Nursing Management of Cutaneous Toxicities From Epidermal Growth Factor Receptor Inhibitors

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Background: Personalized targeted therapies have become an emerging paradigm in cancer treatment. Although generally more tolerable than other chemotherapeutic agents, one therapy, epidermal growth factor receptor inhibitors (EGFRIs), commonly results in the formation of cutaneous toxicities, which can negatively affect patients’ treatment adherence and quality of life.

Objectives: The aim of this article is to review nursing management strategies for EGFRI-related cutaneous toxicities.

Methods: A systematic literature review was performed, including database searches in PubMed/MEDLINE®, CINAHL®, Cochrane Library, PsycINFO®, and Web of Science.

Findings: Nurses are essential to the management of EGFRI-related cutaneous toxicities and are in an ideal position to provide supportive care throughout the course of the EGFRI treatment. The aim of nursing management is to maintain patients’ treatment adherence and quality of life by employing a preemptive and proactive approach. Patient education is the most frequently reported management strategy. However, treatment options and management strategies are largely anecdotal and based on individual reports and expert opinions. Although no evidence-based management strategies exist, nurses can rely on existing assessment tools and guidelines to provide patients with symptom management and supportive care.

Key words: targeted therapy; epidermal growth factor receptor; cutaneous toxicities; adherence; patient education; quality of life

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Targeted therapies have been an emerging treatment paradigm in oncology for longer than a decade, leading to increased patient survival and making cancer therapy more tolerable (Balagula et al., 2011). Targeted therapies are tailored according to tumor-specific markers and individual patient characteristics (Ballestrero et al., 2012; Chu, 2014; Ma, 2012). They include treatment with a class of epidermal growth factor receptor inhibitors (EGFRIs), which target the respective receptors on cancer cells to suppress tumor growth (Balagula et al., 2011). EGFRIs have been approved by the U.S. Food and Drug Administration for the treatment of cancers, such as breast, cervical, head and neck, renal, esophageal, and metastatic colorectal (Esper, Gale, & Muehlbauer, 2007). They can be used orally or via IV in combination with other chemotherapy drugs as adjuvant therapy, or they can be administered as a single-drug treatment (Balagula et al., 2011; Esper et al., 2007).

Although EGFRIs are associated with fewer side effects compared to other chemotherapies (Balagula et al., 2011; Lucchini et al., 2014; Peuvrel & Dréno, 2014), they prevent epidermal keratinocytes from controlling the intercellular signal transduction pathways responsible for cell proliferation.
apoptosis, angiogenesis, adhesion, and motility, and, therefore, result in the formation of cutaneous reactions (Chren, Lasek, Sahay, & Sands, 2001).

Cutaneous reactions are the most common adverse events resulting from the use of EGFRIs, occurring in more than 80% of cases (Ocvirk & Cencelj, 2010). Acneiform eruptions, or rashes, are generally seen within the first two weeks of the start of the treatment regimen (Lynch et al., 2007; Osio et al., 2009). They are later accompanied by xerosis and eczema (Segaert et al., 2009). Other cutaneous symptoms include hand-foot syndrome, telangiectases, paronychia, and hair changes (Edmonds & Spencer-Shaw, 2010; Ocvirk & Cencelj, 2010).

Although cutaneous toxicities may be a significant predictor of EGFR therapy efficacy (Petrelli, Borgenovo, & Barni, 2013), their occurrence has a major impact on patients’ physical, functional, emotional, and social well-being (Coleman, Koltun, Nguyen, Pittelkow, & Jatoi, 2011; Wagner & Lacouture, 2007). Aside from the physical discomfort, patients are concerned about their appearance and may suffer from social isolation (Coleman et al., 2011). EGFR-related cutaneous toxicities are associated with a diminished quality of life (QOL) (Boers-Doets et al., 2011; Gandhi, Oishi, Zubal, & Lacouture, 2010; Hackbarth, Haas, Fotopoulou, Lichtenegger, & Sehouli, 2008; Lucchini et al., 2014; Rosen et al., 2013; Unger et al., 2013), and, consequently, patients may express the wish to discontinue therapy or, conversely, may underreport their symptoms out of fear that the therapy will be withheld (Lemmens, 2011; Tomković et al., 2013).

