Promoting Adherence to Skin Care Practices Among Patients Receiving Radiation Therapy

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Background: The effects of radiation on the skin are particularly troublesome for patients and can result in impaired quality of life and an inability to perform activities of daily living. Skin care during radiation therapy is needed to prevent and treat radiation dermatitis. Patient adherence to prescribed skin care protocols is paramount to an optimal outcome but not always monitored closely.

Objectives: The focus of this study was to optimize patient adherence to the Oncology Nursing Society’s Putting Evidence Into Practice recommendations for skin care during radiation therapy.

Methods: A multidimensional approach was used to enhance adherence to the skin care protocol. Outcomes measured included adherence, patient satisfaction, and skin condition.

Findings: Five interacting dimensions affect adherence: health-system, socioeconomic, therapy-related, patient-related, and condition-related factors. Self-reported adherence to the washing and moisturizing protocol from treatment week 4 through treatment week 7 was high. Implementation of the skin care protocol introduced in this study has led to a statistically significant decrease in the level of skin toxicity.

Review of the Literature

About 95% of patients who receive radiation will develop some degree of radiation dermatitis (Feight et al., 2011). Grade 1
TABLE 1. Common Terminology Criteria for Adverse Events: Radiation Dermatitis

<table>
<thead>
<tr>
<th>Grade</th>
<th>Adverse Event</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Faint erythema or dry desquamation</td>
<td>Moderate to brisk erythema; patchy moist desquamation, mostly confined to skin folds and creases; moderate edema</td>
</tr>
<tr>
<td>2</td>
<td>Moist desquamation in areas other than skin folds and creases; bleeding induced by minor trauma or abrasion</td>
<td>Life-threatening consequences; skin necrosis or ulceration of full thickness dermis; spontaneous bleeding from involved site; skin graft indicated</td>
</tr>
<tr>
<td>3</td>
<td>Life-threatening consequences; skin necrosis or ulceration of full thickness dermis; spontaneous bleeding from involved site; skin graft indicated</td>
<td>Death</td>
</tr>
</tbody>
</table>


Reactions (see Table 1) can occur as early as the first treatment, whereas grade 2 and higher appear as the amount of radiation delivered reaches 30 Gy, usually around the second or third week of treatment (Dendaas, 2012). Research related to radiation dermatitis has focused primarily on comparing the effectiveness of topical products with little attention given to adherence; problematic since the benefits accrued from using even the most efficacious skin care product will not be realized if adherence is poor (Mannix, Barholomay, Doherty, Lewis, & Connors Bilodeau, 2012).

The World Health Organization ((WHO), 2003) defined adherence as, “the extent to which a person’s behavior-taking medications, following a diet, and/or executing lifestyle changes, correspond with agreed recommendations” (p. 3). An erroneous assumption exists that adherence, particularly poor adherence, to a prescribed therapy is a patient-centered problem situated in the patient’s lack of knowledge. Therefore, patient teaching often is the only intervention used to promote adherence. Whereas knowledge is necessary to promote adherence, knowledge alone is not sufficient to ensure adherence (WHO, 2003). In a comprehensive review, the WHO (2003) concluded that five interacting dimensions affect adherence: health-system factors, socioeconomic factors, therapy-related factors, patient-related factors, and condition-related factors. In addition, interventions to enhance adherence are more apt to be successful when multidimensional approaches are used to overcome barriers.

Among patients undergoing chemoradiation, Mannix et al. (2012) reported high levels of adherence to skin washing and moisturizing when a multidimensional approach was used to promote adherence by using a low-cost standardized skin care kit, written instructions, weekly diary, and routine reinforcement. Similarly, Gosselin, Schneider, Plambeck, and Rowe (2010) reported product application adherence in 90% of patients who were given study supplies and kept a daily journal recording satisfaction, ease of use, and application frequency for the study products as well as the effect of a skin reaction, should one occur. Sharp et al. (2012) reported adherence to a skin care protocol as high as 86% (n = 363) during the first week of treatment and 87% (n = 367) during the final week of treatment.

