U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Proposed Rule on Reporting Nuclear Medicine Injection Extravasations as Medical Events

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Office of Nuclear Material Safety and Safeguards

Organization of Agreement States Annual Meeting
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Agenda

- Rulemaking Background
- Proposed Rule – Definitions
- Proposed Rule – Requirements for Procedures and Reporting Extravasations
- Draft Regulatory Guide on Medical Events
- Proposed Agreement State Compatibility
- Regulatory Analysis for the Proposed Rule
- Rulemaking Status and Next Steps

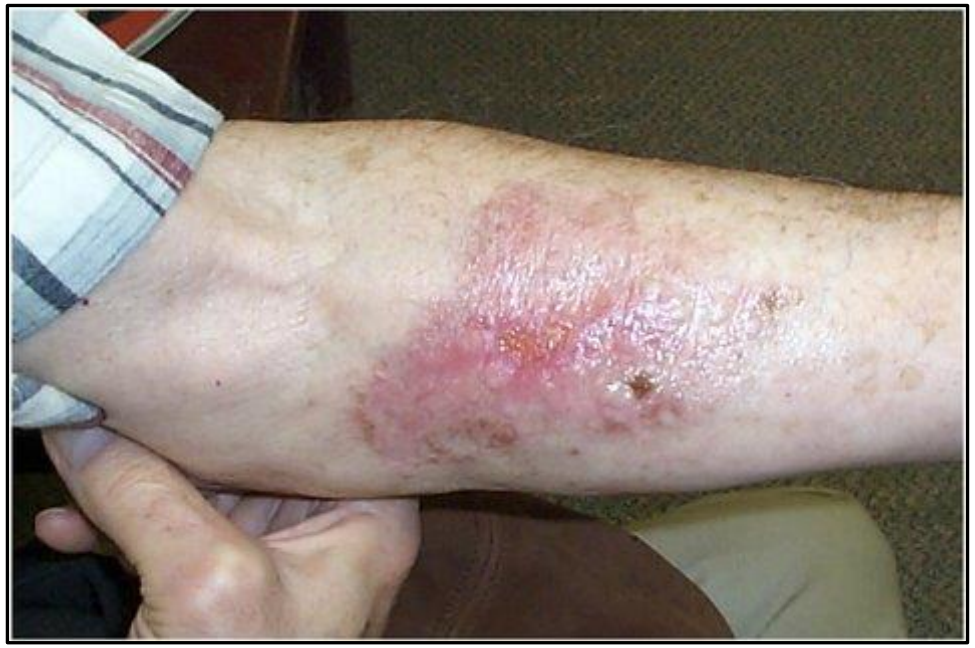
Extravasations Background

- Extravasation, as proposed in this rule, is the unintentional presence of a radiopharmaceutical in the tissue surrounding the blood vessel following an injection
- Not unique to the administration of radiopharmaceuticals
- Studies indicate overall radiopharmaceutical extravasation rates range from 3 to 23% of injections
- Can be affected by patient anatomy; training, experience, and technique of medical personnel; inadequate catheter size

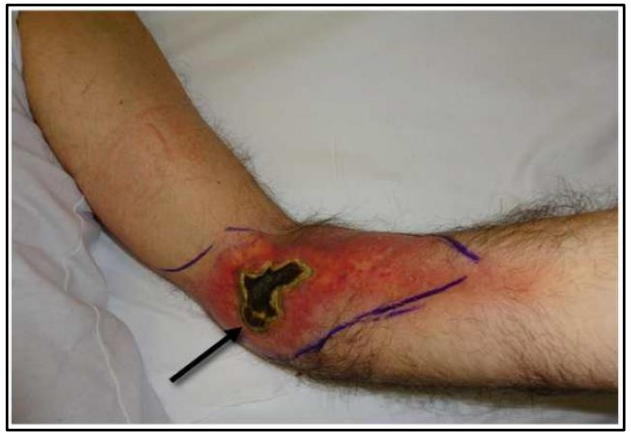
Deterministic Effects of Radiopharmaceutical Extravasation

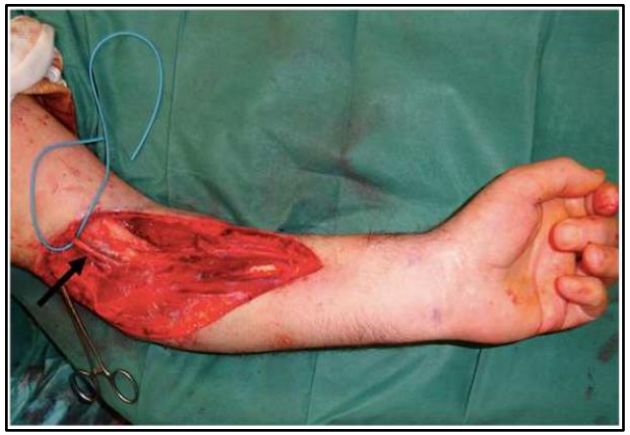
Warning – Graphic images on next slide.