Therefore, adequate and timely management of skin toxicity is important to maximize therapy efficacy, maintain the patients’ QOL (Baas et al., 2012; Boers-Doets et al., 2011; Leporini et al., 2013; Peuvrel et al., 2013), and minimize the need for dose reduction or discontinuation of treatment (Lemmens, 2011). Management strategies, such as pretreatment counseling and increased education, are vital to maximize QOL and minimize unnecessary treatment interruptions or discontinuations (Gandhi et al., 2010; Ruiz et al., 2014; Wagner & Lacouture, 2007). However, Baas et al. (2012) concluded from their systematic review on the management of EGFR-related cutaneous toxicities that, because of the small number of randomized, controlled trials conducted in the respective field so far, generating evidence-based guidelines on its management is not yet possible.

To date, research literature on the treatment of EGFR-related cutaneous toxicities has focused primarily on the management of physical symptoms (Oishi, 2008; White, Roydhouse, & Scott, 2011). Latest research on medical treatment options suggests potentially beneficial effects from the topical application of vitamin K (Pinta et al., 2014) and prophylactic antibiotics to reduce the relative risk for severe skin rash (Ocvirk, Heeger, McCloud, & Hofheinz, 2013; Pinta et al., 2014). As far as nursing research is concerned, White et al. (2011) stated that a lack of focus exists on interventions that address the psychosocial needs of patients affected by EGFR-related cutaneous toxicities. The authors found that a significant gap exists in the development of a comprehensive patient education framework and stressed the importance of accurate psychosocial assessment and appropriate education to prevent a potential underestimation of the overall symptom burden as perceived by the patients (White et al., 2011).

Because of their effectiveness, the use of EGFRIs will most likely continue to increase. For healthcare providers to ensure adequate symptom management, factors that influence patient involvement in treatment must be identified. Assessing for physical changes and psychological distress is pertinent to encouraging patient comfort and compliance to treatment, as well as ensuring that the patient has adopted healthy and effective means of coping with the therapy and cutaneous symptoms (Romito et al., 2010).

The aim of this article is to provide nurses and other healthcare professionals with an overview of EGFR-related cutaneous toxicity management strategies by summarizing research findings, determining the role of nurses, and reviewing available management strategies to maintain patients’ treatment adherence and QOL.

Methods

A systematic literature search was performed, using four groups of keywords in Boolean phrase combinations: epidermal growth factor receptor inhibitor, cutaneous symptoms, management, and adherence (see Figure 1). The search terms within each group were combined using the OR operator; the AND operator was used to combine the search strings across groups.

The search was initiated in PubMed/MEDLINE®, followed by CINAHL®, Cochrane Library, PsyCINFO®, Web of Science, and BIBNet, to identify German-language articles. The last search for each database was done on November 17, 2014.

Articles were eligible for this review if they were original journal articles focusing on the nursing management of EGFR-related cutaneous toxicities in patients with cancer; all types of articles and research designs were considered, and the articles had to be published in English or German from 2003 to 2014.

The database searches yielded a total of 479 individual articles. Duplicates (n = 112) were removed, and titles and

FIGURE 1. Search Terms by Group
abstracts of the remaining 367 articles were screened, which resulted in the exclusion of 315 articles. The remaining 52 articles were retrieved and screened in full text (see Figure 2). Seventeen articles met the inclusion criteria and were added to this review (see Table 1).

Findings

The included articles discuss cutaneous toxicities regarding either a specific type of EGFR1 agent or from a broader perspective, covering various types of EGFR agents. One article is specific to cetuximab (Erbitux®)-related cutaneous toxicities (Pinto et al., 2011). Another specifically addresses cutaneous side effects from treatment with lapatinib (Tykerb®) (Frankel & Palmieri, 2010), and two articles specify side effect management from treatment with cetuximab and panitumumab (Vectibix®) (Melosky et al., 2009; Ouwerkerk & Boers-Doets, 2010).

Four articles specify EGFR1-related cutaneous side effect management in patients with gastrointestinal malignancies (Lacouture, 2007; Melosky et al., 2009; Ouwerkerk & Boers-Doets, 2010; Pinto et al., 2011), three articles are specific to the management of acneiform eruptions (Melosky et al., 2009; Oishi, 2008; Sipples, 2006), and one article focuses on EGFR1 side effect management in patients with advanced breast cancer (Moore, 2007).

Existing Tools and Guidelines

Because of their close interaction with patients, nurses are seen as playing an important role in the management of EGFR1-related cutaneous toxicities (Boucher, Olson, & Piperdi, 2011; Dunsford, 2008; Esper et al., 2007; Ouwerkerk & Boers-Doets, 2010; Purdom & Ohinata, 2007). As far as management strategies are concerned, no controlled data or guidelines exist to date, and most of the existing strategies are anecdotal (Frankel & Palmieri, 2010; Lacouture, 2007; Oishi, 2008; Sun, 2012). However, existing guidelines can be used as tools to support the development of individualized strategies for symptom management based on patient preferences, physical status, and disease condition (Sun, 2012).

