EVIDENCE-BASED PRACTICE

Development of a Radiation Skin Care Protocol and Algorithm Using the Iowa Model of Evidence-Based Practice

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Limited evidence-based standards of care exist in the management of irradiated skin; therefore, the development of a skin care protocol is necessary to improve patient outcomes. This article describes the use of the Iowa Model of Evidence-Based Practice to Promote Quality Care as a framework to identify and validate current evidence. The resulting radiation therapy algorithm provided a succinct guideline for nurses to direct the prevention and management of skin damage secondary to radiation therapy, thus improving quality care.

About 60% of cancer cases require radiation therapy, which is a common treatment modality and a palliative intervention for cancer-related symptoms (National Cancer Institute [NCI], 2010). However, side effects are common with radiation therapy; an estimated 85%–95% of patients with cancer that receive radiation therapy will develop some degree of skin damage (McQuestion, 2006). Despite the frequent occurrence of those side effects, limited evidence-based standards of care exist on its prevention and management. Skin care recommendations vary amongst institutions and individual practitioners, and often are based on expert opinion rather than research evidence for use in the prevention and treatment of radiation-induced skin changes (D’Haese et al., 2005). The development of an evidence-based protocol and algorithm to manage skin changes secondary to radiation therapy is needed to support a practice change and guide the improvement of patient outcomes. The Iowa Model of Evidence-Based Practice to Promote Quality Care (Titler et al., 2001) provided the framework to lead this change and ensure that the most current evidence is available in daily practice.

Radiation therapy uses high-energy waves to interrupt tumor growth, disrupt cellular processes including cell division, and ultimately cause cellular death, which triggers tumor shrinkage. The amount and type of radiation is dependent on each individual patient with cancer, tumor size and location, cancer stage, preexisting health, method of radiation delivery, and total dose (NCI, 2010). Types of radiation include internal and external. Internal radiation consists of brachytherapy or seed implants, in which radioactive material is implanted near or into the tumor. External radiation uses an external beam to deliver the radiation to the tumor or tumor bed, with daily treatment usually delivered five days per week for an extended period of four to seven weeks. External radiation causes many of the observed skin reactions because radiation therapy targets rapidly dividing tumor cells as well as healthy skin cells (NCI, 2010).

The skin is the largest organ of the body and serves as its first line of defense by regulating thermal processes, protecting underlying structures, and excreting waste. The three layers of the skin are the epidermis, dermis, and hypodermis (subcutaneous). The epidermis includes the outer cornified layer and the deeper basal layer and is continually renewed through the proliferation and maturation of skin cells that are completely replaced every four weeks (McQuestion, 2006). The dermis contains support structures such as blood vessels, glands, nerves, and hair follicles, whereas the subcutaneous layer contains the adipose and connective tissues (Noble-Adams, 1999) (see Figure 1). Basal cells in the epidermis are destroyed as a result of external beam radiation (McQuestion, 2006). This destruction disrupts normal cell production and weakens skin integrity, which delays epithelial migration for healing. Radiation-induced skin reactions can occur one to four weeks after initial treatment and persist for two to four weeks following completion of treatment. Those adverse effects can occur on areas of the body that are exposed to radiation, particularly where the outer skin is thin and smooth (McQuestion, 2006). The severity of skin reaction varies greatly among individuals, depending on...
preexisting health conditions, skin condition, race, lifestyle choices (e.g., chronic sun exposure, smoking), age, nutritional status, type and daily and total dose of radiation, and concurrent chemotherapy or immunosuppressant therapies (Porock, 2002). Skin reactions can range from no reaction to moist, painful ulcerations, or even necrosis (Bolderston, Lloyd, Wong, & Robb-Blenderman, 2006). Although several assessment and toxicity scales exist to grade radiation reactions, the NCI Cancer Therapy Evaluation Program’s (2010) Com mon Terminology Criteria for Adverse Events widely is recognized as the gold standard (see Table 1).

Evidence-Based Model

At a comprehensive cancer center in the Midwestern United States, clinical problems in patients receiving radiation therapies were consistently identified by the radiation oncology staff nurses. However, no guideline was available to manage irradiated skin in patients with cancer. The problem became a priority because of the high percentage of patients that experienced radiation skin damage and the lack of standardized care for this population. The staff identified a need to develop an evidence-based protocol for the oncology staff to use in the care of patients undergoing radiation.

The Iowa Model of Evidence-Based Practice to Promote Quality Care was developed by Titler et al. (2001) of the University of Iowa Hospitals and Clinics. The model directs change based on current evidence with attention to the entire healthcare system at the hospital and organizational level. The author’s institution used the Iowa model to develop a radiation skin care protocol. The specific steps incorporated were (a) problem identification, (b) forming a team, (c) critique of relevant research, (d) implementing practice change, and (e) dissemination of findings.

Following the Iowa model guidelines, a radiation skin care task force was established, which comprised a radiation oncology clinic nurse, radiation oncology nurse manager, wound and skin care specialist, and nurse educator. Although physicians were not directly involved with the group, they provided support for the concept. Each member of the team was assigned a particular role. The clinic nurse and nurse manager evaluated the current practice within the radiation oncology department with determination of specific products in use and the consistency at which those products were recommended. They also engaged the nursing staff through meetings and informing them of progress. The wound and skin care specialist focused on conducting a literature review of relevant research and evidence-based standards related to radiation and skin care principles. Those findings were evaluated, leveled, and synthesized, then organized into a protocol based on the NCI Cancer Therapy Evaluation Program’s (2010) radiation dermatitis scale.

