

Rehabilitation Nursing Challenges for Patients With Lower Limb Amputation

Brittany Parnell¹, BSN, RN, CRRN & Michael Urton², DNP, APRN, AGCNS-BC

Abstract

There are over 185,000 amputations annually in the United States, and most of these patients will receive a short inpatient rehabilitation hospital stay as part of their recovery. Complications in care after amputation can negatively impact rehabilitation and subsequent disposition and community reintegration after discharge. The purpose of this article is to discuss the literature, significance, and practice recommendations for three specific challenges—skin integrity, postamputation pain, and falls. The focus population is rehabilitation patients who have undergone nontraumatic, lower limb amputation. Information about the incidence and risks of these complications give nurses necessary knowledge to improve care delivery, reduce suffering, and improve patient safety for postamputation patients during inpatient rehabilitation.

Keywords: Amputation; falls; nursing; pain; pressure injury.

Introduction

There are close to 2 million people in the United States living with lower or upper limb amputation (Belatti & Phisitkul, 2013), and with the aging population in the United States, this number is expected to continue rising over the next decade. The National Limb Loss Information Center (2019) reported that approximately 185,000 individuals undergo amputation annually with the primary cause being vascular-related conditions. After lower limb amputations, patients are faced with pain, alterations in skin integrity, and changes to independence and mobility (Pasquina et al., 2015), and rehabilitation nurses must be capable of managing these challenges during their short, acute inpatient rehabilitation stays. Unfortunately, these patients make up a very small proportion of acute rehabilitation populations, and combined with the limited nursing evidence on the topic of postamputee care, developing and maintaining postamputee nursing competency can be difficult.

This article will review three common complications found in patients with lower limb amputation—skin integrity,

pain management, and fall prevention. Though these topics are part of general nursing practice, patients with lower limb amputations can present unique challenges that bear further exploration. Although this discussion focuses on nontraumatic amputees, most of the recommendations would be appropriate to any patient who has a new lower limb amputation. Current research and evidence on these topics were reviewed in order to summarize current challenges and best practice recommendations and to better guide nursing care for patients after limb loss.

Facility Review

The authors' facility is a 103-bed inpatient rehabilitation department located within a not-for-profit, urban, acute care hospital (Level 1 trauma designation) in North Carolina. The organization is accredited by the Commission on Accreditation for Rehabilitation Facilities and has been granted Amputee Specialty Program accreditation. The primary referral population comes from central and eastern North Carolina, many of whom are classified as rural and low income. Annually, the hospital admits 80–90 lower limb, postsurgical amputee patients, with an average age of 60 years and a mean rehab length of stay of 13.8 days. Over 95% of these patients have vascular-related amputations as a result of diabetes or heart disease, with the remaining amputations being a result of limb trauma or other causes.

Inpatient rehabilitation care is provided by the facility using an interdisciplinary, team-based approach that includes

Correspondence: Brittany Parnell, BSN, RN, CRRN, WakeMed Health & Hospitals, 3000 New Bern Ave., Raleigh, NC 27610. E-mail: bparnell@wakemed.org

¹WakeMed Health & Hospitals, Raleigh, NC, USA

²East Carolina University, Greenville, NC, USA

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medical, nursing, case management, and therapy services to support recovery, restore function, and promote independence after amputation. Recreation therapy services are available, as well as a robust peer mentoring program. The facility also incorporates the patient's prosthetist into the acute phase of rehabilitation to assist with proper fitting of compression socks and limb protection devices in support of early limb shaping, prosthetic fitting, and successive mobilization and ambulation.

Skin Integrity and Pressure Injuries

Problem Significance

In the early phase of rehabilitation of the amputee patient, there is a primary focus on wound management and infection prevention of the surgical site (Amputee Coalition, 2017). Common acute skin issues observed in individuals with lower limb amputations include wound dehiscence, blisters, and cellulitis (Molina & Faulk, 2019). Commonly, the same disorders that put the patient at greater risk of amputation—diabetes and peripheral vascular disease—also place them at an increased risk of infection and skin breakdown after a lower limb amputation. Diabetes and vascular disorders can impair the patient's ability to feel pain, reducing awareness of skin breakdown or infection when it occurs; this makes it crucial for nurses to be observant of any signs of skin breakdown during their assessments (Baird, 2015).