For nurses to be able to provide successful symptom management of EGFR1-related skin toxicities, knowledge about the mechanisms of EGFR1 treatments and possible side effects is crucial (Boucher et al., 2011; Fish-Steagall, Searcy, & Sipples, 2006; Oishi, 2008; Sipples, 2006; Sun, 2012; Viale, 2006) and serves as a strong foundation for patient education (Morse & Calaresh, 2006). Assessment and management skills are also required to provide successful and adequate management (Oishi, 2008; Sun, 2012; Viale, 2006). Nurses must understand how to assess and manage cutaneous toxicities so that treatment discontinuation or dosage modification can be avoided (Oishi, 2008). In addition, nurses should be aware that cutaneous toxicities can affect the patient’s QOL (Sun, 2012).

The nursing process can serve as a basic framework for the management of EGFR1-related cutaneous toxicities (Purdom & Ohinata, 2007). Regular assessments and appropriate grading of the side effects and the related QOL are central for nursing care (Dunsford, 2008). SERIES (Skin and Eye Reactions to Inhibitors of EGFR and kinases) (Lacouture, Basti, Patel, & Benson, 2006) is a commonly used interdisciplinary treatment algorithm for the management of EGFR1-related cutaneous toxicities (Boucher et al., 2011; Purdom & Ohinata, 2007). It includes severity assessment with the National Cancer Institute’s Common Terminology Criteria for Adverse Events (CTCAE) grading system (Boucher et al., 2011; Sun, 2012). However, according to Sun (2012), the CTCAE grading system was not designed specifically for targeted therapy-related cutaneous toxicities and may result in underreporting or poor grading. A more class-specific grading scale for standardizing assessment of treatment-related cutaneous toxicities is the scale developed by the Multinational Association of Supportive Care in Cancer Skin Toxicity Study Group (Lacouture et al., 2010), but, to date, only preliminary evidence exists to support its reliability (Sun, 2012).

