Campaigning for Improved Radiation Safety in Veterinary Practices

Ionising radiation is frequently used in veterinary practice, primarily for diagnostic imaging. Radiation safety is an essential requirement for any practice using ionising radiation, and radiation safety breaches represent a significant health and safety incident and risk to the health of veterinary team members and their patients. Despite this, breaches are not uncommon in clinical practice. This article explores regulations and safety guidelines, challenges to implementation, and proposes solutions to improve radiation safety in companion animal practice.

Risks and Regulations

Ionising radiation damages living tissue. However, the potential damage from an absorbed dose depends on the type and dose of radiation received and the sensitivity of the tissue or organ. High doses, exceeding those from diagnostic imaging radiation, can produce effects such as skin redness, hair loss, radiation burns, or acute radiation syndrome. These effects are more severe at higher doses and higher dose rates.

If the radiation dose is low and/or it is delivered over a longer period, the risk is substantially lower. However, there is still a risk of effects such as cataracts or cancer that may appear years or even decades later. Studies in humans estimate increased occurrence of cancer in patients screened with CT, and perinatal irradiation was shown to increase neoplasia incidence in young dogs.[1,2,3] Studies have found job related exposure to ionising radiation in veterinary practice to be associated with increased risk of spontaneous abortion in female veterinarians and veterinary assistants.[4,5] However, the risks of X-ray radiation to both patients and people may be challenging to convey to personnel due to its invisible nature and the lack of acute symptoms following exposure.

The Regulatory Landscape: A Global Overview

Ionising radiation regulations for veterinary practices vary between countries and may even differ across regions within a country, e.g. different states in the USA and territories in Australia. However, most include the following principles:

1. **Risk Assessments:** Practices are required to identify and mitigate risks associated with radiation exposure.
2. **Equipment Standards:** Guidelines to ensure imaging equipment and surrounding shielding meet safety and performance criteria.
3. **Training Requirements:** Personnel operating or exposed to radiation must be adequately trained in safety protocols, typically with named radiation safety officers required at each site where ionising radiation is used.
4. **Dose Monitoring:** Systems to track radiation exposures and doses received for personnel, including staff and clients (*e.g.* horse owners restraining a patient for X-rays in the field).
5. **Personal Protective Equipment (PPE):** Requirements for the availability and use of shielding such as lead aprons, gloves and thyroid collars.

Recommendations

To reduce radiation exposure risk in veterinary practice it is important to consider the important principle of keeping radiation use and dosage to both personnel and patients As Low as Reasonably Achievable (ALARA).[6] In practice, this may include:

Justification: Ensure each procedure using radiation is justified, weighing the potential benefits to the animal against the risks to the patient, staff, and public. Consider alternative procedures with lower dose (*e.g.* X-ray rather than CT) or no radiation exposure (*e.g.* ultrasound). If ionising radiation is the most appropriate diagnostic modality, consider whether each exposure is necessary to answer the clinical question. Survey X-rays or whole-body CT scans may pose more questions than they answer, highlighting multiple changes, especially in older animals, which may not be clinically significant and could broaden the focus away from relevant findings.

Optimisation: Use the lowest possible exposure settings to achieve good images, optimising the radiation dose for patient size, body area and projection.

Distance: Increase the distance between personnel and the radiation source whenever possible. Ideally, all personnel should leave the imaging room during exposure.

Shielding: Ensure adequate shielding is in place for personnel and members of the public, using leads shielding, such as screens, aprons, gloves, thyroid shields and googles as PPE.

Time: Minimise the time spent near the radiation source. This can include using appropriate restraint techniques and positioning equipment.

Training: Provide comprehensive training to all staff involved in radiation procedures, covering safety protocols, equipment operation, patient preparation and emergency procedures.

