

Continuous learning contributes substantially to a positive safety culture. Continuous learning organizations are characterized by an enhanced ability and willingness of individuals to apply their individual learning in the workplace and to share and transfer it to their team members and coworkers.

At the individual and team level, continuous learning includes obtaining knowledge, determining how that knowledge applies to the work of the individual and the team, as well as sharing that knowledge and ensuring that it is retained in the organization.

To capture and sustain the benefits from individual and team learning, learning organizations develop leadership that prioritizes and motivates the desired learning and behaviors that are effective in ensuring that knowledge is shared and retained within an organization.

Organizations committed to continuous learning reflect an organizational perspective that specifically addresses learning requirements at the individual, group, and organizational levels. Leadership at all of these levels must focus on learning, teaching, and changing an organization into a learning organization.

Organizations focusing on continuous learning ensure that opportunities to improve safety are identified and shared, and by doing so, build a strong safety culture.

Continuous learning requires that leaders and managers trust and respect their workers. An environment that supports continuous learning is one that encourages an employee to ask questions, demonstrates appreciation for raising differing views, allows time for understanding, and encourages communication and collaboration.

Learning organizations are committed to learning from their mistakes and those of others, and they take appropriate action to address lessons learned. They evaluate operating experiences and ensure that lessons learned are shared throughout an organization. They evaluate their own programs and policies for opportunities for improvement, benchmark other organizations, and understand the importance of training.

## WHAT DOES THIS TRAIT LOOK LIKE?

**Operating Experience:**

The organization systematically and effectively collects, evaluates, and implements relevant internal and external operating experience in a timely manner.

A process is in place to ensure a thorough review of operating experience provided by internal and external sources. Operating experience is implemented and institutionalized effectively through changes to processes, procedures, equipment, and training programs. Operating experience is used to understand equipment, operational, and other challenges and to adopt new ideas to improve performance. Operating experience is used to support daily work functions, with emphasis on the possibility that "it could happen here." Operating experience is shared in a timely manner.



**Training:**

The organization provides training and ensures knowledge transfer to maintain a knowledgeable, technically competent workforce and instill radiation safety values.

The organization fosters an environment in which individuals' value and seek continuous learning opportunities. Individuals, including supplemental workers, are adequately trained to ensure technical competency and an understanding of standards and work requirements. Individuals master fundamentals to establish a solid foundation for sound decisions and behaviors. The organization develops and effectively implements knowledge transfer and knowledge retention strategies. Knowledge transfer and knowledge retention strategies are applied to capture the knowledge and skill of experienced individuals to advance the knowledge and skill of less experienced individuals. Leadership and management skills are systematically developed. Training is developed and continuously improved using input and feedback from individual contributors and subject-matter experts. Executives obtain the training necessary to understand basic operations and the relationships between major functions and organizations.

**Self-Assessment:**

The organization routinely conducts self-critical and objective assessments of its programs and practices.

Independent and self- assessments, including radiation protection and safety culture assessments, are thorough and effective and are used as a basis for improvements. The organization values the insights and perspectives assessments provide. Self-assessments are performed on a variety of topics, including the self-assessment process itself. They are performed at a regular frequency and provide objective, comprehensive, and self-critical information that drive corrective actions. Targeted self-assessments are performed when a more thorough understanding of an issue is required. A balanced approach of self-assessments and independent oversight is used and periodically adjusted based on changing needs. Self-assessment teams include individual contributors and leaders from within the organization and from external organizations when appropriate.

**Benchmarking:**

The organization learns from other organizations to continuously improve knowledge, skills, and safety performance.

The organization uses benchmarking as an avenue for acquiring innovative ideas to improve nuclear safety. The organization participates in benchmarking activities with other nuclear and nonnuclear facilities. The organization seeks out best practices by using benchmarking to understand how others perform the same functions. Benchmarking is used to compare standards to the industry and to adjust improve performance. Individual contributors are actively involved in benchmarking.

## WHAT IS A SCENARIO IN WHICH THIS TRAIT COULD PLAY A ROLE?

*Please read the scenario and answer the questions on the next page:*

Radioactive seed implantation is a routine treatment option for the treatment of prostate cancer, and a large number of medical facilities throughout the world offer this treatment. Small radioactive seeds are placed (via needle injection) into the prostate gland, where they irradiate the surrounding cancerous tissue.

A major metropolitan hospital discovered that a prostate therapy seed implantation procedure had used seeds with an activity not prescribed by the treating medical radiation practitioner; i.e., the medical radiation practitioner had ordered seeds to be implanted with an activity of 18 megabecquerel (MBq) per seed, whereas the seeds actually implanted were 10 MBq per seed. This resulted in an underdose to the patient's prostate, and could result in an increased risk of recurrent or relapsed prostate cancer.

After this event was identified, the hospital reviewed all prostate seed implant procedures performed during the five years prior to this event, and several similar events were identified.

These events were reported by two major newspapers, and became the subject of certain governmental proceedings, including public hearings on the topic.

These events also brought to light, numerous events wherein, while the correct activity seeds were implanted, they were implanted in the wrong place, resulting in both an underdose to the prostate gland, and an overdose to adjacent organs and tissues. These events were identified while reviewing post-procedure computed tomography images of the implant location.

Despite the widespread publicity regarding these events, and the events being reported at numerous technical and professional meetings, ten years after the initial event, similar events continue to occur at various other medical facilities.

As has been widely reported, events of this type can be avoided through consistent adherence to implant procedures, proper maintenance and use of ultra-sound imaging equipment to guide the procedure, and extensive training for persons performing and assisting in the procedure, including both seed placement procedures, and image-guidance procedures.

Ongoing programs to identify these events, and make continuous improvements to seed implant programs, including associated imaging programs can reduce or eliminate their occurrence.

## SCENARIO: QUESTIONS

Thinking about the scenario on the previous page, consider the following questions:

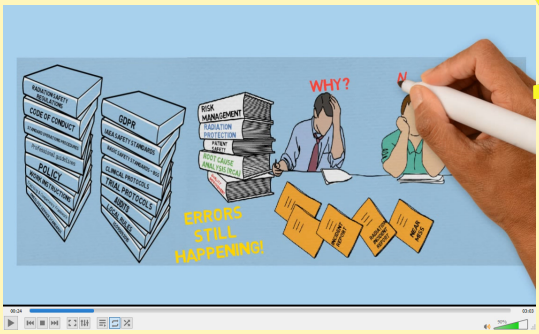
1. List actions and behaviors that would have reinforced safety culture as a priority on this case:

2. What does it mean?

3. How does it look like?

4. List ideas on how this situation could have been prevented:

Digital presentation:




Animated video by Isabel Ho and Geri Briggs won the first place in the trait Continuous Learning in the IAEA competition Towards a Strong Radiation Safety Culture in Medicine.

You can access it **here**.

## TRAIT QUESTIONS

Now that you have read this Trait Talk on Continuous Learning, consider the following questions:

1. Does my practice/group/department have overall Continuous Learning responsibilities?

2. If yes, list actions/ideas to improve the Continuous Learning in your practice/group/department:

3. List potential barriers to improve the Continuous Learning in your practice/group/department:

## REMEMBER

The characteristics of this trait are:

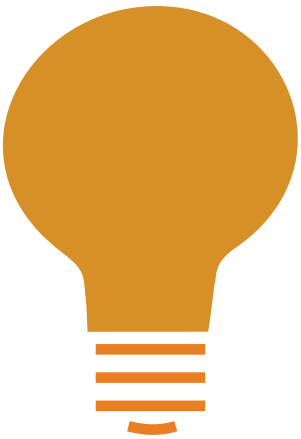
- ✓ Operating Experience
- ✓ Training
- ✓ Self-Assessment
- ✓ Benchmarking

4. Select and share one or two ideas that you would like work on to improve the Continuous Learning when you come back to your practice/group/department:

# PROBLEM IDENTIFICATION AND RESOLUTION

**Problem identification and resolution is an important element of safety culture. Leaders are responsible for identifying and diagnosing organizational or technical deficiencies.**

# TRAIT 8



## WHY IS THIS TRAIT IMPORTANT?

Leaders are responsible for identifying and diagnosing organizational or technical deficiencies, taking corrective action, and anticipating emerging issues.