Aside from the physical symptoms, nurses should assess the effect of cutaneous toxicities on patients’ QOL and function (Sun, 2012; White et al., 2011). The Skindex–16 is an instrument with good psychometric properties developed to assess the effects of cutaneous toxicities on QOL (Chren et al., 2001; Sun, 2012). However, the Skindex–16 focuses on skin adverse events only and, therefore, is unlikely to portray the impact of other common EGFR1-related side effects on QOL (Wagner et al., 2013). The Functional Assessment of Cancer Therapy (FACT)–EGFRI–18 is a more comprehensive instrument, which assesses the physical, emotional, social, and functional impact of skin, nail, and hair toxicities on patients’ health-related QOL (Wagner et al., 2013). A comprehensive review of assessment tools for the psychosocial...
<table>
<thead>
<tr>
<th>Study</th>
<th>Type of Cancer/Drug</th>
<th>Findings</th>
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<tbody>
<tr>
<td>Boucher et al., 2011</td>
<td>Various cancer types, various agents</td>
<td>• Nurses play a vital role in patient education. &lt;br&gt; • Nurses must educate themselves about EGFRI treatment. &lt;br&gt; • Nurses should provide patients with coping strategies to improve adherence.</td>
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<tr>
<td>Dunsford, 2008</td>
<td>Various cancer types, various agents</td>
<td>• Nurses play a significant role in managing EGFRI-related cutaneous toxicities and maintaining treatment adherence and QOL. &lt;br&gt; • Patient education prior to treatment initiation and ongoing support are essential. &lt;br&gt; • Regular assessments and appropriate grading of side effects and related QOL are central.</td>
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<tr>
<td>Eaby et al., 2008</td>
<td>Various cancer types, various agents</td>
<td>• Simple grading system and a therapy algorithm as a guide for nurses &lt;br&gt; • A proactive approach is recommended.</td>
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<tr>
<td>Esper et al., 2007</td>
<td>Various cancer types, various agents</td>
<td>• Nurses play a key role in research and patient education. &lt;br&gt; • Patient education regarding side effects &lt;br&gt; • Research is important for providing evidence for the effectiveness of intervention strategies.</td>
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<tr>
<td>Fish-Steagall et al., 2006</td>
<td>Various cancer types, various agents</td>
<td>• It is important for nurses to understand the mechanisms of EGFR therapies and to promote patient enrollment in clinical trials about anti-EGFR therapies.</td>
</tr>
<tr>
<td>Frankel &amp; Palmieri, 2010</td>
<td>Various cancer types; lapatinib</td>
<td>• Proactive and tailored management is recommended. &lt;br&gt; • Patients may benefit from behavioral strategies. &lt;br&gt; • Symptom reframing can improve coping and QOL.</td>
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<td>Lacouture, 2007</td>
<td>Colorectal cancer</td>
<td>• Nurses play a vital role in management of EGFRI-induced cutaneous toxicities. &lt;br&gt; • Early intervention, close follow-up of skin toxicities, and education can support patients to achieve best outcomes. &lt;br&gt; • Nurses can empower patients to take control of their cutaneous health and have a positive treatment outlook.</td>
</tr>
<tr>
<td>Melosky et al., 2009</td>
<td>Gastrointestinal cancers; cetuximab and panitumumab</td>
<td>• Evaluation of education tools may aid in the promotion of prophylactic interventions, early recognition, and best practices in skin toxicity management, and improve QOL.</td>
</tr>
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<td>Moore, 2007</td>
<td>Various cancer types, various agents</td>
<td>• Nurses have a responsibility to provide supportive care for patients. &lt;br&gt; • Prompt management of EGFR-induced side effects is crucial to guarantee that patients receive the most effective treatment while maintaining QOL.</td>
</tr>
<tr>
<td>Morse &amp; Catalrese, 2006</td>
<td>Breast cancer; various agents</td>
<td>• Knowledge about therapy agents and side effects is crucial for nurses and can serve as the foundation for patient education. &lt;br&gt; • Appropriate management will promote therapy adherence.</td>
</tr>
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<td>Oishi, 2008</td>
<td>Various cancer types, various agents</td>
<td>• Continuous patient education is important. &lt;br&gt; • Assessment and management skills are important to sustain adherence. &lt;br&gt; • Psychological effects have not yet been addressed. &lt;br&gt; • Empathetic listening can help to improve the coping of patients.</td>
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<tr>
<td>Ouwerkerk &amp; Boers-Doets, 2010</td>
<td>Colorectal cancer; cetuximab and panitumumab</td>
<td>• Nurses play a key role in the management of EGFRI-related toxicities. &lt;br&gt; • Nurses have the potential to sustain adherence and improve QOL. &lt;br&gt; • Preemptive symptom management</td>
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<td>Pinto et al., 2011</td>
<td>Colorectal cancer; cetuximab</td>
<td>• Nurses are essential for low-grade cases of EGFRI-induced cutaneous toxicities.</td>
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<tr>
<td>Purdom &amp; Ohiyama, 2007</td>
<td>Various cancer types, various agents</td>
<td>• Nursing process as a basic framework for management &lt;br&gt; • Patient education is an essential tool.</td>
</tr>
<tr>
<td>Sipples, 2006</td>
<td>Various cancer types, various agents</td>
<td>• Nurses need to be informed about possible side effects of anti-EGFR therapies. &lt;br&gt; • Nurses should prepare patients and help them adapt to changes in their appearance, maintaining their QOL. &lt;br&gt; • Patient education, careful monitoring, early intervention, and proactive follow-up are key to successful management.</td>
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<tr>
<td>Sun, 2012</td>
<td>Various cancer types, various agents</td>
<td>• Knowledge about EGFRI-related toxicities is important. &lt;br&gt; • Existing management strategies can serve as guidelines. &lt;br&gt; • Nurses can provide counseling and education. &lt;br&gt; • Maintaining QOL through aggressive symptom management</td>
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<tr>
<td>Viale, 2006</td>
<td>Various cancer types, various agents</td>
<td>• Nurses should recognize skin toxicities and provide management. &lt;br&gt; • Assessment and grading are essential to proper recognition.</td>
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EGFRI—epidermal growth factor receptor inhibitor; QOL—quality of life
impact of EGFR inhibitor-related cutaneous toxicities has been reported by White et al. (2011).

In addition to using clinical toxicity grading scales, nurses should assess and document the degree and location of the toxicities (Sun, 2012). Nurses are responsible for properly assessing and documenting the collected information to ensure continuity of care and to help monitor treatment outcomes. In addition, the patients' readiness for treatment should be assessed through the collection of information regarding the needs of the patients and caregivers, keeping in mind the physiologic and psychological impact of the cancer diagnosis (Purdom & Ohinata, 2007).