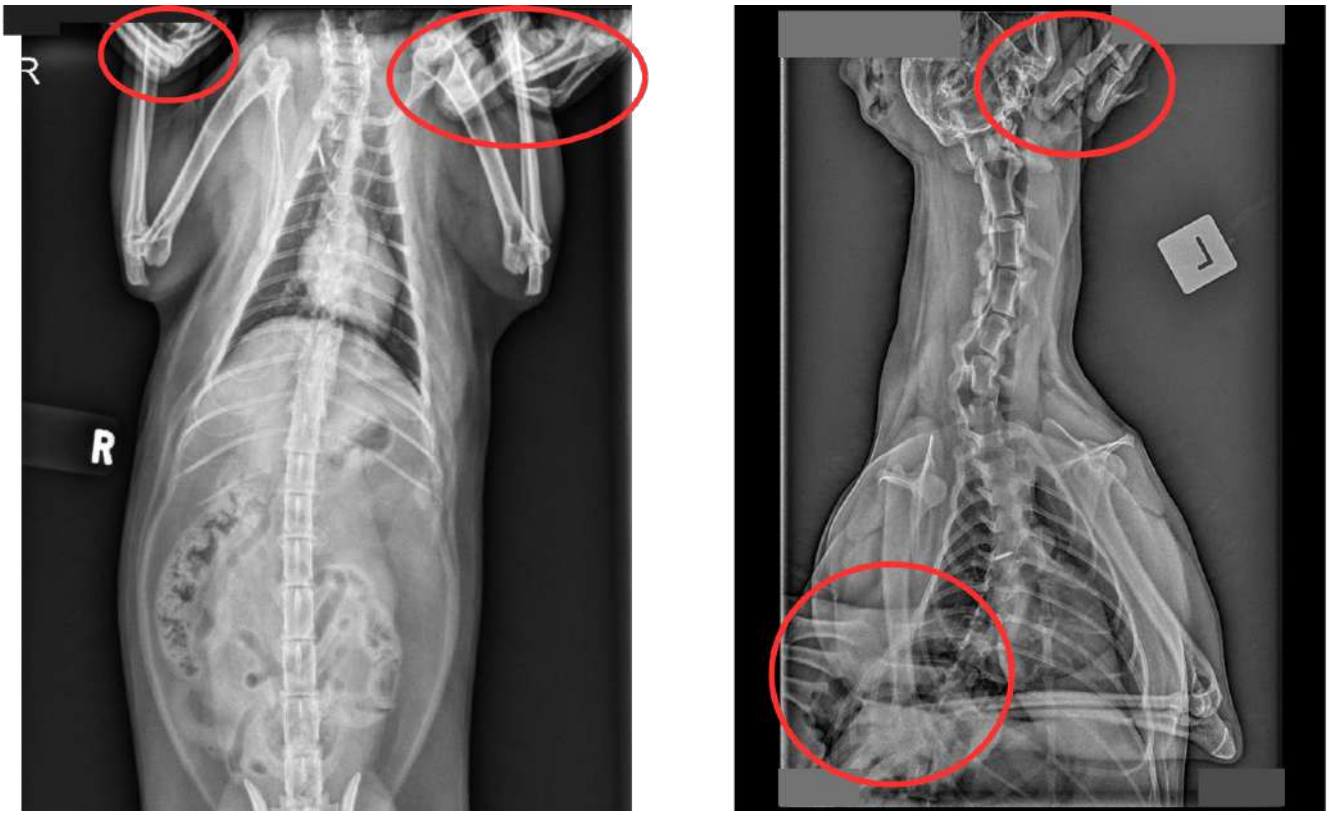
Restraint: Minimise manual restraint of animals. Use positioning aids, sedation, or anaesthesia whenever possible. The number of workers in the room tends to be lower when animals are sedated or anaesthetised.[7] In rare cases where manual restraint is unavoidable, appropriate PPE should be available and individuals should be trained in its appropriate use and safe restraint techniques.

Personnel: Where possible, rotate team members working with ionising radiation, especially if manual restraint is used. Individuals at higher risk from ionising radiation, such as children, teenagers and pregnant women, should be excluded from procedures using ionising radiation.