All members of an organization support problem identification and resolution by promptly raising and reporting concerns (for example, by working through a corrective action program).

The extent and manner in which organizations identify and resolve problems serve as an example how the organization prioritizes safety. The ability and willingness of workers and managers to identify and address problems is also important for continuous learning, another trait of a positive safety culture.

An effective problem identification and resolution program uses the organization's corrective action program, operating experience, and self-assessment results to ensure safe operations. The corrective action program should have a transparent process for evaluating, prioritizing, and resolving issues.

Leaders should ensure that they and the rest of the organization fully understand safety-related issues. Without full understanding, the organization cannot appropriately prioritize and resolve these issues so that they do not occur again.

An effective problem identification and resolution program leads to a strong safety conscious work environment. In such an environment, the organization removes barriers to a free flow of information to ensure that all employees feel free to raise safety-related concerns.

Organizations can approach problem identification and resolution with different mindsets. One mindset focuses on finding existing problems and correcting weaknesses, typically through the organization's corrective action program. However, an organization with a positive safety culture also has a problem identification and resolution program that anticipates issues, reviews operating experience, and tracks emerging themes and trends.

Organizational learning is most successful when issues are anticipated and addressed before they become weaknesses to be corrected.

## WHAT DOES THIS TRAIT LOOK LIKE?

**Identification:**

The organization implements a corrective action program with a low threshold for identifying issues. Individuals identify issues completely, accurately, and in a timely manner in accordance with the program.

Individuals recognize deviations from standards and understand how to enter issues into the corrective action program. They ensure that issues, problems, degraded conditions, and near misses are promptly reported and documented in the corrective action program at a low threshold. Individuals describe the issues entered in the corrective action program in enough detail to ensure they can be appropriately prioritized, trended, and assigned for resolution.


**Trending:**

The organization periodically analyzes information from the corrective action program and other assessments in the aggregate to identify programmatic and common cause issues.

The organization develops indicators that monitor both equipment and organizational performance, including safety culture. Managers use indicators that provide an accurate representation of performance and early indications of declining trends, and routinely challenge the organization's understanding of declining trends. Organizational and departmental trend reviews are completed in a timely manner in accordance with program expectations.process.

**Resolution:**

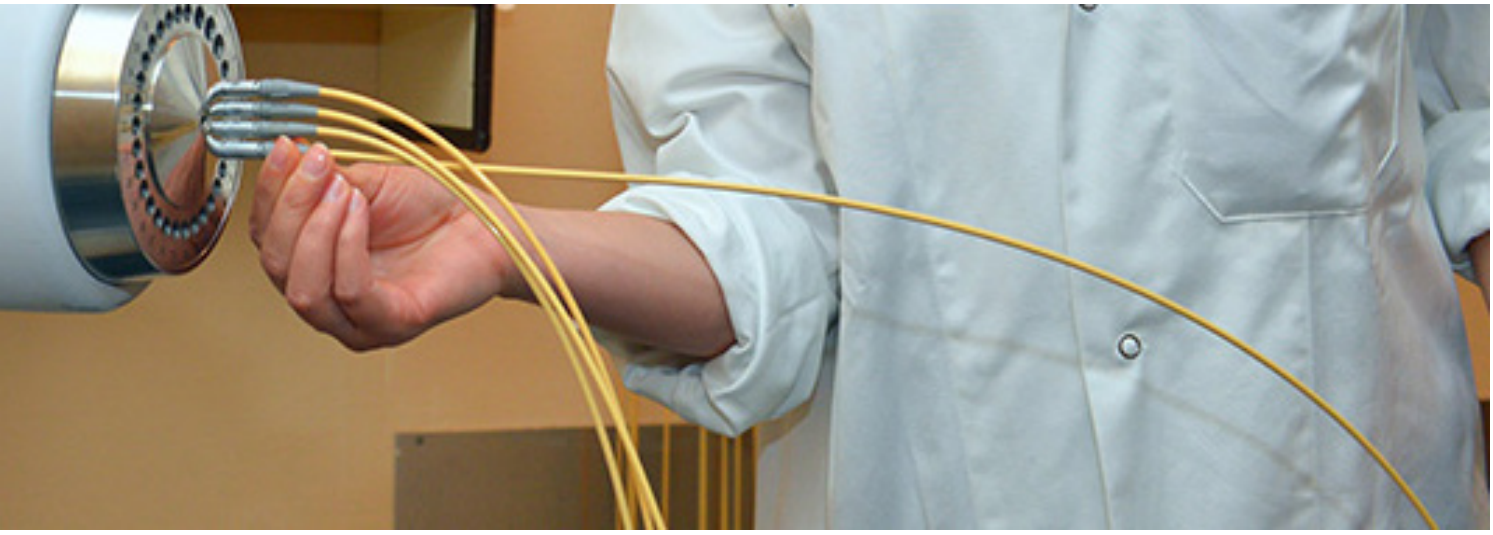
The organization takes effective corrective actions to address issues in a timely manner.

The organization ensures that corrective actions are completed in a timely manner. Deferrals of corrective actions are minimized, and when required, due dates are extended using an established process that appropriately considers safety significance. The organization ensures that appropriate interim corrective actions are taken to mitigate issues while more fundamental causes are being assessed. Corrective actions resolve and correct the identified issues, including causes and extents of conditions, and prevent the recurrence of significant conditions adverse to radiation protection and safety. Trends in safety performance indicators are acted on to resolve problems early.

**Evaluation:**

The organization thoroughly evaluates problems to ensure that resolutions address causes and extents of conditions commensurate with their safety significance.

The organization ensures that issues are properly classified, prioritized, and evaluated according to their safety significance. Extent-of-condition and extent-of-cause evaluations are completed in a timely manner, commensurate with the safety significance of the issue. The organization ensures that apparent and root cause investigations identifying primary and contributing causal factors are completed as required. Issues are investigated thoroughly according to their safety significance, and root cause analyses are rigorously applied to identify and correct the fundamental cause of significant issues. The underlying organizational and safety culture contributors to issues are evaluated thoroughly and are given the necessary time and resources to be clearly understood. Managers conduct effectiveness reviews of significant corrective actions to ensure that the resolution addressed the causes effectively.



## WHAT IS A SCENARIO IN WHICH THIS TRAIT COULD PLAY A ROLE?

*Please read the scenario and answer the questions on the next page:*

A hospital routinely provided treatment for certain cancers using a high dose-rate afterloader (HDR) with an iridium 192 (Ir-192) source.

The room in which these treatments took place was equipped with an independent radiation detector, which alarmed when there were high levels of radiation, if the door to the treatment room was open. That is, if a patient was in the room being treated, and the door was properly closed, the alarm did not go off; however, if the treatment room door was opened while the source was still exposed, the alarm would sound.

Staff frequently complained that the alarm would go off for no reason. Staff often overrode the alarm, without examining why the alarm occurred, and without using an available portable instrument to confirm there was no radiation present.

