Guideline Resource Unit
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Radiation Dermatitis Clinical Practice Guideline Series

Chapter 1: Prevention

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Series Note

This document is Chapter 1 in a multi-chapter guideline series on radiation dermatitis. Chapter 1 addresses prevention only (i.e., strategies initiated before or during radiation therapy [RT] to reduce the incidence and/or severity of acute radiation dermatitis [ARD]). Management of ARD and late radiation dermatitis, including long-term skin effects, will be addressed in Chapter 2 and 3, respectively, as they are completed. A consolidated version of this guideline will be issued when all chapters are complete.

Background

Radiation dermatitis is a side effect of radiation treatment that results from direct radiation-induced injury and the subsequent inflammatory response. Skin reaction may appear at both the entry and exit points of the radiation beam.

Available evidence suggests that the risk and severity of radiation dermatitis are influenced by patient-, disease-, and treatment-related factors, with variation across studies in which factors are reported and the strength of their associations. Commonly reported patient-related factors include high body mass index, skin type and colour, smoking, and diabetes.[1-4] Disease-related factors include treatment sites such as the breast, head and neck, or anal region, which often involve larger fields, skin folds, or areas prone to moisture and friction.[4]

Treatment-related factors include the total radiation dose and fractionation schedule, as higher total doses and certain altered fractionation approaches such as accelerated or hyperfractionation can increase skin toxicity.[1, 2] Beam energy is also important, with lower-energy beams associated with higher skin dose and higher-energy beams offering greater skin sparing.[4] Larger treatment volumes increase the amount of skin exposed, and the use of a bolus or boost further elevates risk.[1, 2, 4] Concurrent administration of radiosensitizing systemic therapies (e.g. platinum-based agents, cetuximab, 5-fluorouracil) can enhance the effects of radiation on both tumour and normal tissues, thereby exacerbating skin reactions.[4, 5]

Finally, advances in modern RT techniques, such as intensity-modulated radiotherapy (IMRT), volumetric modulated arc therapy (VMAT), and hypofractionated RT, have reduced the risk and severity of radiation dermatitis by improving dose distribution and minimizing unnecessary skin exposure.[6-9]

Clinical signs of ARD typically emerge within 1 to 4 weeks after treatment begins and may persist for several weeks following the completion of therapy. Chronic radiation dermatitis can develop more than 90 days after completing radiotherapy. Due to the cumulative effect of radiation, more severe signs are usually most pronounced within 2 to 3 weeks after the end of radiation treatment.[10] Up to 90% of patients develop mild (grade 1) skin reactions, and approximately 20% develop severe forms of radiation dermatitis.[11]

The grading systems commonly used by clinicians to classify these reactions are detailed in Table 1 of Appendix A. Table 2 of Appendix A includes commonly used patient-reported assessment tools that better reflect quality of life impacts, acknowledging that current clinician-reported grading systems have limitations due to subjective interpretation and do not fully capture the patient experience.[12, 13] It should also be noted that these grading systems may not adequately detect ARD in patients with darker skin tones or skin of colour.[3, 10] Additional care, including the use of appropriate lighting, is recommended to ensure accurate assessment in these patients.[10]

Given the significant impact of radiation dermatitis on patients' quality of life[14], this clinical practice guideline provides evidence-based recommendations on strategies to prevent, reduce, and manage acute and late radiation dermatitis, including long-term skin effects, in adult cancer patients receiving radiation therapy. It is intended for clinicians involved in the care and management of these patients to support optimal skin care and improve treatment-related outcomes.