Monitoring: Implement personal dosimetry for all personnel exposed to radiation to track their doses and ensure they are within acceptable limits.

Quality Assurance: Implement quality assurance and quality control programmes to ensure equipment is functioning correctly and procedures are carried out safely. This includes regular maintenance and performance testing of equipment.

Review: Regularly review exposures as a team to ensure they are optimal and diagnostic. Consider additional training for



X-rays showing examples of radiation safety breaches, with human hands evident in the primary beam (red circles).

any areas requiring improvement. Review radiation safety processes and policy at regular intervals to ensure they are up to date and reminders are provided to staff.

By implementing these measures, veterinary practices can create a safer working environment and reduce the risks associated with radiation exposure for both patients and people.

Challenges in Radiation Safety Compliance

There are universal challenges in ensuring compliance with regulatory frameworks and ALARA principles due to varying levels of awareness and resource availability. Studies have shown over-reporting of the use of personal protective equipment (PPE) by veterinary staff compared to reality.[8]

A survey among female veterinarians showed that of 90% of small animal practitioners taking X-rays, 56% reported physically restraining animals, and only one in five respondents used film holders and lead screens.[9] A study of equine practitioners showed poor compliance with radiation safety certification, dose monitoring of personnel and provision of safety protocols within practice in equine practice.[10]

Radiation safety is both a legal requirement and a health and safety obligation, which raises questions about what factors contribute to poor compliance. These may include:

- **Culture and Habits:**
  - Practices commonly using manual restraint may be reluctant to change, especially where perceived increases in risk, cost and/or time of using chemical restraint may be considered prohibitive.

- **Knowledge Gaps:**
  - Lack of access to training or awareness of regulations, best practice principles, chemical restraint protocols or methods for hands-free imaging. A study showed that even veterinary teaching institutions in the US may not meet equipment licence requirements in this regard.[11]

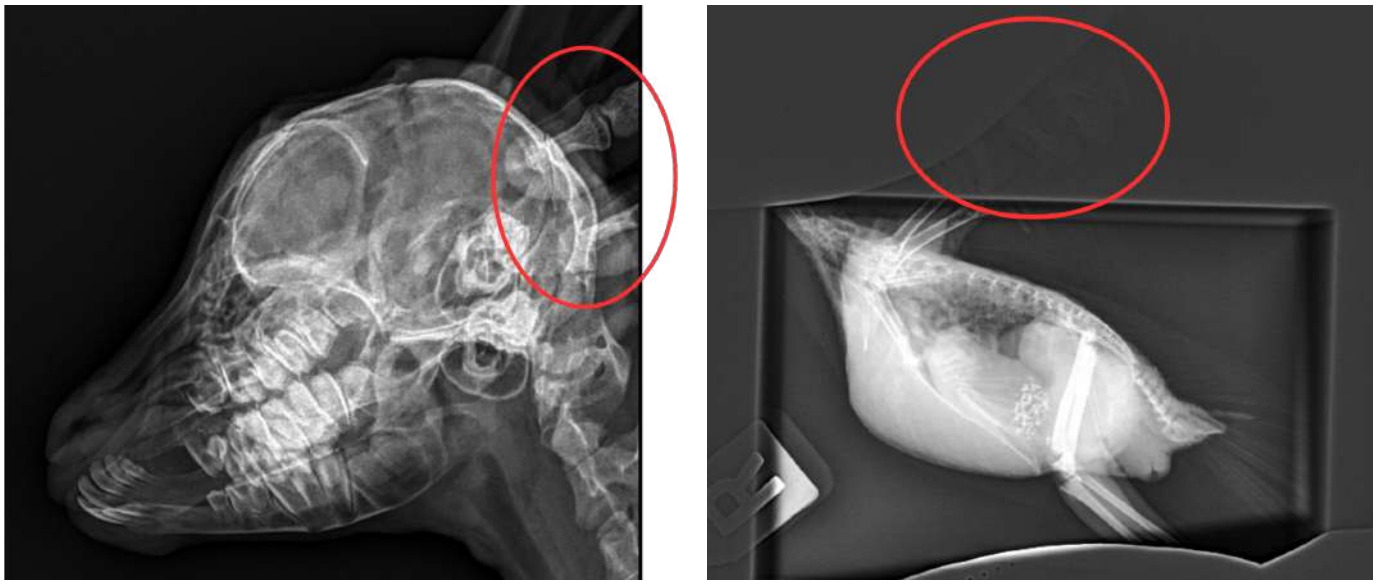
- **Resource Constraints:**
  - Lack of availability of shielding equipment e.g. lead screens, thyroid collars and goggles.[12]
  - Personnel e.g. sole charge practitioners having to perform diagnostic procedures without assistance.
  - Lack of time, e.g. in emergency clinics where the additional time required for safe practice and/or chemical restraint may be seen as prohibitive to rapid triage, diagnosis and management of multiple cases. Correct use of PPE by both veterinarians and veterinary students was less frequent out of hours in one study within a teaching hospital.[13]