After one treatment of an elderly patient, who resided at a long-term care facility, the alarm sounded when the staff had completed the treatment and opened the door to remove the patient.

The staff member entering the room, immediately went to the radiation detector and disabled the alarm. The patient was then removed from the treatment room, and ultimately transported back to her long-term care facility.

The wire connecting the Ir-192 source to the catheter in the patient had broken, and the source remained inside the catheter in the patient.

About four days after this treatment, the catheter came loose and fell out, with the source still in it. A nurse found it, and not knowing it contained radioactive material, placed it in a biohazard bag, and placed it into storage for later disposal. The patient died the next day.

A biohazard waste company collected this waste about 10 days after the treatment, and delivered it to a waste incinerator, which also had radiation detectors.

This load of waste alarmed, and an investigation began. In total a dozen employees of the long-term care facility and visitors there were unknowingly exposed to radiation, and it was determined that the patient died as a result of her excessive radiation exposure.

## SCENARIO: QUESTIONS

Thinking about the scenario on the previous page, consider the following questions:

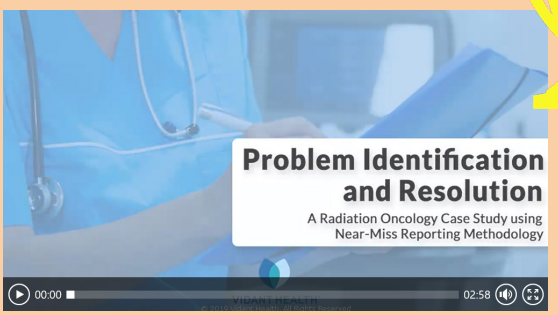
1. List actions and behaviors that would have reinforced safety culture as a priority on this case:

2. What does it mean?

3. How does it look like?

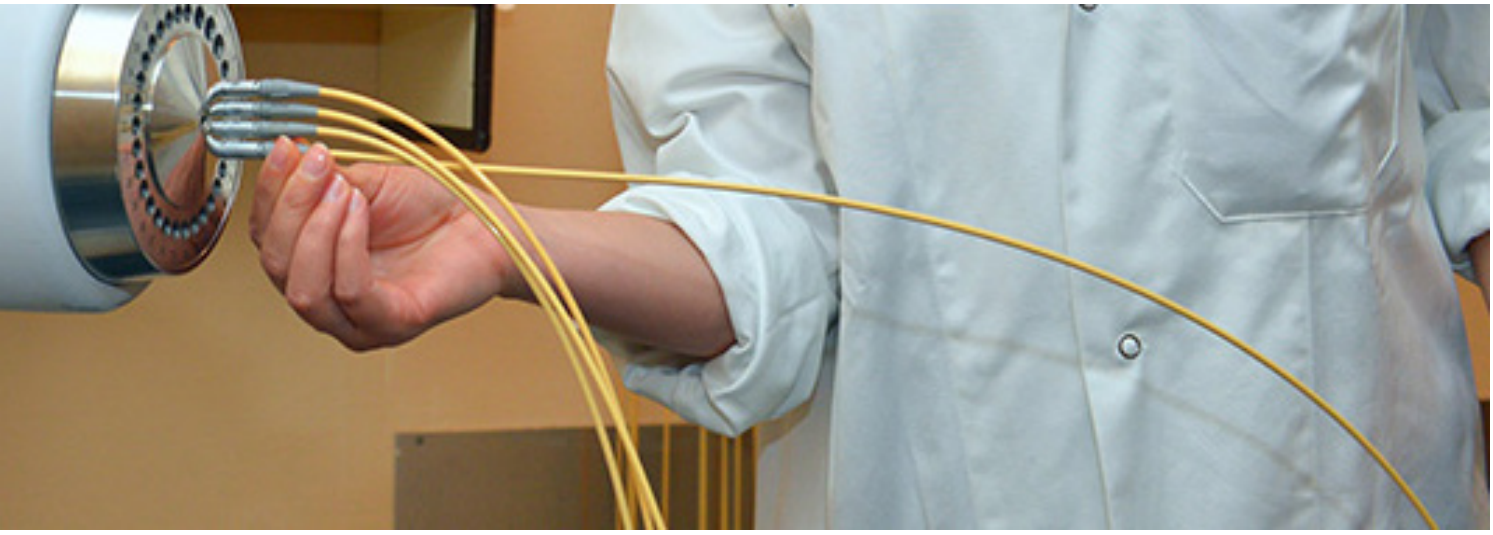
4. List ideas on how this situation could have been prevented:

Digital presentation:




Video entitled “Problem Identification and Resolution: A Radiation Oncology Case Study Using Near-Miss Reporting Methodology” by Timothy S. Barnes won first place in the trait Problem Identification and Resolution in the IAEA competition Towards a Strong Radiation Safety Culture in Medicine.

You can access it **here**.



## TRAIT QUESTIONS

Now that you have read this Trait Talk on Problem Identification and Resolution, consider the following questions:

1. Does my practice/group/department have overall Problem Identification and Resolution responsibilities?

2. If yes, list actions/ideas to improve the Problem Identification and Resolution in your practice/group/

3. List potential barriers to improve the Problem Identification and Resolution in your practice/group/department:

### REMEMBER

The characteristics of this trait are:

- ✓ Identification
- ✓ Trending
- ✓ Resolution
- ✓ Evaluation

4. Select and share one or two ideas that you would like work on to improve the Problem Identification and Resolution when you come back to your practice/group/department:

# ENVIRONMENT FOR RAISING CONCERNS

**A safety-conscious work environment (SCWE) is maintained where personnel fell free to raise safety concerns without fear of retaliation, intimidation, harassment, or discrimination. The facility creates, maintains, and evaluates policies and processes that allow personnel to freely raise concerns.**

# TRAIT 9

## WHY IS THIS TRAIT IMPORTANT?

Fostering an environment for raising concerns is an important attribute of a positive radiation protection and safety culture. Organizations should have a work environment where employees are encouraged to raise safety concerns and where those concerns are reviewed promptly, given the proper priority based on their potential safety significance, and appropriately resolved, with timely feedback to the originator of the concerns and to other employees as appropriate.

Employees should feel free to raise safety concerns to their management without fear of harassment, intimidation, retaliation, or discrimination.

The organization is prohibited by law from taking adverse retaliatory actions against employees because they raised concerns. When allegations of discrimination or retaliation arise, the appropriate level of management must be involved to review the facts, evaluate or reconsider the action, and, where warranted, remedy the matter. In addition to the hardship caused to the individual employee, the perception by fellow workers that raising concerns has resulted in retaliation can generate a chilling effect that may discourage other workers from raising concerns. Any reluctance on the part of employees to raise concerns can be detrimental to radiation protection and safety.

The organization should clearly identify the processes that employees may use to raise concerns, such as discussing issues with their supervisor or filing deficiency reports for problem identification and resolution.

However, it is important to recognize that some employees may not always be comfortable raising concerns through the normal channels, such as with their immediate supervisor. From a safety perspective, no method of raising potential safety concerns should be discouraged. Therefore, the organization should focus on achieving and maintaining an environment where employees feel free to raise their concerns directly to their supervisors, as well as ensuring that alternate means of raising and addressing concerns are accessible, credible, and effective. These alternative approaches may include an “open-door” policy that allows the employee to bring a concern to a higher-level manager, an ombudsman program, or an employee concerns program.