**TABLE 2. Strategies Used to Promote Adherence**

<table>
<thead>
<tr>
<th>WHO Dimension</th>
<th>Factors Within Dimension</th>
<th>Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition-related</td>
<td>Understanding and perceptions about cancer and its treatment</td>
<td>Teach the patient about prescribed treatment modalities.</td>
</tr>
<tr>
<td>Therapy-related</td>
<td>Understanding about radiation therapy</td>
<td>Teach the patient about the importance of keeping radiation treatment appointments.</td>
</tr>
<tr>
<td>Patient-related</td>
<td>Lack of knowledge</td>
<td>Teach patients what self-care must be done to prevent or minimize radiation dermatitis and how it must be done. Use the 4MAT system to organize presentation of information to capture diverse learning styles.</td>
</tr>
<tr>
<td>Socioeconomic</td>
<td>Poverty, Low literacy</td>
<td>Provide needed skin care supplies at no cost to patient. Use three methods of teaching (verbal, video, and written) for initial instruction. Reinforce teaching at weeks 1 and 3. Give the patient choice of instruction method used for reinforcement at weeks 2 and 3. Patients with low literacy will, therefore, have the option of using verbal or video reinforcement.</td>
</tr>
<tr>
<td>Health system</td>
<td>Heterogeneity in content presented and order of presentation across health educators (nurses)</td>
<td>Use the Oncology Nursing Society’s Putting Evidence Into Practice guidelines to provide uniform content in all teaching materials and methods. Use the 4MAT system to provide consistency in ordering the presentation of content across all teaching materials and methods. Provide initial instruction about the skin care protocol at time of simulation visit and again at weeks 1 and 3. Provide reinforcement for adherence to the skin care protocol by monitoring adherence weekly. Build a positive, patient-centered relationship.</td>
</tr>
<tr>
<td></td>
<td>Heterogeneity in the frequency of instruction and reinforcement</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Variability in patient-provider relationship</td>
<td></td>
</tr>
</tbody>
</table>

WHO—World Health Organization

Type Two
Do not use soap on the treatment area. You must apply Aquaphor

Time
Wear loose clothes. Less rubbing and friction on the treated area is

What?
Do not rub or scrub your skin with anything that may irritate your

Do not go to the beach or sunbathe.

Date
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Optimizing Adherence to the Skin Care Protocol
Organized Using the 4MAT Model

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FIGURE 1. McCarthy’s 4MAT Model

Optimizing Adherence to the Skin Care Protocol

Developing the Protocol

In this project, a multidimensional approach was used to enhance adherence to the skin care protocol. Strategies used to promote adherence were conceptually linked to the WHO’s five interactive dimensions (see Table 2). Strategies used in the patient-related, socioeconomic, and health-system factors are discussed in greater detail in this article.

Two person-related factors, knowledge and learning style, were addressed. Having correct knowledge is a key factor in preventing radiation dermatitis. Self-care interventions cannot be effective if the patient is confused or uncertain about what needs to be done and how to do it (Zullig, Peterson, & Bosworth, 2013). Because radiation therapy is done, typically, on an outpatient basis, patients play a major role in caring for their skin. Instructions to minimize radiation effects on the skin must be provided in a consistent manner that is understandable and acceptable to the patient and matches the patient’s learning style.

McCarthy’s (1987) 4MAT system (see Figure 1) was used to organize the presentation of skin care information across all methods of teaching: written, verbal, and video. A distinct feature of McCarthy’s model is that it defines the learning process as a natural sequence proceeding across the four distinct learning styles of imaginative, analytic, common sense, and dynamic (McCarthy, 1987). The question “Why?” is paramount to type one (imaginative) learners, who learn by seeking personal meaning. “What?” is the favorite question of type two (analytic) learners, who prefer having information presented at the conceptual level. Type three (common sense) learners learn by doing and, therefore, thrive on active engagement and opportunities to practice. Their favorite question is “How does it work?” Type four (dynamic) learners are the most creative. Their favorite question is “So what can I do with this new knowledge?” By teaching in sequence—Why? What? How? So what?—health educators can address all four learning styles.

Why Take Care of Your Skin?

Head and Neck Skin Care

Radiation therapy can cause changes to your skin. Your skin may change color. It may become pink, red, or darkened. Other changes could include peeling and drying. These changes can be quite severe. They may also include tenderness, soreness, and itching. Taking special precautions to protect your skin will reduce the severity of skin changes caused by radiation therapy.

What: You need to protect your skin. There are some things you must do and some things you must not do.

Things You MUST DO
You must clean your skin twice a day using the wipes given to you by your nurse.
• You must apply Aquaphor® to your skin twice per day.
• Wear loose clothes. Less rubbing and friction on the treated area is preferred.
• If you are going out in the sun, wear a wide-brimmed hat or cover your skin with clothing to protect the treatment area. Once you have completed your therapy, use sunscreen of skin protection factor (SPF) 30 or higher when you go out in the sun.
• If you must shave, use an electric razor only.