Guideline Question

1. What evidence-based prophylactic strategies are effective for preventing or reducing the severity of ARD?

Search Strategy

The Medline database was searched on May 22, 2025, following the comprehensive search approach outlined by the Multinational Association of Supportive Care in Cancer (MASCC) in its published systematic review summarizing the available evidence on the prevention and management of acute radiation dermatitis.[15] The search covered the period from January 20, 2023, the date of MASCC's last search update, through to the current search date. Inclusion was limited to studies published after January 1, 2015, unless evidence was otherwise limited, RCTs with ≥50 patients, and meta-analyses. Studies were excluded if the product investigated was not supported by at least one additional randomized controlled trial (RCT). The specific literature search strategy and Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram are presented in Appendix B. The evidence tables will be made available as a separate document posted alongside the guideline.

In addition to the MASCC guideline,[16] clinical practice guidelines and consensus documents from other oncology-based organizations were systematically searched. Relevant guidelines considered in developing these recommendations included those from the British Columbia Cancer Agency,[17] Cancer Care Manitoba,[18] the European Society for Radiotherapy and Oncology,[19] the International Society for Nurses in Cancer Care,[20] the Society and College of Radiographers,[21] and a group of Canadian experts specializing in breast cancer and radiation dermatitis.[10]

Target Population

The following recommendations apply to adult cancer patients receiving radiation therapy.

Intended Use

This supportive care guideline provides evidence-based recommendations for standards for care and prophylactic strategies to prevent or reduce the severity of ARD. While it outlines recommendations for specific interventions, the implementation, including clinician and patient education, remains the domain of the treating teams and may vary based on local resources and practices. All recommendations are rated according to the levels of evidence and strength of recommendation rating system provided on the last page.

General Skin Care Recommendations

1. Gentle washing of the treated skin with lukewarm water and a mild, unscented, pH-balanced cleanser is recommended daily, with bathing limited to under 10 minutes and the skin gently pat-dried with a soft towel, avoiding any friction.[10]
2. Moisturizers should be applied at least twice daily, preferably after washing, using products that are water-based, unscented, non-comedogenic, and hypoallergenic.[10]
3. Topical antibiotics and antimicrobials should be avoided unless infection is suspected, with a barrier cream recommended instead due to the risks of allergic dermatitis and antibiotic resistance.[10]
4. Sun exposure to the treated skin should be avoided by using protective clothing, hats, shade, and UVA/UVB-protective sunscreen with SPF ≥ 30.[10]
5. Swimming is allowed unless skin breakdown or moist desquamation is present, but the treated skin should be rinsed and moisturized immediately afterward to remove residual chlorine. Hot tubs, steam rooms, and saunas should be avoided due to excessive heat.[10]
6. Shaving in the treatment area is acceptable unless the skin is sensitive, irritated, affected by dermatitis; an electric shaver is preferred, and aftershave, waxing, or depilatory creams should not be used.[10]
7. Loose-fitting clothing made of natural fibers such as cotton, linen, or silk is recommended to minimize friction and ***irritation*** over the treated area.[10, 19, 21]
8. ***Breast cancer-specific:*** Patients may wear any comfortable bra, including underwire bras, and may use deodorants or antiperspirants on intact skin within the treatment area, unless the skin is sensitive, irritated, or affected by dermatitis.[10]

Prophylactic Recommendations

Prophylactic products may be offered selectively based on individual risk factors and treatment context. Regardless, use of the products listed should be discussed and agreed upon between the patient and the healthcare team to ensure safety and coordination of care. Prior to use, confirm that

the patient has no known allergies to the product and, if possible, test on a small area of skin. For each product, assess whether it should be removed prior to radiation therapy. Products listed in these recommendations should not be used or applied at the same time to avoid potential interactions or reduced effectiveness, unless otherwise specified.

Clinically Relevant, Higher-Level Evidence Recommendations

Recommendations in this section have been assigned an A or B rating, indicating improved clinical outcomes, or a C rating, where a product neither improves nor worsens clinical outcomes. C-rated recommendations are considered optional.