An organization that reinforces an environment for raising concerns typically has well-developed systems for prioritizing problems and directing resources, effective communications for openly sharing information and analyzing the root causes of identified problems, and management that promotes employee confidence in raising and resolving concerns

## WHAT DOES THIS TRAIT LOOK LIKE?

**Safety Conscious Work Environment (SCWE) Policy:**

The organization effectively implements a policy that supports individuals' rights and responsibilities to raise safety concerns and does not tolerate harassment, intimidation, retaliation, or discrimination for doing so.

Individuals feel free to raise radiation protection and safety concerns without fear of retribution, with confidence that their concerns will be addressed. Executives and senior managers set and reinforce expectations for establishing and maintaining a safety-conscious work environment. Policies and procedures reinforce that individuals have the right and responsibility to raise radiation safety concerns and define the responsibilities of leaders to create an environment in which individuals feel free to raise safety concerns. Leaders are trained to take ownership when receiving and responding to concerns, recognizing confidentiality if appropriate, and ensuring they are adequately addressed in a timely manner. Individuals are trained that behaviors or actions that could prevent concerns from being raised, including harassment, intimidation, retaliation, or discrimination, will not be tolerated and are violations of law and policy. All claims of retaliation are investigated, and any necessary corrective actions are taken in a timely manner, including actions to mitigate any potential chilling effect.

**Alternate Process for Raising Concerns**

The organization effectively implements a process for raising and resolving concerns that is independent of line management influence. Safety issues may be raised in confidence and are resolved in a timely and effective manner.

Executives establish, support, and promote the use of alternative processes for raising concerns and ensure corrective actions are taken. Leaders understand their role in supporting alternative processes for raising concerns. Processes for raising concerns or resolving differing professional opinions that are alternatives to the corrective action program and operate outside the influence of the management chain are communicated and accessible to individuals. Alternative processes are independent, include an option to raise concerns confidentially, and ensure these concerns are appropriately resolved in a timely manner. Individuals receive feedback in a timely manner. Individuals have confidence that issues raised will be appropriately resolved. Individuals assigned to respond to concerns have the appropriate competencies.

## WHAT IS A SCENARIO IN WHICH THIS TRAIT COULD PLAY A ROLE?

*Please read the scenario and answer the questions on the next page:*

A pediatric patient came into the emergency department of a hospital, after a dramatic fall down some stairs. The medical practitioner ordered a computed tomography (CT) scan of the child's head to assess for serious injury.

The medical radiation technologist took the young patient and his parent to the scanning room, and proceeded to input the protocol, and position the patient. After initiating the scan, the machine halted after completing less than half of the scan.

The machine showed an error code. The technologist reset the machine and initiated another scan. Once again, the machine stopped mid-scan, and the technologist reset the machine again, and initiated another scan. This occurred over ten times, when the parent became concerned, and suggested the technologist contact the medical radiation practitioner.

The medical radiation technologist assured the parent that these errors were common on this machine, and that she would be able to complete the scan. After making two more attempts, the parent asked to remove her child from the scanner and left with him to find the original medical practitioner, who requested that a CT be performed on the other, newer CT scanner.

After a report by the parent to the regulatory agency, the regulatory agency investigated, and determined that the scanner in question had suffered frequent malfunctions, and the response by medical radiation technologists was not uniform, with some attempting one or more re-scans before removing the patient, while others removed the patient to the other scanner (if available) upon the first error code.

This was usually accomplished without communication with the referring medical practitioner or a radiological medical practitioner, and when interviewed, the medical radiation technologists reported they were reluctant to complain about the malfunctions, since complaints sometimes resulted in having their work hours reduced, so they simply made their own decisions about what to do.

## SCENARIO: QUESTIONS

Thinking about the scenario on the previous page, consider the following questions:

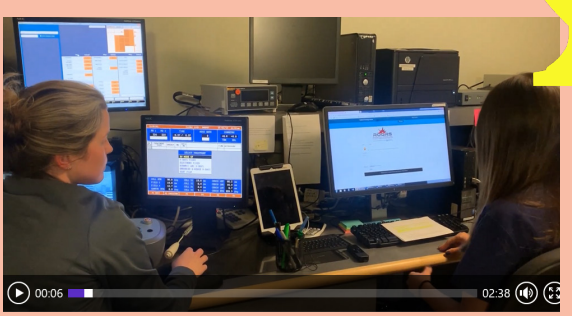
1. List actions and behaviors that would have reinforced safety culture as a priority on this case:

2. What does it mean?

3. How does it look like?

4. List ideas on how this situation could have been prevented:

Digital presentation:




Video about an incident reporting system by Daniel Scanderbeg won first place in the trait Environment for Raising Concerns in the IAEA competition Towards a Strong Radiation Safety Culture in Medicine.

You can access it **here**.

## TRAIT QUESTIONS

Now that you have read this Trait Talk on Environment for Raising Concerns, consider the following questions:

1. Does my practice/group/department have overall Environment for Raising Concerns responsibilities?

2. If yes, list actions/ideas to improve the Environment for Raising Concerns in your practice/group/department:

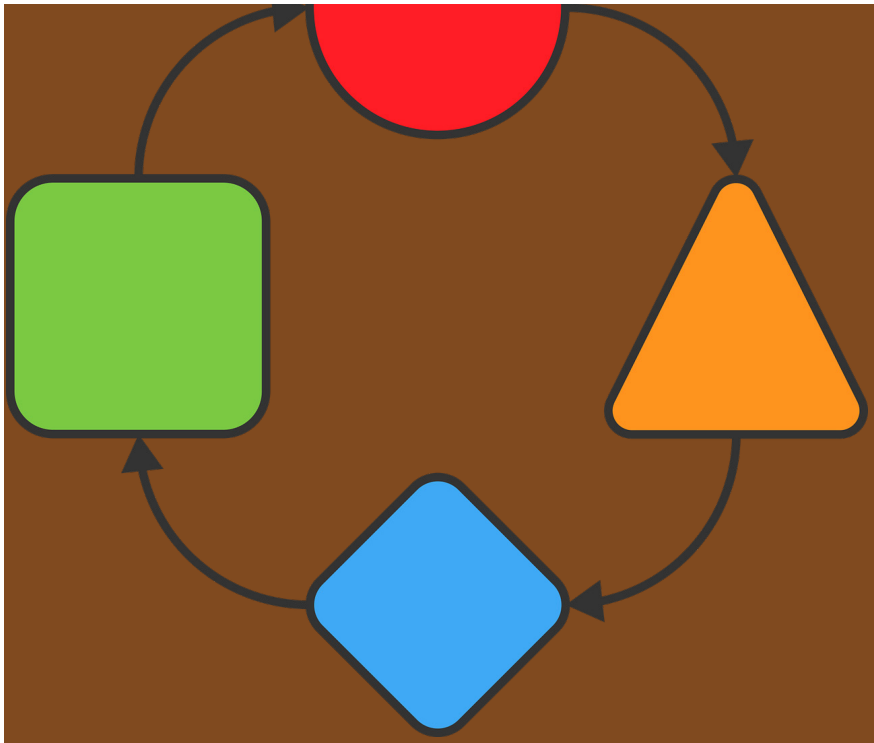
3. List potential barriers to improve the Environment for Raising Concerns in your practice/group/department:

## REMEMBER

The characteristics of this trait are:

- ✓ Safety Conscious Work
- ✓ Environment Policy and Alternate Process for Raising Concerns

4. Select and share one or two ideas that you would like work on to improve the Environment for Raising Concerns when you come back to your practice/group/department:



# WORK PROCESSES

**The process of planning and controlling work activities is implemented so that safety is maintained. Work management is a deliberate process in which work is identified, selected, planned, scheduled, executed, closed, and critiqued. The entire organization is involved in and fully supports the process.**

# TRAIT 10

## WHY IS THIS TRAIT IMPORTANT?

The process of designing and controlling work to ensure safety is an important part of an organization, and how effectively an organization manages and implements their work processes reflects their safety culture.