Nursing diagnoses can be made using the nomenclature and criteria as defined by the North American Nursing Diagnosis Association. Potential nursing diagnoses for patients with EGFR inhibitor-related cutaneous toxicities include knowledge deficit, (potential for) pain, (potential for) infection, and body image disturbance (Purdom & Ohinata, 2007).

The planning phase of the nursing process includes establishing priorities, managing expectations regarding the patient outcomes, selecting nursing interventions, and documenting the chosen plan of care. Proper planning and patient education will likely result in positive patient outcomes. Continuous evaluation of patient outcomes and prompt reporting of possible adverse effects allow for timely changes in medical and nursing interventions (Purdom & Ohinata, 2007).

**Patient Education**

Boucher et al. (2011) stated that nurses play a vital role in educating patients about EGFR inhibitor-related skin toxicities and in providing them with a variety of coping strategies. Providing patient support is crucial for nurses because informing patients about potential EGFR inhibitor-related cutaneous toxicities helps them to prepare for their treatment (Boucher et al., 2011). Managing patients' expectations regarding side effects is the first step in patient education. Patient education prior to the beginning of therapy and proactive intervention at the first signs of cutaneous toxicities are key to successful management (Sipples, 2006).

Patient education consists of verbal and written information about the drug the patient will be receiving (Oishi, 2008) and which and when symptoms can be expected to occur (Ouwerkerk & Boers-Doets, 2010), as well as information about precautions, self-management strategies (Ouwerkerk & Boers-Doets, 2010), and the application of potential ointments for the topical treatment of skin rash (Oishi, 2008). In addition, patients are instructed to contact a healthcare provider when symptoms or adverse events occur (Oishi, 2008; Ouwerkerk & Boers-Doets, 2010). Educating patients prior to the start of the treatment is essential so that patients recognize and minimize any potential side effects. Patient education should be continued throughout the course of the treatment (Oishi, 2008).

Education regarding and monitoring of EGFR inhibitor medication, cutaneous toxicities, lifestyle changes, and coping strategies are important. Encouraging open communication with patients will help them to promptly report any cutaneous toxicities during the EGFR inhibitor treatment (Boucher et al., 2011).

Patients may benefit from behavioral strategies, such as guided imagery, for the management of physical discomfort, anxiety, and depression (Purdom & Ohinata, 2007). In addition, symptom reframing can help to improve coping and QOL. Symptom reframing involves teaching patients that cutaneous toxicities should be anticipated and are common side effects of treatment. In addition, interpreting cutaneous toxicities in a constructive manner may reduce the intensity of the physical discomfort and adverse effects on QOL (Frankel & Palmieri, 2010). Tips (e.g., the skin rash may be a positive sign associated with tumor response) may reinforce patient adherence to the treatment (Oishi, 2008). Evidence-based nursing measures, such as empathetic listening, can help to improve the coping of patients (Oishi, 2008). In addition, nurses can provide counseling to the patients and facilitate the communication of symptoms between patients and clinicians through advocacy (Sun, 2012).

Patient education will have a direct impact on patients' adherence with and tolerance of the EGFR inhibitor treatment and, therefore, should be adequately tailored to fit the individual situation (Purdom & Ohinata, 2007). Further evaluation of education tools may aid in the promotion of prophylactic interventions, early recognition, and best practices in skin toxicity management, improving patients' QOL (Melosky et al., 2009). Esper et al. (2007) stressed the importance of research to provide evidence for the effectiveness of intervention strategies.

**Maintaining Treatment Adherence**

The goal of any program for the management of cutaneous toxicities related to EGFR inhibitor treatment is to prevent them from interfering with cancer treatment and to reduce the risk of their development and their psychological consequences (Frankel & Palmieri, 2010; Oishi, 2008). Proactive and tailored management aimed at the type and severity of the cutaneous toxicities is recommended (Frankel & Palmieri, 2010). Education, early intervention, careful monitoring, and proactive follow-up of skin toxicities can support patients to achieve their best outcomes (Lacouture, 2007; Sipples, 2006). According to a number of authors, nurses play a significant role in maintaining QOL and treatment adherence, in avoiding unnecessary dosage modifications of patients undergoing EGFR inhibitor treatment (Dunsford, 2008; Oishi, 2008; Ouwerkerk & Boers-Doets, 2010), and in improving patients' coping strategies (Boucher et al., 2011; Oishi, 2008; Sipples, 2006). Nurses are responsible for providing supportive care to patients undergoing EGFR inhibitor treatment and, therefore, for ensuring that the patients receive the most effective treatment (Moore, 2007). Nursing management of EGFR inhibitor skin toxicities is aimed at empowering patients to take control of their own cutaneous health, as well as at giving patients a positive outlook on their treatment (Lacouture, 2007).