- **Variation in Enforcement:**
  - Inconsistent enforcement of regulations by health and safety departments across regions creates disparities in safety standards.

Improving Radiation Safety in Practice

To address these challenges in radiation safety knowledge and compliance, global teleradiology and specialist consultancy company, VET.CT, has launched a global awareness campaign focused on radiation safety in veterinary practice. The campaign centres on education and provides easily accessible, practical solutions with a suite of free resources tailored to the needs of veterinary teams. It also highlights the importance of fostering a culture of care for both staff and patients by making radiation safety best practice a core value in the clinic.

The downloadable tools include practical guides for equine and small animal practice, and a series of case studies with global veterinary practices, including primary care, referral



Human hands in the primary beam (left) and scatter radiation (right) circled red.

and emergency clinics, and ambulatory equine practitioners, giving real-life insights into how good standards can be applied in practice.[14] The resources are designed to empower veterinary teams to protect themselves, their clients and their patients, while optimising diagnostic accuracy and quality of their imaging, and include:

- **Step-by-Step Guides:** Top tips for successful imaging workflow, application of the ALARA principles to obtain high quality, diagnostic value images.
- **Positioning posters:** Instructions for implementing hands-free techniques using positioning aids, which can be printed to display in imaging suites.
- **Chemical Restraint Protocols:** Guidance for using sedation or anaesthesia based on patient risk level.
- **Equipment Lists:** Recommendations for positioning aids and PPE.
- **Exposure Charts:** Templates for recording exposures.
- **Case Studies:** Success stories from veterinary practices around the world with high compliance and a culture of radiation safety best practice and hands-free restraint.

Benefits of Improved Radiation Safety

There are many benefits to improving workflows in diagnostic imaging. Ensuring safety is optimised reduces radiation exposure for staff and animals through the adoption of best practices, reducing potential health risks. Enhanced compliance ensures practices meet regulatory requirements. Taking greater care in good positioning and optimising exposures increases the diagnostic quality of images and the accuracy of interpretation, reducing the need to repeat exposures and contributing to better outcomes for patients.

Overall, this can result in both cost and time savings to both the practice and the client. In addition, a good day's imaging and good patient management contributes to motivation and satisfaction for team members, knowing the collective effort has ensured their health and safety is protected, while providing the best experience and service to patients and clients.

Conclusion

Radiation safety in veterinary practice is a global issue that requires attention and collective action. Through launching an awareness campaign and providing free, practical resources, the VET.CT radiation safety campaign aims to bridge knowledge gaps, address resource disparities, and create a culture of safety that benefits veterinary teams, their patients and their clients.