Barrier Films and Barrier-Forming Creams

9. Barrier film with silicone adhesion (Mepitel Film) may be recommended for patients receiving breast or chest wall RT, reducing severity and improving recovery *(Level of Evidence: I[22-24] and II[25-27]; Strength of Recommendation: A)*; and is optional for patients receiving head or neck RT, with limited efficacy, low adherence to stubble, and often not well tolerated *(Level of Evidence: II[28, 29]; Strength of Recommendation: C)*. For patients receiving RT to other sites, use should be considered on a case-by-case basis due to the absence of direct evidence and limited research.

10. Silicone-based barrier-forming gel (StrataXRT) generally may be recommended for patients receiving breast RT, lowering severity *(Level of Evidence: II[30]; Strength of Recommendation: B)*; and generally recommended for head and neck RT, reducing incidence of grade 2 and 3 ARD *(Level of Evidence: I[31]; Strength of Recommendation: B)*. Note that a meta-analysis and two RCTS indicated reduced performance or inferiority in breast cancer patients compared to Mepitel Film.[26, 27, 32]

11. Polymer-based barrier-forming cream (3M Cavilon Cream) generally may be recommended for patients receiving chest wall RT due to reduced severity of ARD on the medial side and decreased moist desquamation *(Level of Evidence: I[33, 34]; Strength of Recommendation: B)*. For patients receiving breast RT, it is optional, with no demonstrated benefit *(Level of Evidence: I[33]; Strength of Recommendation: C)*.

12. Polymer-based barrier-forming liquid spray (3M Cavilon Spray) may be considered for patients receiving breast RT, with reduced severity and burning in lateral breast *(Level of Evidence: II[35]; Strength of Recommendation: C)*. For patients receiving anal and rectal RT, it may be considered, with positive effects negated by increased treatment interruptions *(Level of Evidence: II[36]; Strength of Recommendation: C)*.

Dressings

13. Polyurethane dressing with hypoallergenic acrylic adhesive (Hydrofilm) generally may be recommended for patients receiving breast RT due to reduced severity of ARD *(Level of Evidence: II[37, 38]; Strength of Recommendation: B).*

Prophylactic Topical Corticosteroids

14. Betamethasone 0.1% applied once or twice daily generally may be recommended for patients receiving breast or chest wall RT, demonstrating reduced severity and moist desquamation *(Level of Evidence: II[39]; Strength of Recommendation: B)*. It generally may be recommended for patients receiving head and neck RT, lowering severity *(Level of Evidence: II[40, 41]; Strength of Recommendation: B)*.

15. Mometasone 0.1% applied once or twice daily generally may be recommended for patients receiving breast or chest wall RT, with reduced severity, moist desquamation, and a longer time to onset, though benefits are not uniformly reported *(Level of Evidence: II[42, 43]; Strength of Recommendation: B)*. Note that a meta-analysis concluded that betamethasone is more effective compared to mometasone.[44]

16. Hydrocortisone 1% applied twice daily may be considered for patients receiving chest wall RT, with lower severity and delay in onset in a small RCT *(Level of Evidence: II[45]; Strength of Recommendation: C),* and may be considered for patients receiving breast RT, with no difference reported *(Level of Evidence: II[42]; Strength of Recommendation: C)*. Note that another trial reported worse performance compared to henna ointment.[46]

Commonly Patient-Initiated Interventions with Lower-Level Evidence

Many recommendations in this section are rated C to reflect insufficient evidence for efficacy or uncertainty that benefits clearly outweigh potential risks or disadvantages.