Recent literature related to postamputation skin integrity complications during inpatient rehabilitation is minimal. Like most hospitalized patients, pressure injuries after amputation are common across bony prominences, especially over the sacrum and heels (Wang et al., 2014). Although general pressure injury prevention recommendations are helpful, unique skin integrity challenges have been observed after lower limb amputation—specifically, higher incidence of pressure injury development on the sound limb, most commonly presenting on the heel. These injuries may be a result of changing body mechanics during mobility and position changes as well as changes to footwear fit after surgery (Wang et al., 2014). These pressure injuries can limit early mobilization and impair progress toward clinical goals (Price et al., 2015). With underlying conditions such as diabetes or vascular disease, impaired skin integrity on the sound limb greatly increases the likelihood of subsequent amputation, making it critical for nurses to perform vigilant skin assessments on the residual and sound limb (Huseynova et al., 2018).

Practice Recommendations

Daily inspections of the residual limb and incision should include any areas of redness or pain, periwound skin,

incision approximation, and drainage (Baird, 2015). Although early redness and swelling are common, it should begin to decrease by postoperative day 7 (Schreiber, 2017). Changes in the neurovascular condition of the limb or signs of potential infection should be promptly identified and evaluated (Schreiber, 2017). Daily dressing changes should be performed using aseptic technique. Elastic bandages or elastic compression socks ("shrinkers"), typically used to reduce swelling of the residual limb and promote early shaping for later prosthetic fitting, can result in skin breakdown or pressure injuries if these devices are not applied with equal and consistent pressure (Schreiber, 2017). For those patients requiring hard-shell limb protection devices, the authors have observed an increased risk of device-related friction or pressure injuries at the knee or upper thigh.

On the foot of the sound limb, frequent comprehensive skin assessments should be conducted to quickly identify areas of concern. Early pressure injury formation (Stage I) is marked by nonblanchable redness, which, if not treated promptly, could progress to further skin breakdown (Baird, 2015). Patients at the authors facility commonly receive pressure-relieving padding/footwear while in bed to reduce heel pressure on the sound limb. Patients and family members should be educated on the risks of pressure injury to the sound limb and should be taught to inspect the skin on both the residual and sound limb (Department of Veterans Affairs & Department of Defense, 2017).

Pain Assessment and Management

Problem Significance

Pain is a common experience in patients after amputation. This pain can be severe and varied, including both nociceptive and neuropathic pain components. In addition, amputation patients frequently have preoperative chronic pain conditions that can make postoperative pain management challenging (Paschou et al., 2018). If not properly managed, postamputation pain can negatively impact early rehabilitation activities and limit potential gains during the rehab hospitalization.

Acute nociceptive pain generally resolves with postoperative healing. Nociceptive pain is usually described as sharp, stabbing, or throbbing and is most often related to tissue damage at the surgical site or musculoskeletal pain because of changes in mobility and body mechanics. By the time patients arrive for rehabilitation, acute pain is usually mild and generally managed with nonopioid medications, though short-term opioid medications may occasionally be used in cases of severe pain (De Jong & Shysh, 2018). In some cases, chronic nociceptive pain (e.g., low back pain or arthritic joint pain) will continue to be present or may worsen during the hospitalization.

After the initial postoperative period, postamputation patients report neuropathic pain more frequently than nociceptive pain (Uustal & Meier, 2014). Neuropathic pain is typically described as tingling, shooting, electric, and/or burning, and results from the damage or abnormalities in the peripheral and central nervous system. Phantom limb pain—pain reported in the absent limb—is the most common form of postamputation neuropathic pain, found in nearly 80% of patients (Limakatso et al., 2019; Uustal & Meier, 2014). The precise mechanism of action for phantom limb pain is still only partially understood, but it is generally accepted to be a central pain condition related to the pain signal processing in the brain. In most cases, neuropathic pain severity is mild to moderate and does not significantly impact function and rehabilitation. Many patients (20%–50%) continue to experience neuropathic pain/sensations for months to years after amputation (Brunelli et al., 2015; Uustal & Meier, 2014).