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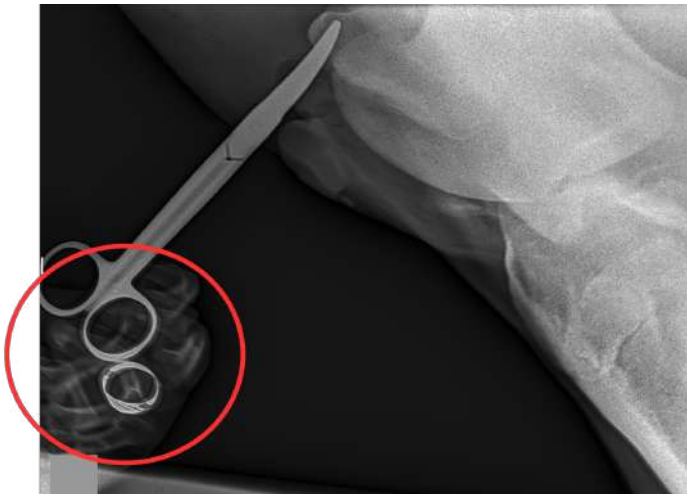
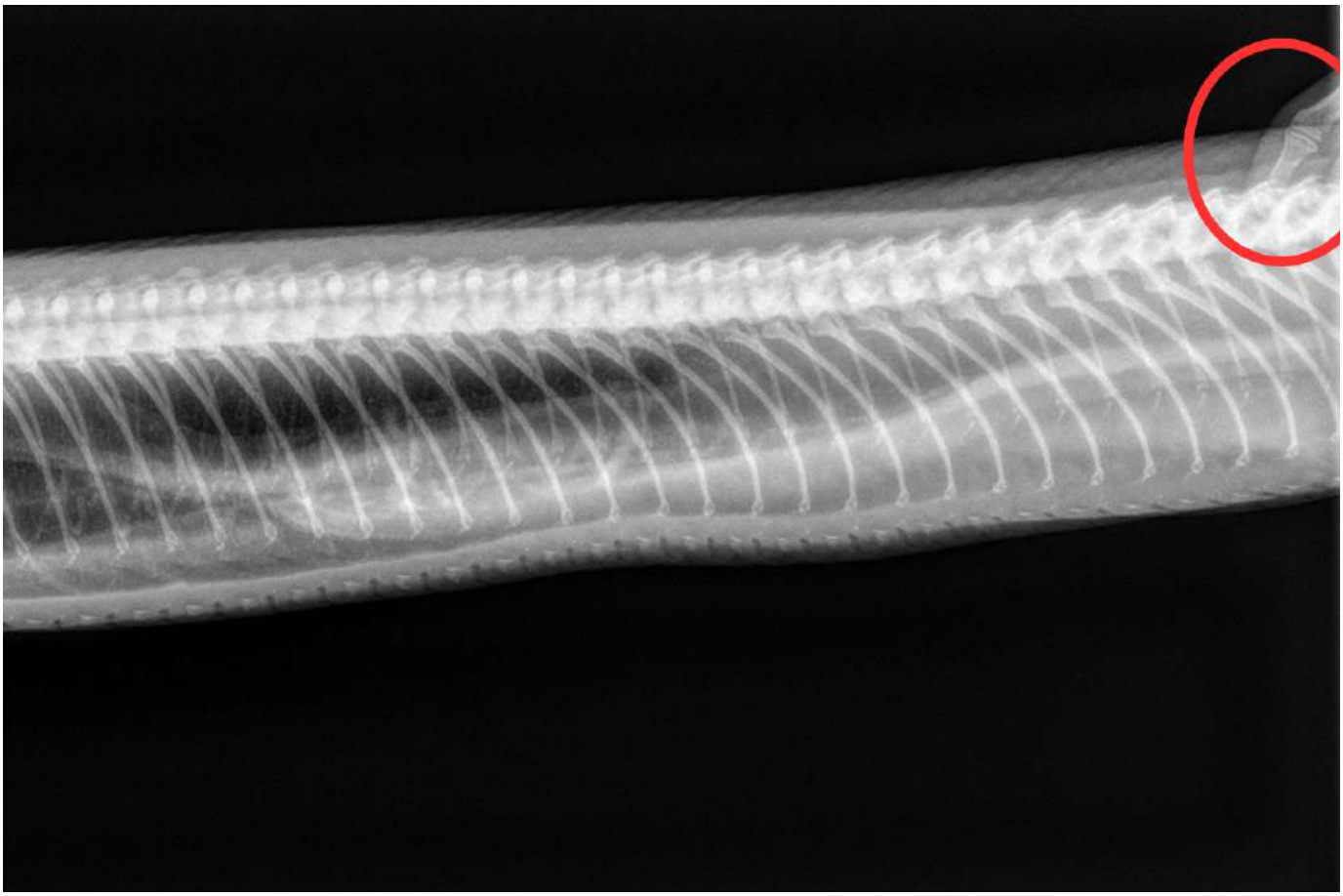