17. Topical formulations containing hyaluronic acid or hyaluronan are optional for patients receiving breast RT, with no reported benefits compared to moisturizers *(Level of Evidence: II[47]; Strength of Recommendation: C)*. Note that better performance was reported compared to barrier-forming hydroactive colloid gel.[48] It is generally not recommended for head and neck RT given the lack of trials against standard comparators (moisturizers/negative controls), no observed difference versus a hydrogel, and worse performance compared to a linolenic acid-based cream *(Level of Evidence: II[49, 50]; Strength of Recommendation: D).*

18. Topical aloe vera gels or creams are optional for patients receiving breast or chest wall RT, with no evidence of impact on incidence and severity reported in two meta-analyses *(Level of Evidence: II[51, 52]; Strength of Recommendation: C).*

19. Topical formulations containing olive oil may be considered for patients receiving breast or chest wall RT, with reduction in severity *(Level of Evidence: II[53]; Strength of Recommendation: C)*. It may also be considered for patients receiving RT to the nasopharyngeal area, with reduction in severity and longer time till ARD onset *(Level of Evidence: II[54]; Strength of Recommendation: C)*.

20. Calendula lotions, creams and ointments are optional for patients receiving breast or chest wall RT, with no evidence of impact on moist desquamation in a meta-analysis of 4 RCTs *(Level of Evidence: II[51]; Strength of Recommendation: C)*.

21. Topical or oral curcumin products are optional for select patients receiving breast or chest wall RT, inconsistent impact on ARD across trials *(Level of Evidence: I[55], II[56, 57]; Strength of Recommendation: C)*. Oral curcumin is contraindicated for patients receiving certain chemotherapeutic agents (e.g., doxorubicin, and cyclophosphamide), anticoagulants, or endocrine therapy.[58-60]

22. Oral glutamine may be optionally considered for patients receiving RT for breast or head and neck cancers. A meta-analysis of five RCTs found that oral glutamine (20–30 g/day) significantly reduced the incidence of moderate to severe radiation dermatitis, though the overall certainty of evidence was moderate due to risk of bias and missing data. *(Level of Evidence: II[61]; Strength of Recommendation: C).*

Not Routinely Available with Limited Evidence

23. Low-level laser therapy (photobiomodulation) is associated with reduced severity of ARD in patients receiving RT for breast or head and neck cancers, based on several small randomized and non-randomized clinical trials. However, due to high heterogeneity, risk of bias, and limited availability and clinical familiarity in Alberta, its use is not currently recommended. *(Level of Evidence: II[62, 63] V[16]; Strength of Recommendation: C)*

Appendix A: Acute Radiation Dermatitis Scoring Systems

Table 1. Common Clinician-Reported Scoring Systems. Adapted from Huang et al. (2015)[64]

Grade	RTOG	RTOG modified	CTCAE v5.0
0	No change over baseline	No change over baseline	None
1	Follicular, faint or dull erythema/epilation/dry desquamation/decreased sweating	Follicular, faint or dull erythema/epilation/dry desquamation/decreased sweating	Faint erythema or dry desquamation
2	Tender or bright erythema, patchy moist desquamation/moderate edema	Tender or bright erythema	Moderate to brisk erythema; patchy moist desquamation, mostly confined to skin folds and creases; moderate edema
2.5		Patchy moist desquamation/moderate edema	
3	Confluent, moist desquamation other than skin folds, pitting edema	Confluent, moist desquamation other than skin folds, pitting edema	Moist desquamation in areas other than skin folds and creases; bleeding induced by minor trauma or abrasion
4	Ulceration, hemorrhage, necrosis	Ulceration, hemorrhage, necrosis	Life-threatening consequences; skin necrosis or ulceration of full thickness dermis; spontaneous bleeding from involved site; skin graft indicated

CTCAE, Common Terminology Criteria for Adverse Events; RTOG, Radiation Therapy Oncology Group; WHO, World Health Organization

Table 2. Common Patient-Reported Assessment Tools. Adapted from Forde et al. (2025)[19]

Assessment Tool	Scale	Type of Patient-Reported Outcomes	Other Domains Evaluated
RISRAS	0 to 4	Tenderness, discomfort, pain Itching Burning sensation Impact on daily activities	–
Skindex-16	0 to 6	Itching Burning or stinging Hurting Irritation	Emotional and functional subscales (frustration, embarrassment, depression, personal relationships, daily activities)
STAT	0 to 5	Burning Itchiness Pulling Tenderness Other	Skin care treatment, assessment time

RISRAS, Radiation Induced Skin Reaction Assessment Scale; STAT, Skin Toxicity Assessment Tool.