For example, effective work processes in a positive safety culture will have a well-designed workflow that includes the assignment of responsibilities to leaders, work groups, and individuals. Work activities will be prioritized, coordinated across workgroups, and communicated effectively. Policies and procedures will incorporate the appropriate risk insights and be effectively planned, executed, verified, and documented. The rigorous development, management and adherence to work processes helps ensure the safe use of radiation sources and reflects a positive safety culture.

Many organizations operating high-risk technologies (such as in industries using radiation sources) employ collaborative decision-making, develop detailed procedures, and require verification of steps during procedure implementation under normal operations. The development and implementation of emergency operating procedures is equally as rigorous.

Other high reliability organizations, however, may base activities around individual expertise and professionalism, autonomy, and rapid team-based response, particularly during off-normal conditions.

Both perspectives can be important for the design and implementation of work processes. For example, organizations may require strict adherence to normal and emergency operating procedures. However, flexibility may be necessary when responding to off-normal conditions.

The need for procedural compliance during normal or emergency operations and the allowance for flexibility and individual autonomy during periods of off-normal conditions pose a dilemma for many organizations.

One of the biggest management challenges may be how to realize the benefits of both approaches given that these two perspectives on controlling work processes can create internal inconsistencies.



## WHAT DOES THIS TRAIT LOOK LIKE?

**Resources:**

The organization implements a process of planning, controlling, and executing work activities such that safety is the overriding priority. The work process includes the identification and management of risk commensurate to the work.

Work is effectively planned and executed by incorporating risk insights, work conditions, and the need for coordination with different groups or job activities. The work process appropriately prioritizes work and incorporates contingency plans, compensatory actions, and abort criteria as needed. Leaders consider the impact of changes to the work scope and the need to keep personnel apprised of the work status. The work process ensures individuals are aware of the radiation safety risks associated with their work. Insights from probabilistic risk assessments are considered in daily work activities and change processes. Work activities are coordinated to address conflicting or changing priorities across the whole spectrum of activities contributing to radiation protection and safety. The work process limits temporary modifications.

**Documentation:**

The organization creates and maintains complete, accurate, and up-to-date documentation.

Activities are governed by comprehensive, high-quality programs, processes, and procedures. Design documentation, procedures, and work packages are complete, thorough, accurate, and current. Components are labeled clearly, consistently, and accurately. The backlog of document changes is understood, prioritized, and actively managed to ensure quality.

**Alternate Process for Raising Concerns:**

The organization effectively implements a process for raising and resolving concerns that is independent of line management influence. Safety issues may be raised in confidence and are resolved in a timely and effective manner.


**Design Margins:**

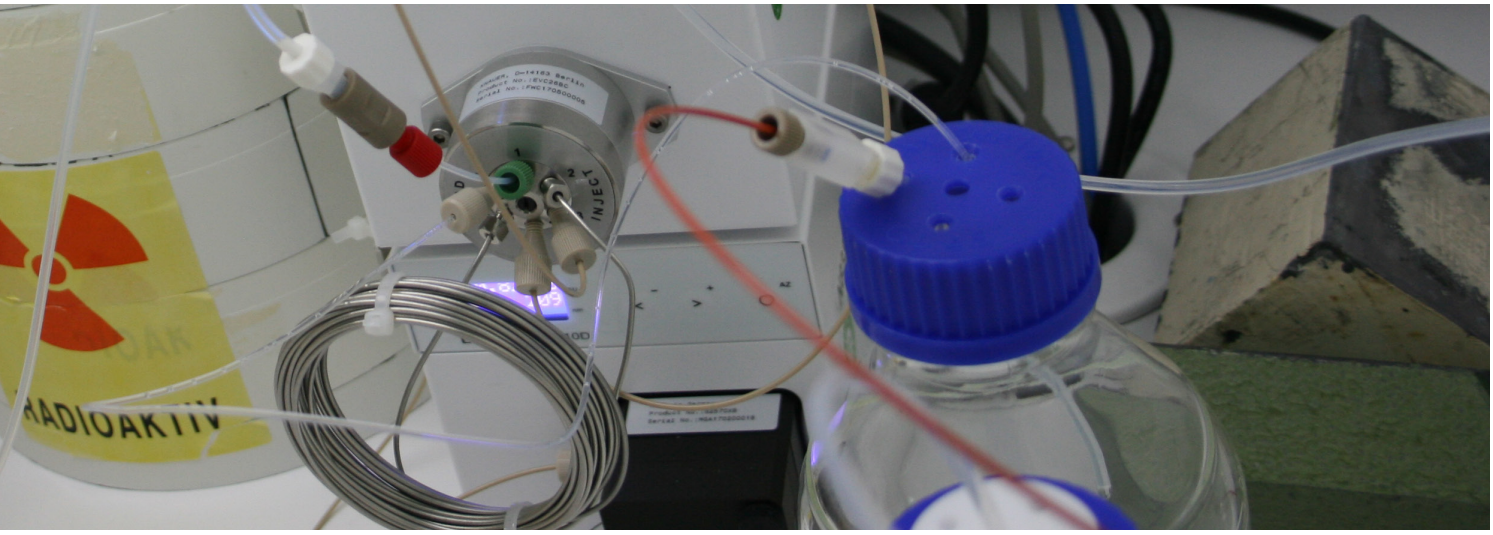
The organization operates and maintains equipment within design margins. Margins are carefully guarded and changed only through a systematic and rigorous process.

The work process supports radiation protection and safety and the maintenance of design margins by minimizing long-standing equipment issues, preventive maintenance deferrals, and maintenance and engineering backlogs. The work process ensures focus on maintaining safety-related equipment. Design and operating margins are carefully guarded and changed only with great thought and care. Safety-related equipment is operated and maintained well within design requirements.

**Procedure Adherence**

Individuals follow processes, procedures, and work instructions.

Individuals follow procedures. Individuals understand and use human error reduction techniques. Individuals review procedures and instructions prior to work to validate that they are appropriate for the scope of work and that required changes are completed prior to implementation. Individuals manipulate equipment only when appropriately authorized and directed by approved procedures or work instructions. Individuals ensure that the status of work activities is properly documented.




## WHAT IS A SCENARIO IN WHICH THIS TRAIT COULD PLAY A ROLE?

*Please read the scenario and answer the questions on the next page:*

Every morning, the nuclear medicine department receives delivery of all the radiopharmaceutical dosages they will be using on that day. These dosages are delivered in packages that each contain multiple dosages for different types of scans.

The individual dosages are labeled with the name of the radiopharmaceutical. Procedures require the medical radiation technologist receiving the material to review the day's schedule, to ensure they have received the correct dosages, then to sort the dosages into drawers by type, according to the label (cardiac scan, bone scan, lung scan, etc.) in the nuclear medicine laboratory.

When a patient arrives, a medical radiation technologist takes a dosage from the appropriate drawer, checks the label, then removes the syringe, and checks the syringe label, before injecting the patient.

One morning, a package arrived, containing six individual dosages. There were five bone scan dosages and one dosage for a resting cardiac scan.

There were two medical radiation technologists on duty that morning. The technologist who arrived first, opened the package and distributed the dosages into the drawers without first reviewing the schedule. After she saw that the first three were all bone scan dosages, she stopped reading the labels and placed them all in the bone scan dosage drawer.