Things You MUST NOT DO
• Do not rub or scrub your skin with anything that may irritate your skin. Things that can irritate the skin over the treatment area include washcloths, loofahs, and mesh scrubbies.
• Do not scratch your skin. If itching starts, notify the nurse.
• Do not use hot or cold water when showering. Only use lukewarm water on the treatment area.
• Do not use soap on the treatment area.
• Do not go to the beach or sunbathe.
• Do not use pre-shave or after-shave on the treatment area.
• Do not apply hot packs or cold packs to the treatment area.
• Do not use bandages or tape on the treatment area.

How: To clean the skin, use the wipes given to you by your nurse. Gently wipe the skin with the wipe. Use two wipes each time. Allow the skin to dry. Then apply Aquaphor to your skin as directed by your nurse.

When: You will use the wipes and apply Aquaphor immediately after your radiation therapy and then just before you go to bed. On non-treatment days, clean the area with the wipes and apply the Aquaphor twice daily, once in the morning and once at bedtime.

What to Expect: By cleaning your skin with the wipes and using Aquaphor twice a day, your skin will be less likely to develop severe skin reactions from radiation therapy.

Patient Signature __________________________ Date ________ Time ________
Nurse Signature __________________________ Date ________ Time ________

FIGURE 2. Head and Neck Skin Care Teaching Sheet Organized Using the 4MAT Model
Note. Courtesy of the Barbara Ann Karmanos Cancer Center. Reprinted with permission.
and no one is left out (Villejo & Meyers, 1991). Well-developed and organized education programs should help learners by employing strategies that address all four learning styles (Weber & Armstrong, 2012). McCarthy’s 4MAT principles were used to organize teaching content across all three teaching methods (i.e., verbal, video, and written). Figure 2 demonstrates how the 4MAT system was used to organize skin care information on a written instruction sheet.

Two socioeconomic barriers to adherence, poverty and low literacy, were addressed. Poverty is one of the most significant barriers to adherence (WHO, 2003). Therefore, skin care kits were provided to all patients free of charge. Low health literacy is common among older adults, individuals with chronic illness or disability, people who live in poverty, patients who do not speak English, and people with a mental illness (Torp, Burke, & Golub, 2011). About 32 million adults in the United States—about one in seven—have such low literacy skills that it would be difficult for them understand a medication’s side effects listed on a pill bottle (Kutner, Greenberg, Jin, & Paulsen, 2006). Therefore, many patients (aged 16 years and older) in the United States understand few, if any, of the written materials provided to them by healthcare professionals (Kutner et al., 2006). In providing information to a low-literacy population, verbal instruction (one-to-one, group, or audiovisual) must be the primary method of education (Doak, Doak, & Root, 1996). In addition, low-literacy patients often require frequent reinforcement to ensure comprehension (Doak et al., 1996). Therefore, deliberate steps were taken to ensure that patient instructions included both verbal and video instruction with planned episodes of reinforcement.

Finally, health-system factors with the potential for interfering with adherence were addressed. Chief among those was the problem of heterogeneity in the presentation of healthcare information. When different healthcare providers present information differently, or vary the content or order of presentation of health information, patients become confused about what is important and what is not (D’haese, Van Roy, Bate, Bijdekerke, & Vinh-Hung, 2010). This confusion increases the risk for poor adherence. To minimize heterogeneity, all teaching material (verbal, written, and video) contained the same content offered using the same order of presentation following the 4MAT System. Nurses received special instruction regarding the importance of using the 4MAT system. In addition, nurses rehearsed their verbal presentations before project launch and received additional training and rehearsal if their patient teaching began to stray from the agreed on content or format.

**Measurement**

Outcomes measured included adherence, patient satisfaction, and skin condition. Adherence to the skin care protocol was measured by self-report during weekly clinic visits. Trained nurses interviewed patients to assess both cleansing and moisturizing adherence using a structured interview guide (see Figure 3).

Satisfaction with skin care instruction was measured using a scale depicting four faces. Faces at opposite ends of the scale were anchored with the words “not satisfied” and “extremely satisfied.” Patients were instructed to circle the face that most closely resembled their level of satisfaction with the instruction provided. Confidentiality of patient responses was maintained by allowing patients to complete the scale in private, seal it in an envelope, and return it to a drop box. Therefore, the nurses providing instruction were blinded to patient responses. Satisfaction with skin care instruction was assessed during the first teaching session and during reinforcements provided at the end of treatment weeks 1 and 3.