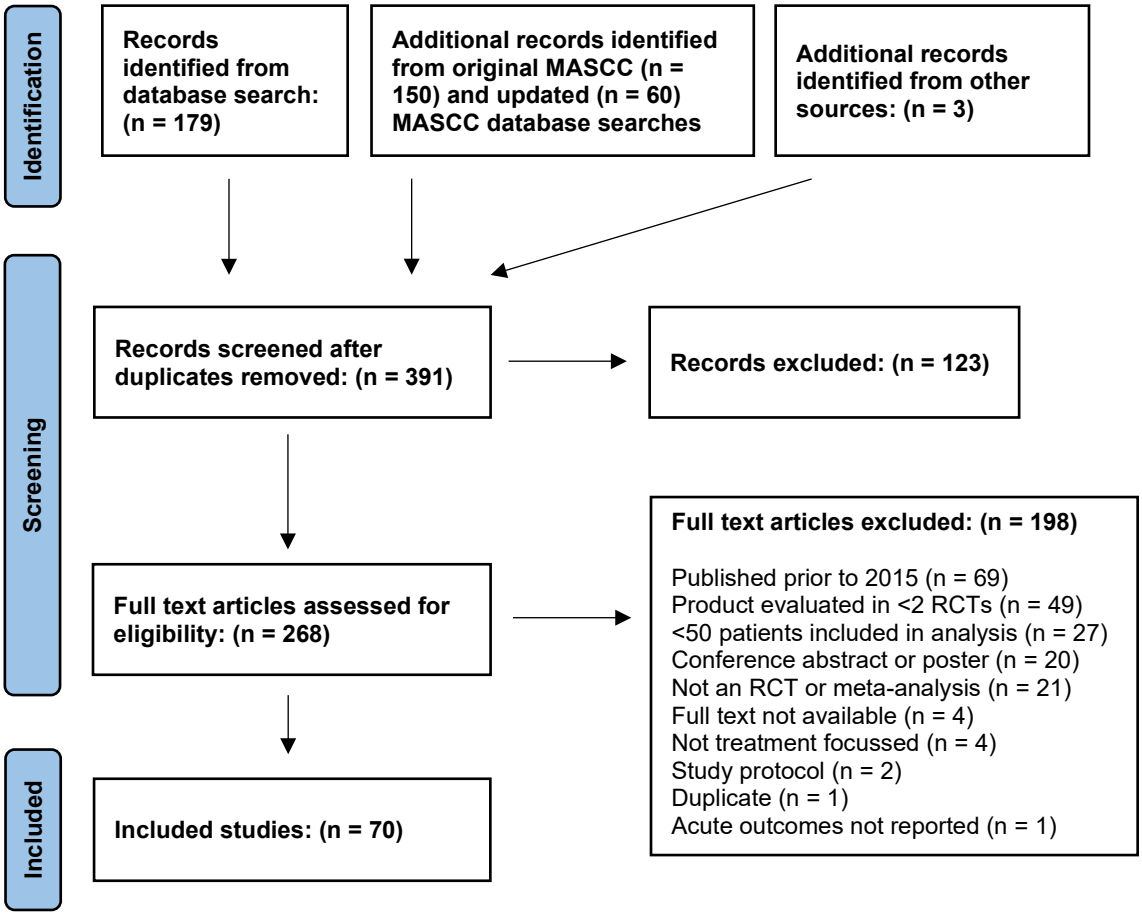
Appendix B: Literature Search Strategy and PRISMA Flow Diagram