When the second patient of the morning arrived for a bone scan, the second technologist, who had arrived late, was in a hurry. He opened the drawer labeled bone scan and took out one of the shielded syringes. He did not read the label on the syringe shield, or on the syringe itself. He injected the patient with the dosage, placed the used syringe in the syringe shield, and told the patient to return in three hours for the scan.

The first technologist then looked at the schedule, noting the next patient was scheduled for a resting cardiac scan. She did not recall seeing a cardiac scan dosage in the morning delivery, and searched through the bone scan drawer, where only four bone scan dosages remained. She contacted the second technologist, who checked the label on the dosage he had just injected to find out it was a cardiac scan dosage.

The second technologist notified the medical radiation practitioner and the radiation safety officer. The second patient was notified and counseled by the medical radiation practitioner and re-scheduled for the bone scan. The third patient was asked to re-schedule for later in the day.

## SCENARIO: QUESTIONS

Thinking about the scenario on the previous page, consider the following questions:

1. List actions and behaviors that would have reinforced safety culture as a priority on this case:

2. What does it mean?

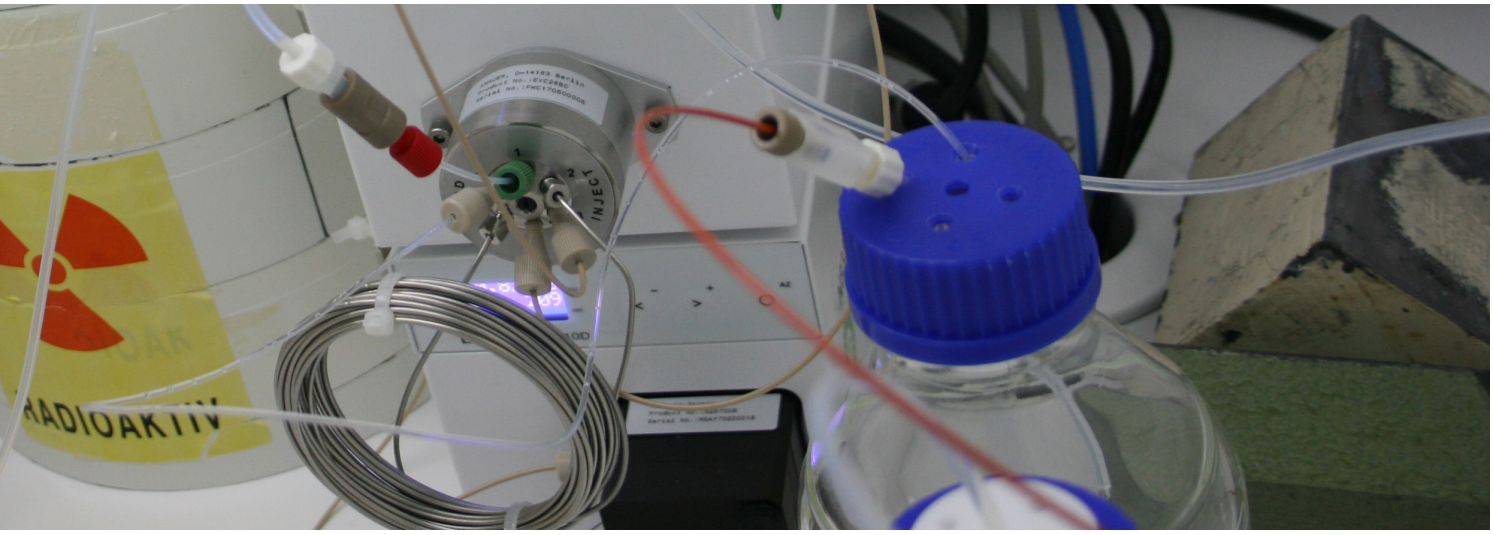
3. How does it look like?

4. List ideas on how this situation could have been prevented:


Digital presentation:


Video about radiotherapy by Rodanthi Karavelaki won first place in the trait Work Processes in the IAEA competition Towards a Strong Radiation Safety Culture in Medicine.

You can access it **here**.




## TRAIT QUESTIONS

Now that you have read this Trait Talk on Work Processes, consider the following questions:

1. Does my practice/group/department have overall Work Processes responsibilities?

2. If yes, list actions/ideas to improve the Work Processes in your practice/group/department:

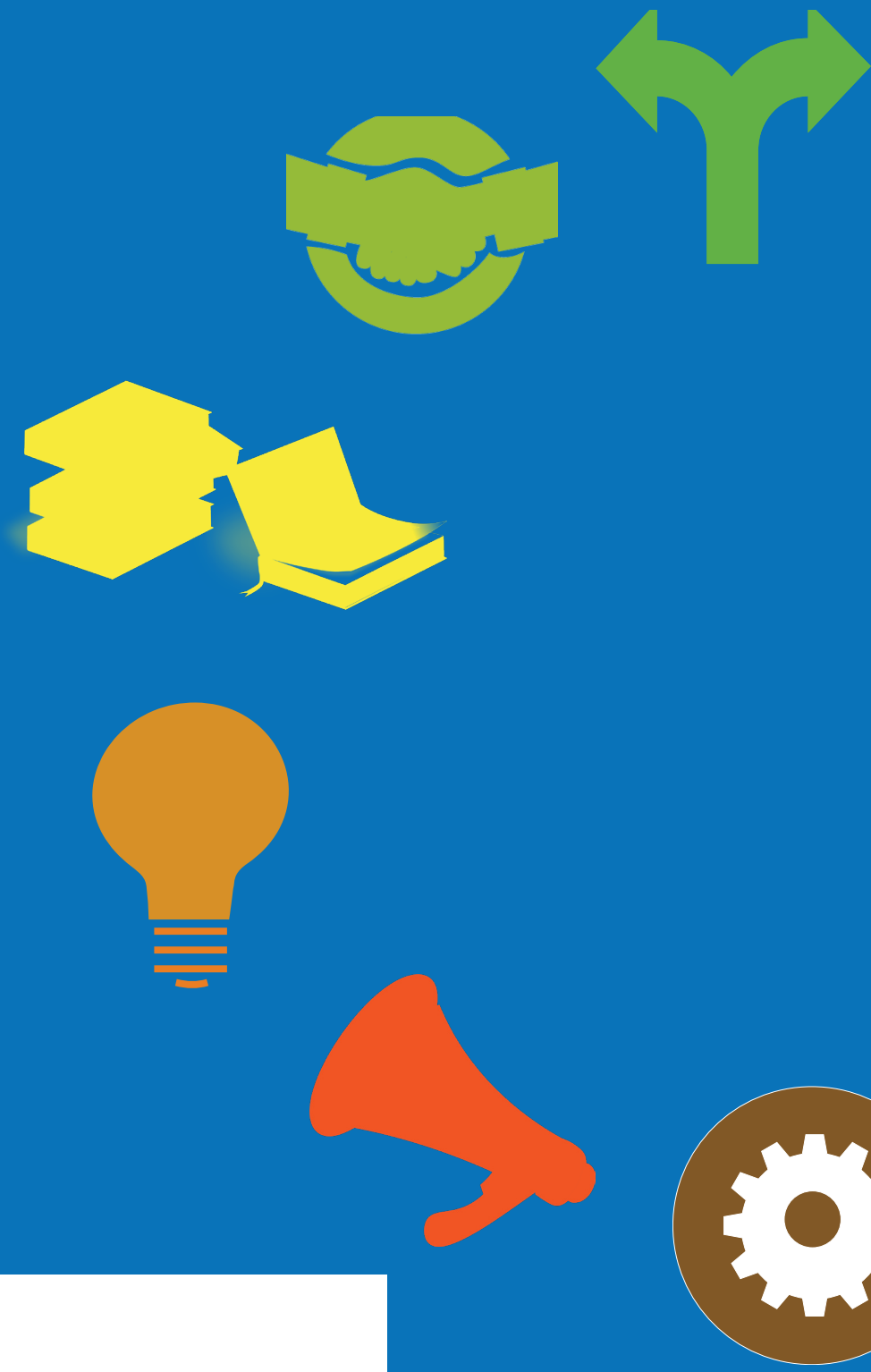
3. List potential barriers to improve the Work Processes in your practice/group/department:

### REMEMBER

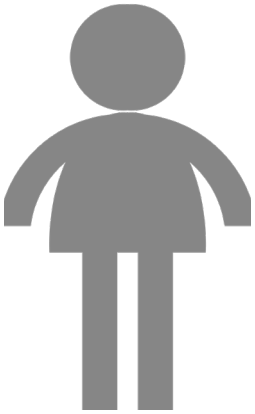
The characteristics of this trait are:

- ✓ Resources
- ✓ Documentation
- ✓ Design Margins
- ✓ Procedure Adherence

4. Select and share one or two ideas that you would like work on to improve the Work Processes when you come back to your practice/group/department:



# WHAT DID WE LEARN?



## WHAT WE LEARNED

Using the concepts and tools found in this workbook, sharing the lessons learned with healthcare leadership, and educating other workers directly or indirectly involved in the administration of radiation to humans will improve patient safety, worker safety, and public safety at healthcare facilities.

> **"If you take personal responsibility for effectively communicating the concepts of Radiation Safety Culture to enhance your leadership's commitment to safety, and help identify and resolve problems at your facility, encourage a questioning attitude among your co-workers, in a respectful environment, where they may raise concerns, so that you all may continue to learn, and improve your work processes and decision-making skills, radiation safety and protection will improve around the world one facility at a time."**

## HOW TO BEGIN

1. Lead by Example

Lead by example by following all radiation protection and patient safety policies. Encourage your co-workers to do the same. This is crucial if you are a manager, employees will follow the example set by you. If employees believe management is committee, then they will also be committee. If you don't have policies in procedures in place this may be a good place to start. Demonstrate that the organization values radiation protection and safety.

2. Communicate

Start communicating with your co workers and management. Strong communication will reduce errors and misunderstandings. This can lead to a better more effective radiation protection program. Developed policies and procedures need to communicate to assure that these are understood and what expectations of expected of both employees and management. Employees should feel comfortable raising awareness to undesirable situations. A great way to improve communication is the hold weekly or monthly talks. Increase worker interest by letting them lead the talks. Policies and procedures should be easily accessible to all staff. Implement pathways for both the formal and informal communication. Consider electronic communication with and between staff.

3. Prioritize a few critical activities

It is easily to be overwhelmed and achieve nothing. It is better to begin with small achievable steps. Formalizing through procedures and communication how to assure that the correct patient is imaged or treated. Develop or participate in an incident learning system. Establish technique charts that will be used for the purpose of optimization of radiation exposure in diagnostic imaging. Assure employees have the correct tools. Don't take short cuts, such as not optimizing when performing digital imaging examinations.

4. Involve employees

To build a strong radiation safety culture, it must start from the ground up. Employees must be included in the improvement project, they should identify challenges and solutions. Have employees participate in meetings where they can identify ways to improve radiation safety culture. Employees should demand a radiation safe environment. Employees should receive comprehensive training to assure a strong radiation safety culture is in place. Employees should have access ot complete all the training for their positions.


Thinking about strengthened radiation safety culture in your facility, consider the following questions

1. What I can I do to strengthen radiation safety culture?

2. How can I influence my co-workers to adopt a stronger radiation safety culture?

3. How can I influence management to support a stronger radiation safety culture?

Now that you have completed the course, consider the following questions:

1. Where is my organization position in the improving radiation safety culture?

2. What can my organization do to improve radiation safety culture immediately?

4. What can my organization do to improve radiation safety culture in the next 6 months?

5. How can my organization sustain the changes to improve radiation safety culture?

## CASE STUDIES

**On this page, you can find additional case studies supporting the previous material.**

## RADIOLOGY CASE STUDY

**Review the case and determine what went wrong and how to correct it using the new tools you have obtained.**

New State Hospital has an advanced radiology department. They have highly qualified staff during normal working hours but use students for afterhours examinations. These students receive on-the-job training. There are no managers, medical physicists or radiologists present in the facility after 5 pm. The students work independently but themselves. There are no procedures for performing x-rays provided for the students.

A 16-year-old female patient came into the emergency department of a hospital, after a dramatic fall down some stairs. The medical practitioner ordered a computed tomography (CT) scan of her head and abdomen to assess for serious injury.

The student took the patient to the scanning room, and proceeded to input the protocol, and position the patient. After initiating the head scan, the patient complained that she was nauseated, and the student halted after completing less than half of the scan. The patient was repositioned, and the head scan was completed. The patient then had her abdomen scanned. When the student viewed the scan, she saw something that did not look correct.

The student returned the patient to the emergency room. In about an hour the emergency room nurse contacted the student, to inform her that the patient was pregnant. The patient and her family were upset and concerned about the radiation dose the patient and the fetus received. The student contacted the radiation protection officer and the radiologist. The RPO was very upset with the student for not asking the patient if it was possible that she could be pregnant. There were no posters or signage in the room to encourage patients to share this type of information. There were no procedures requiring the student to ask the patient. The radiologist dismissed the student. The university was told to remove the student from the program. The student filed a complaint with the university and the hospital over the expulsion from the education program. The patient filed a complaint with the hospital and the ministry of health.

The medical physicists determined that the dose the patient received from the exam was less than 10 mSv. The radiologists confirmed with the patient and her parents that there was a small chance of birth defects from the dose the fetus received.


## NUCLEAR MEDICINE CASE STUDY

**This is a complex cases involving weak safety culture traits.**

**Review the case and determine what went wrong and how to correct it using the new tools you have obtained.**

Every morning, the nuclear medicine department receives delivery of all the radiopharmaceutical dosages they will be using on that day. These dosages are delivered in packages that each contain multiple dosages for different types of scans.

The individual dosages are labeled with the name of the radiopharmaceutical. Procedures require the medical radiation technologist receiving the material to review the day's schedule, to ensure they have received the correct dosages, then to sort the dosages into drawers by type, according to the label (cardiac scan, bone scan, lung scan, etc.) in the nuclear medicine laboratory.

When a patient arrives, a medical radiation technologist takes a dosage from the appropriate drawer, checks the label, then removes the syringe, and checks the syringe label, before injecting the patient.

One morning, a package arrived, containing six individual dosages. There were five bone scan dosages and one dosage for a resting cardiac scan.

There were two medical radiation technologists on duty that morning. The technologist who arrived first, opened the package and distributed the dosages into the drawers without first reviewing the schedule. After she saw that the first three were all bone scan dosages, she stopped reading the labels and placed them all in the bone scan dosage drawer.

When the second patient of the morning arrived for a bone scan, the second technologist, who had arrived late, was in a hurry. He opened the drawer labeled bone scan and took out one of the shielded syringes. He did not read the label on the syringe shield, or on the syringe itself. He injected the patient with the dosage, placed the used syringe in the syringe shield, and told the patient to return in three hours for the scan.

The first technologist then looked at the schedule, noting the next patient was scheduled for a resting cardiac scan. She did not recall seeing a cardiac scan dosage in the morning delivery, and searched through the bone scan drawer, where only four bone scan dosages remained. She contacted the second technologist, who checked the label on the dosage he had just injected to find out it was actually a cardiac scan dosage.