Boucher et al. (2011), as well as Ouwerkerk and Boers-Doets (2010), stress the importance of a preemptive management strategy that aims to prevent EGFR inhibitor-related cutaneous toxicities because dose reduction or treatment discontinuations may negatively influence treatment outcomes (Boucher et al., 2011).
Nurses have the important role of preparing patients, helping them adapt to changes in their appearance during therapy, and maintaining their QOL (Sipples, 2006). By providing patients with an adequate symptom management plan, nurses have the potential to sustain patient adherence to the completion of treatment, identify symptoms early, proactively manage adverse events, and, thereby, improve the QOL of patients (Dunsford, 2008; Ouwerkerk & Boers-Doets, 2010).

**Discussion**

A broad consensus appears to be that nurses play an essential role in the management of EGFR inhibitor–related cutaneous toxicities. Through their close interaction with patients, nurses are seen to be in the ideal position to proactively educate patients about the treatment and its possible side effects, and to provide supportive care throughout the course of treatment. Adequate symptom management requires knowledge about the EGFR treatment and its possible side effects, as well as assessment skills—both of which can serve as a solid foundation for patient education. Nurses working with patients receiving EGFR treatment are encouraged to stay up to date with the latest research and to familiarize themselves with best practices in the management of possible adverse effects.

Nurses must adequately assess cutaneous toxicities and be aware of their potential impact on patients’ QOL. A variety of tools and grading systems exist that help nurses to assess cutaneous toxicities; however, some lack sufficient evidence to support their use. Caution is advised with tools that were not designed specifically for the assessment of EGFR-related skin toxicities because they may result in underreporting and poor grading.

In addition, instruments, such as the Skindex–16 and FACT–EGFRI–18, can be used to assess the impact of cutaneous toxicities on patients’ QOL. Nurses are encouraged to use such instruments to assess the need for adequate interventions to maintain or enhance patients’ QOL and, consequently, treatment adherence.

Nurses should use existing evidence-based intervention strategies and apply them to the management of EGFR-related cutaneous toxicities. The nursing process can serve as basic framework for that purpose. The focus in clinical practice should be on assessment, early detection, and close follow-up.

The aim of nursing management of EGFR-related cutaneous toxicities is to maintain treatment adherence and QOL. A preemptive and proactive approach is widely agreed to be best suitable to achieve these aims and will result in the highest outcomes for patients. The most frequently reported strategy for the management of EGFR-related cutaneous toxicities is patient education. Patient education ideally consists of verbal and written information about the EGFR treatment, precautions, and self-management strategies; it should be initiated prior to the beginning of treatment and should be continued until its end. Behavioral and cognitive strategies, such as guided imagery and symptom reframing, as well as evidence-based nursing measures, such as empathetic listening, can improve coping and QOL.

The findings of this literature review support the findings of previous reviews that identified a lack of evidence-based management strategies (Baas et al., 2012; White et al., 2011). The management strategies described in the included articles are largely anecdotal and based on expert opinions and case reports.

Although research on clinical medical treatment options has increased and promising clinical trials are underway (Pinta et al., 2014; White et al., 2011), nursing management strategies do not appear to have been a focus in research (White et al., 2011). Given this lack of evidence-based data, a need exists for the development of theory-driven symptom management interventions, such as patient education programs, and for experimental research designs to evaluate their effectiveness and feasibility.

**Conclusion**

Nurses are in the ideal position for the preemptive and proactive management of EGFR-related cutaneous toxicities. Although, to date, medical treatment options and management strategies are largely anecdotal, nurses can rely on a variety of existing tools, guidelines, and evidence-based interventions to manage EGFR-related cutaneous toxicities. Patient education is key to providing successful management and supportive care throughout the course of treatment.

Maintaining or enhancing patients’ QOL and treatment adherence, as well as avoiding treatment cessation or alteration, are the primary aims of nursing management. Education and knowledge about EGFR agents and their possible side effects are crucial for nurses. Personalized targeted cancer therapies call for adequate and equally personalized and tailored nursing management interventions. Therefore, future research should focus on the development of nurse-delivered symptom management interventions and employ experimental research designs to examine their effectiveness and feasibility.

**References**