Skin condition was measured using MOSAIQ® radiation oncology (RO) ratings from ONS on a scale of 0–4. Skin assessments made and MOSAIQ RO ONS scores were recorded in the medical record at weekly clinic visits using the following terminology.

- **No changes (0)**
- **Faint or dull erythema, follicular reaction (1)**
- **Bright erythema (2)**
- **Dry desquamation with or without erythema (3)**
- **Small-to-moderate amount of wet desquamation (4)**
- **Confluent moist desquamation, edema (5)**
- **Ulceraion, hemorrhage or necrosis (6)**

**Implementation of the Protocol**

After receiving approval from the institutional review board at Wayne State University, the new skin care protocol was

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**TABLE 3. Patient Characteristics (N = 86)**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Previous Protocol (n = 56)</th>
<th>New Protocol (n = 30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)*</td>
<td>57.3 (13.6)</td>
<td>61.5 (10.3)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>42</td>
<td>20</td>
</tr>
<tr>
<td>Female</td>
<td>14</td>
<td>10</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>16</td>
<td>8</td>
</tr>
<tr>
<td>Caucasian, Non-Hispanic</td>
<td>37</td>
<td>20</td>
</tr>
<tr>
<td>Hispanic</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Asian</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Smoking status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>30</td>
<td>7</td>
</tr>
</tbody>
</table>

*Age statistics are based on 29 participants in the New Protocol group.
implemented with careful patient monitoring. All patients with head and neck cancer scheduled for radiation therapy participated in the project with the exception of non-English-speaking patients. All head and neck treatment sites and stages were included. Concurrent chemotherapy or radiation alone were the accepted treatment types. Patients were taught one-on-one about skin care by trained nurses prior to starting radiation therapy using three different teaching methods: verbal, video, and written. At the first teaching session, patients received a skin care kit that included two tubes of Aquaphor® and three packages of cleansing wipes. Patients were instructed to use the wipes to cleanse the skin twice daily then apply a thin layer of Aquaphor after each cleansing. This skin care was to be done every day, including non-treatment days.

Skin care education was reinforced at the end of treatment weeks 1 and 3. Patients were asked which teaching method they preferred, and that was the method used to reinforce skin care at that encounter. The patient did not always choose the same teaching method for each reinforcement.

FIGURE 4. Severity of Skin Reactions Weeks 1–7 With the New and Previous Protocols

RO ONS—radiation oncology rating from the Oncology Nursing Society

Note: RO ONS scores are rated on a 0–4 scale.
Results

When possible, outcome measures for patients using the new protocol described in this article were compared to outcome measures of patients using the previous protocol used at the authors’ institution. Patients using the previous protocol were randomly selected from a list of 200 patients with head and neck cancer treated before implementation of the new protocol. Patient characteristics are shown in Table 3.

Skin Reaction

Skin reactions occurred in both protocol groups, but differed with respect to onset and severity. The onset of skin reactions was delayed among the new protocol group (X̄ = 21.43 days to onset) compared to the previous protocol group (X̄ = 17.51 days to onset), but the observed differences in days to onset were not statistically significant. However, severity of skin reaction, using the highest RO ONS score for each patient, was less for the new protocol group (X̄ = 1.6) compared to the previous protocol group (X̄ = 2.09), and these mean differences were statistically significant (t = –2.1, p = 0.038). The distribution of skin reactions by MOSAIQ RO ONS scores are shown in Figure 4. With the new protocol, no patients had skin reactions greater than grade 2 until week 6, whereas, with the previous protocol, some patients experienced grade 3 and grade 4 reactions as early as the second week of treatment. Similarly, by weeks 5, 6, and 7, the proportion of patients experiencing grade 3 or higher skin reactions was greater among patients using the previous protocol compared to those using the new protocol.

Adherence to the Skin Care Protocol

The percentage of patients reporting full adherence to the skin cleansing protocol is shown in Figure 5. A sharp uptake was noted in self-reported full adherence to the protocol from week 1 to week 3. After week 3, more than 90% of patients reported full adherence to the skin cleansing protocol. The percentage of patients reporting daily cleansing consistently exceeded 95% for treatment weeks 4, 5, 6, and 7. However the percentage of patients adhering to twice-daily cleansing varied from 93%–95% for treatment weeks 4, 5, 6, and 7.