The second technologist notified the medical radiation practitioner and the radiation safety officer. The second patient was notified and counseled by the medical radiation practitioner and re-scheduled for the bone scan. The third patient was asked to re-schedule for later in the day.

## CASE STUDIES

**On this page, you can find additional case studies supporting the previous material.**

## RADIOTHERAPY CASE STUDY

**This is a complex cases involving weak safety culture traits.**

**Review the case and determine what went wrong and how to correct it using the new tools you have obtained.**

The National Oncological Hospital has services of Radiotherapy, Nuclear Medicine and Diagnostic Radiology. The radiotherapy service is provided with: teletherapy equipment with cobalt 60 radiation sources, High Dose Rate (HDR) brachytherapy equipment with iridium 192, three Linear Accelerators, two CT (Computer Tomography) for planning of teletherapy treatment and one conventional X-ray equipment for positioning in brachytherapy treatments.

The number of patients is high, since it is the only service in the country, which has forced to establish two times of 5 hours each in the equipment of cobalt 60 teletherapy. The first shift starts at 7:00 and ends at 12:00 and the second shift starts at 13:00 and ends at 18:00.

In the rest of the equipment: the brachytherapy with its conventional X-ray equipment, the three linear accelerators and the two CT´s for planning, are used in the normal hours of 7:00 to 16:00.

**1.2 Main persons involved in the case**
The Hospital is headed by the Director, who at the time of story was world-known Professor Smart.
The managers participating in safety-relevant decision-making includes:
• The Hospital Director,
• The Head of Radiotherapy Service,
• The Head of Nuclear Medicine Service,
• The Head of Radiology Service
• The Radiation Protection Officer, who is subordinate to the Director of the Hospital.

At the time of the story the Head of Radiotherapy Service was Marion. She is not well perceived by some specialists and they prefer to address their ideas and concerns directly to Prof Smart, even if it's under her responsibility. It is the case of the Radiotherapist Carlos, who is older and considers himself more qualified.

The Radiotherapy Service was staffed with:
• Head Service
• Administrative Assistant (for administrative matters and who is not trained in safety issues)
• Radiotherapists (prescribe treatments and follow up patients)
• Medical physicists (plan treatments and do daily checks of equipment parameters)
• Radiotherapy technicians (operate the equipment)
• Dosimetrists (calculate doses to be given to patients)
• Nurses (assist patients)

The staff number was adequate to use available equipment. Everybody has received the training stipulated, as well as has the individual license granted by the Regulatory Authority.

One of the most experienced and skilled radiotherapy technicians is Mark, who had no complaints from patients or doctors for almost 20 years.

There were available both Quality Assurance Program and Working Instructions for each staff positions, which satisfied the Regulatory Authority, but were perceived by most of staff as just formal documents needed to be. The same was perception of the Radiation Protection Officer, whose role in daily life was limited to endorsement of safety relevant documents and preparation of papers as requested by the Regulator. Manuel, who took the position a long time ago and now was approaching the retirement age, was not interested in intervening unless directly requested.

## 2. Description of the challenge

### Hospital looking how to meet increased demand in Cobalt 60 radiotherapy treatments within existing budget

Starting year 2011 the demand for radiotherapy treatment demonstrated a steady growth and from time to time the schedule for cobalt 60 teletherapy was full and some treatments postponed. Since September 2016 it became an everyday story, and patients and their relatives started complaining.

Meanwhile complaints on unavailability of radiotherapy services become an avalanche, and at the end of November Prof. Smart called the Ministry asking about additional budget to enhance services to meet demand. However, he had not received even promises in return – just a letter from the Minister himself requesting the Director to do something without additional money for equipment or staff. The Director has discussed this request with the Chief Accountant and found that they could manage to rearrange staff positions to make available additional technician to operate cobalt 60 teletherapy equipment.

The Director has decided to add a third shift to the cobalt 60 teletherapy equipment from 18:00 to 22:00, with a single radiotherapy technician, considering that the number of patients would not be as high as in the other two shifts. The Radiation Protection Officer was not consulted. Neither staff was not informed about this decision in advance nor not analyzed the potential impact of the decision on patient safety and practice in general. There was no notification to the Regulatory Authority, as required by the License granted. Nobody questioned that decision while it was put into implementation.

### 2.2 Introduction of the third "reduced" shift and four months of its implementation

The Director requested Marion to implement this decision and starting the beginning of January, the third reduced shift started to operate with Mark, who volunteered to work without any support on condition of agreed financial compensation.

Shortly after that Marion was informed by Administrative Assistant about a few complaints from patients assigned to the third shift. She did not report/investigated the complaints because she did not consider it relevant.

Later, the Director receives a notification from a radiotherapist about a patient who was prescribed Co-60 radiation therapy in both the right hip and the thoracic-lumbar spine, to be completed on different dates. After the patient was finished the treatment in the spine, the technician mistakenly continued treatment in that area, unaware of the note in the Patient Treatment Sheet that treatment in that area had been completed. The error was also not detected during the routine review of the Treatment Sheet performed by the medical physicists.

This patient, who was being treated on the morning shift, was put on the last shift set from 18:00-22:00, where the radiotherapy technician works alone. Then the patient was overexposed in the spine. The radiotherapist only noticed the situation at the follow-up appointment after completing the treatment.

The problem was fixed, but no lessons had been learned and neither Marion nor Manuel were informed about it. In few weeks the Director receives a written complaint from a wife of patient who reports that he has received a wrong treatment the previous day on the last time shift. When the patient expressed his concern to the Radiotherapy Technician while positioning him, the Technician argued that the doctor had reviewed his Treatment Sheet and confirmed that everything was correct.

The Director passed the complaint to Marion and she interviewed Mark to determine what has happened. He reported that several patients were included in that shift, and he had not previously treated them, so he was not familiar with the treatments. It was confirmed that there was an identification error. Mark called a patient by name and started treatment as was prescribed without recognition that it was different person with different treatment prescribed as he does not usually take any measure to confirm the identity of the patient, even not by looking at the photograph on the Treatment Sheet. When the patient was positioned for therapy, Mark did confuse freckles on his back as the tattoo marks used for positioning the treatment. And eventually the treatment was provided in the wrong way. Marion asked Mark to be more attentive, rescheduled the patient to the morning shift and did everything possible to please his wife. Later she assured the Director that the problem had been fixed and that Mark will be more careful from now on. The Director decided not to inform the corresponding authorities or the patients, fearing the legal and financial implications for the Hospital that could be derived in addition to the loss of recognition and social prestige.

### 2.3 End of story

Everything looked normal for a while, but as people could never be stopped from talking, some rumors started to circulate and at the beginning of April the article was published by the investigative reporter in the popular local newspaper.

The Ministry of Health immediately started investigation, the Prosecutor's Office started official investigation, the Regulator sent a reactive inspection team. The third shift was cancelled, and some arrangements were made by the Ministry of Health with private hospitals to deal with excessive demand in Co60 treatment.

## PLEDGE

Take the pledge to put radiation protection and safety first in your professional activities.

I pledge to put my patient's and co- worker's safety, health and welfare first.

I pledge to communicate radiation protection and safety concerns to management and to look for solutions to assure that radiation safety culture is strong in my institution

I pledge to work with others to find solutions to radiation protection and patient safety so that all patient receives justified, optimized or safe procedures and that my co-workers are protected from unnecessary exposure to radiation because of safety issues.

I will be an example to others that radiation safety culture is important to me.

## SIGNATURE

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