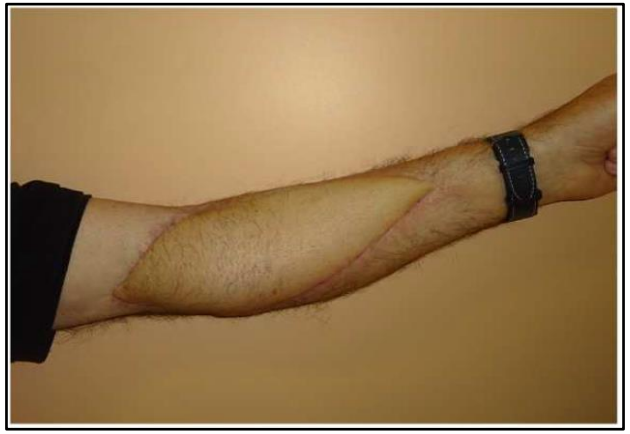
Deterministic Effects of Radiopharmaceutical Extravasation



Bonta, et.al. *Extravasation of a Therapeutic Dose of 131I-Metaiodobenzylguanidine: Prevention, Dosimetry, and Mitigation.* JNuMed. 2011







Baus, et.al. *Complex upper arm reconstruction using an antero-lateral thigh free flap after an extravasation of Yttrium-90-ibritumomab Tiuxetan: A case report and literature review*. Ann Chir Plast Esthet. 2017

Extravasation Rulemaking Timeline

2020

Jan: NRC staff begins independent review of whether extravasations should be reported as medical events

May: Lucerno Dynamics, LLC, submits Petition for Rulemaking (PRM) 35-22 requesting extravasations exceeding 50 rem be reported medical events.

2022

Mar: Staff recommends addressing PRM-35-22 via rulemaking in SECY-22-0043

Dec: Commission approves rulemaking in SRM-SECY-22-0043

2023

Jan: Rulemaking Working Group formed

Apr: NRC issues preliminary proposed rule language for comment

2024

Apr: Draft proposed rule to Agreement States for comment and G2G meeting

Jun: ACMUI meeting and recommendations

Aug: Proposed rule sent to Commission

2025

(ESTIMATED)
If approved by Commission, publish proposed rule for public comment (which will include public meetings)

2026

Mar: Final rule due to Commission

(ESTIMATED)
If approved by Commission, publish final rule

2029

(ESTIMATED)
If final rule published in 2026, Agreement States have three years to implement compatible regulations

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Proposed Revised § 35.2 Definitions

Extravasation means the unintentional presence of a radiopharmaceutical in the tissue surrounding the blood vessel following an injection.

Radiation injury means a deterministic health effect to the area around an injection site that can be attributed to radiation.

Proposed Revised § 35.3045 Report and notification of a medical event

(a) * * *

(1) * * *

(3) The administration of byproduct material that results or has the potential to result in a radiation injury from an extravasation, as determined by a physician.

Proposed New § 35.42 Procedures for evaluating and reporting extravasations

(a) For any administration in which an extravasation can occur, the licensee must develop, implement, and maintain written procedures to provide high confidence that an extravasation that results or has the potential to result in a radiation injury, as determined by a physician, will be detected in a timely manner and reported in accordance with § 35.3045.

(b) The written procedures required by paragraph (a) of this section must address how the licensee determines that an extravasation meets the criteria in § 35.3045(a)(3) for a medical event and how the licensee documents this determination.

(c) A licensee must retain a copy of the procedures required under paragraph (a) of this section in accordance with § 35.2042.

Proposed New Regulatory Guide 8.16, "Medical Event Evaluation and Reporting"

Describes acceptable approach to meet the 10 CFR Part 35 requirements for evaluating and reporting medical events, including extravasations.

- When should medical events be filed
- How reports should be made
- What information reports should contain

RG also provides guidance on the procedures for administrations that require written directives and procedures for evaluating and reporting extravasations.