Literature Search Strategy

Ovid MEDLINE(R) ALL

1	exp Neoplasms/rt [Radiotherapy]
2	exp Neoplasms/
3	(cancer* or neoplasm* or carcinoma*).mp.
4	exp Radiotherapy/
5	(radiotherap* or radiation therap*).mp.
6	1 or ((2 or 3) and (4 or 5))
7	exp Radiodermatitis/
8	(radiation dermatitis or radiodermatitis or dermatitis).mp.
9	((skin or dermatol*) adj3 (toxic* or react* or burn* or rash* or damage* or injur* or irritat*)).mp.
10	or/7-9
11	th.xs.
12	pc.fs.
13	((manag* or treat* or alleviat* or avoid* or lessen* or prevent* or prophyla* or control*) adj5 (skin or dermatol* or dermatitis or radiodermatitis)).mp.
14	or/11-13
15	6 and 10 and 14
16	limit 15 to english language
17	limit 16 to ed=20230120-20250923
18	limit 17 to (english language and humans and (clinical trial, all or comparative study or controlled clinical trial or guideline or meta analysis or multicenter study or network meta-analysis or observational study or practice guideline or randomized controlled trial or "systematic review"))
19	remove duplicates from 18

PRISMA Flow Diagram



Adapted from: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. For more information, visit http://www.prisma-statement.org/

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Development and Revision History

This guideline was developed by a multidisciplinary working group comprised of members from the Alberta Provincial Breast Tumour Team, Alberta Provincial Head and Neck Tumour Team, and two methodologists from the Guideline Resource Unit. The draft guideline was externally reviewed and endorsed by Alberta radiation oncologists and members of the clinical education team who were not involved in the guideline's development, including radiation therapists. A detailed description of the methodology followed during the guideline development process can be found in the Guideline Resource Unit Handbook.

This guideline was originally developed in 2025.

Levels of Evidence

I	Evidence from at least one large randomized, controlled trial of good methodological quality (low potential for bias) or meta-analyses of well-conducted randomized trials without heterogeneity
II	Small randomized trials or large randomized trials with a suspicion of bias (lower methodological quality) or meta-analyses of such trials or of trials with demonstrated heterogeneity
III	Prospective cohort studies
IV	Retrospective cohort studies or case-control studies
V	Studies without control group, case reports, expert opinion

Strength of Recommendations

A	Strong evidence for efficacy with a substantial clinical benefit; strongly recommended
B	Strong or moderate evidence for efficacy but with a limited clinical benefit; generally recommended
C	Insufficient evidence for efficacy or benefit does not outweigh the risk or the disadvantages (adverse events, costs, etc.); optional
D	Moderate evidence against efficacy or for adverse outcome; generally not recommended
E	Strong evidence against efficacy or for adverse outcome; never recommended

Maintenance

A formal review of the guideline will be conducted in 2030. If critical new evidence is brought forward before that time, however, the guideline working group members will revise and update the document accordingly.

Abbreviations

AHS, Alberta Health Services; ARD, acute radiation dermatitis; AUC, area under the curve; CCA, Cancer Care Alberta; CI, confidence interval; CTCAE, Common Terminology Criteria for Adverse Events; HR, hazard ratio; IMRT, intensity modulated radiation therapy; OR, odds ratio; QOL, quality of life; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses; RCT, randomized controlled trial; RD, radiation dermatitis; RISRAS, Radiation-Induced Skin Reaction Assessment Scale; RR, risk ratio; RT, radiation therapy; RTOG, Radiation Therapy Oncology Group; SOC, standard of care; STAT; Skin Toxicity Assessment Tool; VMAT, volumetric modulated arc therapy.

Disclaimer

The recommendations contained in this guideline are a consensus of the Alberta radiation oncologists and are a synthesis of currently accepted approaches to management, derived from a review of relevant scientific literature. Clinicians applying these guidelines should, in consultation with the patient, use independent medical judgment in the context of individual clinical circumstances to direct care.

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Conflict of Interest Statements

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