Adherence to the skin moisturizing protocol is shown in Figure 6. Again, a sharp uptake was noted in the percentage of patients reporting full adherence to the moisturizing protocol by week 3. After week 3, full adherence to daily moisturizing exceeded 95% and remained at or above 95% for weeks 4, 5, 6, and 7. Adherence to twice-daily moisturizing exceeded 95% at week 3, but varied from 93%–95% during weeks 4, 5, 6, and 7.

Satisfaction With Initial Teaching and Reinforcement

Initial skin care instruction was presented using three methods of presentation: verbal, written, and video. On average, patient satisfaction with this triple method of instruction was very high (X̄ = 3.87), with 87% indicating “extremely satisfied” (a score of 4 on a 1–4 score range) and 13% reporting satisfaction (a score of 3 on a 1–4 score range). Levels of satisfaction with self-selected method of reinforcement were similarly high for the first reinforcement at week 1 (X̄ = 3.93) and the second reinforcement at week 3 (X̄ = 3.82). The reinforcement method selected most frequently for week 1 was video instruction (50%) followed by verbal instruction (37%) and written instruction (13%). A similar distribution of reinforcement method was observed for week 3: video (45%), verbal (41%), and written (14%).

Discussion

Self-reported adherence to the washing and moisturizing protocol was high (greater than 93%) from treatment week 4 through treatment week 7. The adherence rates are somewhat higher than what others have reported in the literature. For example, in a skin care study conducted by Mannix et al. (2012), adherence among chemoradiation patients during weeks 6
and 7 exceeded 85% for washing (once per day) and exceeded 89% for moisturizing (2–3 times per day). The reasons for the slightly better adherence observed in the current study compared to those reported by Mannix et al. (2012) are difficult to determine. Both studies were comparable with respect to using a multifaceted approach to promote adherence, particularly in terms of providing skin care supplies, frequent reinforcement, and written instructions. Also, both studies were comparable with respect to frequency of washing and moisturizing. However, it could be that labor intensity was somewhat higher for the Mannix et al. (2012) study because it required washing with soap, which could entail partially disrobing and standing at a sink to wash and rinse the treatment area. In contrast, the cleansing protocol used in the current project involved using prepackaged wipes, which would not require disrobing and could be done easily in any convenient location. Also, reinforcements may have been more robust in the current study compared to the Mannix et al. (2012) study. In the current study, deliberate steps were taken to minimize heterogeneity in the educational reinforcements by providing consistent messaging about the “Why?” “What?” “How?” and “So what?” across all methods of teaching (verbal, video, and written). Also, patients were able to exercise choice about the method of reinforcement (verbal, video, or written). Those two features—consistent messaging and choice—may have enhanced adherence by reducing confusion and increasing the patient’s sense of control. Alternatively, it could be that the daily diaries used in the Mannix et al. (2012) study provided a more reliable record of daily washing and moisturizing than the weekly self-reports obtained in the current study, which could have been influenced by limitations of recall, as well as social desirability bias.

Implementation of the skin care protocol introduced in this article has led to a statistically significant decrease in the level of skin toxicity observed at the authors’ institution. The project did not control for smoking status or Gy of radiation administered between the different protocols. The project used a multidimensional approach to promote adherence by targeting specific health-system, socioeconomic, and patient-related barriers to adherence. Determining from the data which strategies were most efficacious in promoting adherence and minimizing radiation dermatitis was difficult. However, attempting to isolate a single, best strategy to promote adherence and positive outcomes may be unwarranted and unreasonable because best evidence suggests that success in promoting adherence to optimize health outcomes depends on the use of multidimensional rather than unidimensional strategy approaches (WHO, 2003).

### Implications for Practice

- Educate using a consistent plan following the Oncology Nursing Society’s Putting Evidence Into Practice guidelines to improve adherence to skin care protocols.
- Determine adherence to skin care protocols when evaluating the effectiveness of the protocol.
- Examine adherence if protocols are ineffective, then search for a failure of the system before determining a failure of the protocol.

### Conclusions

The ONS PEP guidelines provide a firm foundation to help patients understand the level of skin care needed to minimize radiation dermatitis. The authors’ experiences suggest that having a collateral multidimensional plan to promote adherence to skin care might optimize patient outcomes. Future testing of any products for the prevention or treatment of radiation dermatitis should also include components to test patient adherence.

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