Proposed New Regulatory Guide 8.16, "Medical Event Evaluation and Reporting"

- Provides several examples of what are and are not medical events
- Events associated with extravasation
  - Discusses "radiation injury" as defined in 10 CFR 35.2 and that all deterministic effects reasonably attributed to radiation—as determined by a physician—must be reported, including radiation-induced erythema.
  - Any physician can make this determination (but licensee reports).
  - Extravasations are not reportable if they don't have the potential to result in radiation injury.

Model Procedures for Evaluating and Reporting Extravasations

Per the new 10 CFR 35.42, for any administration in which an extravasation could occur, licensees must develop, implement, and maintain written procedures to provide high confidence that an extravasation that results in, or has the potential to result in, a radiation injury will be detected in a timely manner and reported in accordance with (revised) 10 CFR 35.3045.

- Model procedures are publicly available in ADAMS at ML24047A272 and if the rulemaking goes into effect, they will be added as a new appendix to Volume 9 of NUREG-1556 when that document is next revised.

Proposed Compatibility

Section	Change	Compatibility	
		Existing	New
35.2	(New) Definition: Extravasation	-	B
35.2	(New) Definition: Radiation Injury	-	C
35.8(b)	(Amend) Information collection requirements: OMB approval	D	D
35.42(a)	(New) Procedures for evaluating and reporting extravasations	-	H&S
35.42(b)	(New) Procedures for evaluating and reporting extravasations	-	H&S
35.42(c)	(New) Procedures for evaluating and reporting extravasations	-	D
35.2042	(New) Records for procedures for evaluating and reporting extravasations	-	D

Proposed Compatibility (continued)

Section	Change	Compatibility	
		Existing	New
35.3045(a)	(Amend) Report and notification of a medical event	C	C
35.3045(a)(3)	(New) Report and notification of a medical event	-	C
35.3045(b)	(Amend) Report and notification of a medical event	C	C
35.3045(c)	(Amend) Report and notification of a medical event	C	C
35.3045(d)	(Amend) Report and notification of a medical event	C	C
35.3045(e)	(Amend) Report and notification of a medical event	C	C
35.3045(g)	(Amend) Report and notification of a medical event	C	C

Proposed Rule Regulatory Analysis

- Regulatory Analysis document evaluates the costs and benefits of the proposed rule, and the petitioner's 50-rem reporting alternative, to the baseline of "no action."
- Proposed rule would result in additional costs over the 10-year horizon:

Entity	Total (2023 dollars)		
	Undiscounted	7% NPV	3% NPV
NRC	($2,395,000)	($1,510,000)	($1,945,000)
Industry	($15,743,000)	($12,535,000)	($14,232,000)
Agreement States	($24,265,000)	($15,312,000)	($19,712,000)
Net Benefit (Cost)	**($42,403,000)**	**($29,357,000)**	**($35,889,000)**

Cost of the 50-rem Reporting Alternative

- The petitioner's 50-rem reporting requirement would result in additional costs over the 10-year horizon:

Entity	Total (2023 dollars)		
	Undiscounted	7% NPV	3% NPV
NRC	($355,726,000)	($211,814,000)	($282,283,000)
Industry	($2,546,998,000)	($1,594,243,000)	($2,064,361,000)
Agreement States	($3,484,091,000)	($2,084,556,000)	($2,770,889,000)
Net Benefit (Cost)	**($6,386,815,000)**	**($3,890,613,000)**	**($5,117,533,000)**

Qualitative Benefits of Proposed Rulemaking

There would be qualitative benefits that outweigh the quantified costs of the proposed rule:

- Improve NRC and Agreement States' ability to protect public health
- Improve NRC and Agreement States' knowledge of the safety impact of extravasations
- Increase public confidence in the NRC and Agreement States

Current Rulemaking Status and Next Steps

- The proposed rulemaking package was delivered to the Commission on August 12, 2024.
- The proposed rule (ML24016A290) and draft Medical Events RG (ML24016A109) will be publicly available by late August.
  - NRC will issue a Medical List Server email when the proposed rule is publicly available; the rule will also be available on the NRC's public website, "Commission Papers (SECY)"
- If the Commission approves, the proposed rule and draft RG will be issued for public comment and NRC staff will hold public meetings to facilitate comments.

For More Information

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Extravasation Rulemaking Website

NRC Rulemaking Process Website

Acronyms

- ACMUI – Advisory Committee on the Medical Uses of Isotopes
- CFR – *Code of Federal Regulations*
- I-131 – Iodine-131
- NPV – Net present value
- PRM – Petition for rulemaking
- RG – Regulatory Guide