Practice Recommendations

Pain management best practices are not unique to post-amputee patients, but they are critical to rehabilitation success during the compressed hospitalization time often seen in this population. An effective pain management plan should begin with a comprehensive assessment and history of all new and chronic pain conditions (Seroussi, 2015). Assessments based only on pain severity can fail to capture the complexity of the patient's pain, limiting the nurse's ability to establish an effective plan of care. To fully understand the patients reported pain, nurses should assess the nature of the pain (i.e., descriptors, location, timing) in addition to the intensity (Fillingim et al., 2016). This collaborative exploration of the patient's history with pain can be invaluable for identifying appropriate and effective interventions for postamputee pain.

Treatment

Current pain treatment recommendations emphasize a multimodal approach that includes multiple disciplines, uses both pharmacological and nonpharmacological interventions, and is tailored to the patient-specific pain experiences identified on assessment (Department of Veterans Affairs & Department of Defense, 2017). As with most conditions, treatment options should be evaluated with regard to anticipated effect, potential harm (adverse effects), and overall risk–benefit to the patient. Many commonly used interventions (including opioids for neuropathic pain) lack strong, evidence-based support in the literature and should be used with caution.

Pharmacological Interventions

Medications continue to be the foundation of pain management after amputation. These medications—including both

nonopioids and opioids—are often necessary during the initial days after amputation and may continue for months in cases of chronic, persistent pain (De Jong & Shysh, 2018; Uustal & Meier, 2014). For nociceptive pain, nonopioid medications typically include acetaminophen and nonsteroidal anti-inflammatories, whereas neuropathic pain can often be managed with medications such as gabapentin or tricyclic antidepressants (Alviar et al., 2016). In cases of severe pain, opioids may have a limited, short-term value to improve comfort and function (De Jong & Shysh, 2018). Because of the limited high-quality research regarding effective postamputation pain management, ongoing assessment and adjustment of the medication plan are often necessary.

Nonpharmacological Interventions

Although nonpharmacological interventions have long been a part of the pain treatment plan, patients and clinicians often discount their value compared to medications. Examples of nonpharmacological options include heat, positioning, or residual limb edema management in addition to contributions from a wide variety of disciplines (therapy, social work, chaplaincy, mental health). As with medications, identifying potential options depends on a comprehensive assessment and history to fully understand the patient's pain experience and needs (Eaton et al., 2017). Although it is beyond the scope of this article to discuss these interventions in detail, all should be considered for the treatment plan established by nursing, medical, therapy, or case management staff. Though the evidence base for some of these nonpharmacological interventions is weak or equivocal, their low-cost and (generally) low-risk nature make them valuable to consider as an adjunct to pharmacological interventions.

Fall Prevention

Problem Significance

Over half of lower limb amputees fall each year, and nearly a third have multiple falls (Hunter et al., 2017, 2020). The initial changes in body mass and proprioception after amputation are often far more significant than patients expect, resulting in overestimation of ability and loss of balance. As with other populations, these falls can result in significant negative effects, including injury, rehospitalization, fear of falling, and increased isolation and depression (Steinberg et al., 2019). Following a fall, there is often a marked decrease in prosthetic use (because of fear), which further contributes to reduced mobility and community reintegration (Hunter et al., 2017).

In the inpatient rehabilitation setting, postamputation patients represent one of the highest risk populations for experiencing a fall (Ross et al., 2012) with inpatient postamputation fall rates reported at 21%–35% (Hunter et al.,

2017; Steinberg et al., 2019). In the hospital setting, these falls are more likely to result in injuries such as lacerations, bruises, or other major events (e.g., dehiscence, fracture, head injury). Further contributing to fall risk, patients requiring lower limb amputations often have mild-to-moderate cognitive impairment related to executive function and complex motor function, which can limit the effectiveness of fall prevention efforts (Coffey et al., 2012).