**Protocol Development**

The wound and skin care specialist developed the framework of the protocol based on findings in the literature. Within the protocol, each radiation-induced skin reaction (erythema, dry desquamation, moist desquamation, and ulceration, hemorrhage, or necrosis) was represented and then categorized into specific product recommendations based on evidence within the literature, best practice, clinical experiences, and knowledge of moist wound healing. The protocol included specific product names, information about the product, the method and frequency of application, and evidence-based standards related to radiation and skin care principles.

Table 1. Common Terminology Criteria for Dermatitis Radiation

<table>
<thead>
<tr>
<th>GRADE</th>
<th>SKIN CHANGE</th>
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<tr>
<td>1</td>
<td>Faint erythema or dry desquamation</td>
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<tr>
<td>2</td>
<td>Moderate to brisk erythema; patchy moist desquamation, mostly confined to skin folds and creases; moderate edema</td>
</tr>
<tr>
<td>3</td>
<td>Moist desquamation in areas other than skin folds and creases; bleeding induced by minor trauma or abrasion</td>
</tr>
<tr>
<td>4</td>
<td>Life-threatening consequences; skin necrosis or ulceration of full thickness dermis; spontaneous bleeding from involved site; skin graft indicated</td>
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Rinse well. 28–42. doi:10.1111/j.1365–42. Johnson's
Tom's of Maine
Pat dry.

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and expected outcomes. Product names were essential because a variety of interventions were recommended, including over-the-counter medications, common skin cleansing agents, and prescription drugs.

The complete protocol was a 20-page document that included evidence-based interventions with product examples based on the stage of irradiated skin damage. Staff feedback was positive, although many expressed that the protocol was too lengthy for daily use. Therefore, an algorithm was created that resulted in a shortened version of the protocol (see Figure 2). The algorithm provided a concise overview for reference to clinical recommendations in the prevention, minimization, and management of radiation-induced skin changes; interventions for observed skin changes; and specific product recommendations. If additional information is needed, the full protocol can be accessed easily by the radiation oncology staff for expanded references.

The algorithm was subsequently printed on a 36” x 56” poster that was displayed in the radiation oncology nurses’ station. Photographs of stage-related skin changes were included on the poster for visual reference.

Figure 2. Radiation Skin Care Algorithm for Normal Skin

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Discussion

The radiation skin care protocol and algorithm are valuable tools to guide healthcare professionals in preventing and minimizing radiation-induced skin changes, as well as treatment of observed skin changes secondary to radiation therapy. Protocol development was guided by the interdisciplinary team using the Iowa model. Members of the team have been vital in dissemination of the algorithm and protocol. The nurse educator developed a teaching plan for the staff, and the radiation oncology nurse manager and clinic nurse engaged interdisciplinary members within the department. In addition, the wound and skin care specialist provided personalized care for individual patients by using the algorithm.

Implications for Practice

The author’s institution currently is in the implementation phase of the Iowa model (Titler et al., 2001). A pilot project using the algorithm and protocol is ongoing in the radiation oncology department. Once the pilot phase is completed, the group is interested in evaluating the ease and practical use of the algorithm by the staff, and the patient-related effects of an institutional approach to the prevention and treatment of radiation-induced skin changes.

Oncology nurses focus on quality patient care as a component of advancing nursing practice. If a gap in practice is recognized, nurses must have access to the necessary tools and resources to develop a practical solution. Nurses are vital to improving the quality of health care, particularly in the area of supportive care.

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References


Do You Have an Interesting Topic to Share?

Evidence-Based Practice offers information to help nurses integrate research-based findings into practice. Length should be no more than 1,000–1,500 words, exclusive of tables, figures, insets, and references. If interested, contact Associate Editor Marlon Saria, MSN, RN, AOCNS®, at msaria@ucsd.edu.
Appendix A. Iowa Model of Evidence-Based Practice (EBP) to Promote Quality Care

Problem-Focused Triggers
1. Risk management data
2. Process improvement data
3. Internal or external benchmarking data
4. Financial data
5. Identification of clinical problem

Knowledge-Focused Triggers
1. New research or other literature
2. National agencies or organizational standards and guidelines
3. Philosophies of care
4. Questions from institutional standards committees

Is this topic a priority for the organization?
Yes
Form a team.

Assemble relevant research and related literature.

Critique and synthesize research for use in practice.

Is there a sufficient research base?
Yes
Pilot the Change in Practice
1. Select outcomes to be achieved.
2. Collect baseline data.
3. Design EBP guidelines.
4. Implement EBP on pilot units.
5. Evaluate process and outcomes.
6. Modify the practice guideline.

No
Consider other triggers.

Is change appropriate for adoption in practice?
Yes
Institute the change in practice.

No
Continue to evaluate quality of care and new knowledge.

Conduct research.

Base Practice on Other Types of Evidence
1. Case reports
2. Expert opinion
3. Scientific principles
4. Theory

Monitor and Analyze Structure, Process, and Outcome Data
- Environment
- Staff
- Cost
- Patient and family

Disseminate results.