Human hand evident in the primary beam holding scissors as a position marker (red circle)



Human finger in the primary beam (red circle)

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X-PERT | RADIATION SAFETY GUIDE

YOUR SAFETY MATTERS – BE RADIATION SAFE

By following these guidelines and maintaining a strong culture of radiation safety awareness in your veterinary practice, you can help protect both the health of your staff and the animals under your care.

- **Before you radiate, COLLIMATE. It reduces scatter radiation**
- **Wear ALL your PPE and a dosimeter EVERY time**
- **Practice the ALARA principle**
- **Turn the lights DOWN, often patients RELAX in a darker room. It's also easier to see where you have collimated**
- **Before you radiate, AVOID remaining in the room or ask if everyone needs to be present**
- **REGULARLY test your PPE**

HANDS-FREE BEST PRACTICE

Using hands-free techniques and positioning ties for both awake and sedated patients during radiographic procedures is best practice for several reasons:

Safety
By ensuring you and your colleagues are as far from the main beam as possible, you will minimise your exposure to radiation.

Accuracy
Hands-free techniques and positioning ties can help ensure consistent positioning of the patient. Accurate positioning is crucial for obtaining high-quality diagnostic images, which are essential for accurate diagnoses and treatment planning.

Patient Comfort
Radiographic positioning can sometimes be uncomfortable. Using sedation including analgesia and cushioning, gentle positioning and hands-free restraints can reduce discomfort and anxiety for the patient. This approach can also improve the patient experience during the procedure.

PROTECT YOURSELF

- **Lead goggles**
- **Lead gloves**
- **Lead gown**
- **Thyroid shield**
- **Dosimeter**

SCATTER

Scatter radiation primarily comes from the patient being imaged. It's the result of X-rays interacting with the patient's body tissues and scattering in various directions. Understanding scatter radiation is essential for safety.

- Always tightly collimate to reduce scatter and the risk of accidental exposure.
- Remember: scatter comes from the patient.
- Lead PPE is designed to protect from scatter radiation – your anatomy should never be in the primary beam.
- Never keep gloved hands in the primary beam – the primary beam contains the most intense radiation and should be strictly controlled to prevent unnecessary exposure.

LEAD BY EXAMPLE AND LOWER YOUR EXPOSURE [ALARA]

The ALARA principle emphasises keeping radiation exposure "As Low As Reasonably Achievable", meaning taking every reasonable step to minimise radiation exposure to both staff and patients.

- Be efficient – be prepared and remember image quality (settings, straightness, collimation).
- Ensure all personnel are as far from the primary beam as possible, ideally outside the X-ray room during exposure.
- Keep settings low to reduce exposure and consider a lower exposure system.
- Keep manual restraint to a minimum and always wear PPE when staying inside the room.

Please note, this is general advice only. Each person using ionising radiation needs to adhere to their local radiation protection regulations/legislation.

Should you have any queries, please contact: **radiation.safety@vet-ct.com**