At the authors' organization, postamputation fall rates were noted at 15%–25%. Over 75% of these falls were unassisted, with most occurring during a patient-initiated transfer to or from the wheelchair. Although most patients were found to be cognitively intact and aware of fall prevention interventions, they were often reluctant to call for assistance and failed to appreciate how significantly their body mechanics had changed after amputation. Fall-related injuries were more common in postamputation patients than any other rehabilitation population.

Practice Recommendations

Fall prevention in the inpatient rehabilitation setting is a challenge. Efforts to encourage mobility and independence are seemingly at odds with the interventions to minimize fall likelihood. Like all patients, postamputation fall prevention begins with a comprehensive and *individualized* fall risk assessment using a validated tool (Agency for Healthcare Research and Quality, 2018). From this assessment, clinical staff establish and implement an interdisciplinary fall risk plan of care that best addresses each patient's specific needs. Regardless of the fall risk tool, nearly all patients will be identified as high falls risk after amputation and should receive an individualized plan of care with two key components: (a) patient/family education and (b) monitoring and rounding (Agency for Healthcare Research and Quality, 2018).

Although nearly all organizations educate their patients about fall risk and safety, the authors have noted that initial education (e.g., on admission) was ineffective unless continuously reinforced by all disciplines. In addition, it is critical to include the patient's family and friends where appropriate. Education is delivered on admission, during routine nursing care, and during most therapy sessions. Patients are educated on the postamputee risks for falling (e.g., changes in one's center of gravity) and the unique injury risks of falling (e.g., damage to residual limb). Education also includes the need for safety devices such as limb protectors to reduce the risk of injury in the event of a fall. In addition, therapy staff educate patients on techniques to reduce injury from a fall and how to get back up after a fall.

While hospitalized, patients at high risk for falling often receive increased monitoring by nursing staff. The

specific patient risks and monitoring needs can vary throughout the hospitalization, as patients become more comfortable with the environment and become more independent with mobility and self-care. A review of facility falls had shown that amputee falls were most common between Rehab Days 7 and 10, so rounding and education reinforcement were increased during this time. While remote video monitoring, bed alarms, and constant observers (i.e., "sitters") were occasionally used, frequent rounding and support for patient needs (e.g., personal belongings, toileting assistance) were found to be highly effective.

Conclusions

With the typical short rehabilitation length of stay, it is critical to develop a specialized plan of care utilizing an interdisciplinary approach to ensure safe, high-quality care for patients after amputation. The growth of this population makes it essential for rehabilitation nurses to understand the most common nursing challenges faced by postamputation patients during rehabilitation.

Although the focus of this article has been on vascular-related lower limb amputations, the nursing considerations and recommendations are similar for patients who have experienced an upper extremity amputation or a trauma-related amputation (upper or lower). Postamputation pain (nociceptive and neuropathic) and management considerations are similar regardless of amputation location and cause. Pressure injury and fall incidence are both impacted by changes in mobility, body mechanics, and positioning, and practice recommendations should be similar regardless of type/cause of amputation.

As noted previously, there are significant gaps in research related to postamputation nursing care and safety considerations, especially within the inpatient rehabilitation setting. Although this article attempts to apply general best practice recommendations alongside the authors' clinical experiences with this population and setting, further research is urgently needed.

Following amputation, nurses have the opportunity to collaborate with the patient, family and interdisciplinary team to develop a plan of care to address the most common care and safety concerns—skin integrity, pain, and fall safety. Failing to adequately consider and address these complications can result in poor rehabilitation outcomes with dramatic, long-term effects on a patient's future, including discharge disposition, community reintegration, prosthesis use, and quality of life (Stineman et al., 2008). The specialized expertise that rehabilitation nurses bring to this vulnerable population can be the catalyst for recovery and the next phase of a patient's life after an amputation.

Key Practice Points

- Skin integrity should be closely monitored on both the residual and intact limbs to reduce the incidence of subsequent injury and/or amputation.
- Effective pain management after amputation requires a comprehensive pain assessment and a plan that includes both medications and nonpharmacological interventions.
- Fall incidence is extremely high in postamputation patients (30%–50%), both in the hospital setting and upon return to the community.

Conflict of Interest

The authors declare no conflict of interest.

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