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REVIEW

Multidisciplinary and comprehensive approaches to optimal management of chronic pressure ulcers in the elderly

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Abstract: The occurrence of pressure ulcers (PUs) is common and poses serious problems for the frail elderly, with implications for functional disability and reduced quality of life. PUs are preventable in a majority of cases. The increase in PU occurrence, however, appears regardless of higher awareness in prevention and improvement through utilization of pressure relieving devices. Multiple changes in the elderly body systems occur over time including aging, multiple chronic conditions, and functional impairment, potentially culminating in the final pathways of geriatric syndrome, unless awareness to the development of PUs is reversible and prevented. The assumption is that the development of PUs is based on multifactorial causes (extrinsic and intrinsic factors); thus, the optimal management for elderly patients requires a comprehensive approach in all medical settings (community, hospital, and at the long term care [LTC] level). Comprehensiveness signifies looking beyond the wounds, assisting the patient through both local (wound) and systemic (medical condition) treatment, using a strategy of prevention and supporting quality of life. Within the multidisciplinary involvement team approach, each professional discipline contributes its own task in coordination with other disciplines to address PU prevention, assessment, and treatment. The entire medical staff and the multidisciplinary team work together and communicate frequently in order to prevent, halt at an early stage, and provide healing in a timely fashion. Limiting the formation of PUs is facilitated through early identification, treating contributing causes, eliminating all unnecessary medications, instituting supportive interventions which include the family. Understanding the relationship between the formation of PUs and the vulnerability of the elderly patient is key to the optimal approach for the prevention and management of PUs.

Keywords: multifactorial causes, medical conditions, frailty, geriatric syndrome, prevention strategy, quality of life

Introduction

Pressure ulcers (PUs) continue to escalate, and the incidence rate increased by 80% between 1995 and 2008.[1] The elderly as a risk population comprised over 70% of those affected with PUs.[2] With the expected increase in longevity, the prevalence of PUs will have a significantly alarming rate of growth.[3] PUs are preventable in major cases; however, the increase in PU occurrence appears regardless of higher awareness in prevention and improvement through utilization of pressure relieving devices.[4] It is interesting to note that certain patients with an equal grade of immobility develop PUs and others do not given the same prevention strategy for intervention policy. Currently, it is recognized that the development of PUs in the elderly is multifactorial, reflecting underlying medical conditions and not limited to only local occurrence.[5]

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PUs are primarily defined and categorized as nonhealing wounds, along with other etiologies, eg, diabetic, ischemic, and vascular ulcers.[6] In contrast to other ulcers where a clear dominant intrinsic etiology is observed (including neuropathy in diabetic ulcers, atherosclerosis in ischemic ulcers, and thrombosis in venous ulcers, although other factors contribute), PUs cannot always be attributed to clear extrinsic "mechanical" factors such as pressure, shearing forces, frictional forces, and wetness/moisture. Initially, the appearance indicates there is no definable intrinsic factor linked to the patient's background. Thus, PU development is perhaps considered a local skin injury to the soft tissue compressed between hard surface and bony prominence, requiring only local treatment. However this narrow vision omits comorbidities beyond the local area and excludes the potential for optimal prevention and treatment for PUs.[7]

This recognition acknowledges PU development in the elderly as multifactorial, including the influence of intrinsic (systemic) factors. These systemic risk factors accumulate and interact synergistically with extrinsic "mechanical" risk factors in different pathways.[8]

The combination of these cumulative factors promotes emphasis on using the comprehensive management approach, involving a multidisciplinary team utilizing prevention of extrinsic factors, stabilizing intrinsic systemic conditions, and stressing relationship with the patient and family for optimal prevention and treatment.

To begin the PU process, the first step is to determine what makes the elderly person more vulnerable and exposed to the development of PUs?

Vulnerability of the elderly

Understanding the relationship between PU formation and the vulnerability of the elderly patient is the key to the optimal approach for the prevention and management of PUs. Multiple changes in the elderly body systems occur over time, including the effects of aging processes, multiple chronic conditions, functional impairment, potentially increasing frailty and vulnerability to PU geriatric syndrome unless risk awareness is emphasized and the development of PUs is prevented or reversible.[9]

Aging

During an individual's lifespan, aging processes occur and accumulate in the body systems, which elicit imbalance and disrupted homeostasis across multiple physiological systems. The four principal aging processes include body composition changes, energy imbalance, homeostatic disequilibrium, and neurodegeneration.[10] These aging processes contribute to PU formation and can be assessed using known clinical tests. Changes in the body composition are assessed by weight, height, body mass index (BMI), waist circumference, skin folds, increase in fat mass, and reduction in muscle mass and strength (sarcopenia). Increased fat mass has less vascular perfusion while less adenosine triphosphate from muscle cells produce less energy and malnutrition; both changes are associated with PU development. An energy gap is assessed by reduced oxygen consumption during minimal effort, fatigue, weakness, slow exercise tolerance, and bed rest, which promotes immobility. Homeostatic disequilibrium is measured by increased proinflammatory markers, including C reactive protein, erythrocyte sedimentation rate, interleukin-6, tumor necrosis factor alpha, and reduced antioxidant level (vitamins D and E). Deficiencies in anabolic hormones (androgens and growth hormone), excess catabolic hormones (cortisol), and insulin resistance compromise the immune system, hindering the wound healing process. Neurologic system degeneration is assessed by mental tests measuring reduced cognitive functions and alertness and progression to advance dementia, gait imbalance, and slow reaction time, resulting in falls, hip fracture, and immobility.

Pathology and frailty

A PU reflects symptoms of an elderly patient with multiple comorbidities and impairment, similar to the tip of the proverbial iceberg. Many pathology processes progress and accumulate, including degenerative neurologic illnesses (Parkinson and advance dementia); anoxic-ischemic processes; impaired circulation (locally as peripheral vascular disease or centrally as cerebrovascular accident); low metabolic rate in malnutrition; endocrine disturbance such as diabetes; and impaired inflammation and immunologic system with reduced host response (local as cellulitis or systemic as sepsis). All of these are conducive to frailty.[11] Frailty is a condition that indicates loss of major physiologic reserve with expression of weight loss, exhaustion, weakness, slowness, and low levels of activity.[12] The dysfunction is manifested through immobility and instability.[13] Acute processes, superimposed as a trigger, may include infection, metabolic impairment, impeded blood flow and/or fracture (trauma). The final outcome is damage to the skin and soft tissue layers potentially leading to the formation of PUs.

Classic case reports of elderly persons vulnerable to the formation of a PU include sarcopenia exemplified in an overweight diabetic woman with obesity and/or an underweight man with Parkinson's disease. The progression leading to

the PU was characterized by poor cardiovascular perfusion and neurodegenerative illness associated with immobility, incontinence, inability to eat or swallow, and delirium. The process culminated in developing extensive and deep PUs over the sacrum and heels (Figure 1).

Geriatric syndrome (disability)

Geriatric syndrome refers to multiple risk factors causing a unified manifestation and is the final result of ongoing multifactorial health processes which affect various body systems in a manner that renders elderly people vulnerable.

Geriatric syndrome is a frequent clinical manifestation reducing both daily function and quality of life (QoL) for the elderly and is comprised of multiple common etiologies (risk factors).[14] These risk factors accumulate and interact synergistically on various organs or systems resulting in final common pathways presented clinically as the PU geriatric syndrome.[15] Other common geriatric syndromes include falls, delirium, dementia, incontinence, and dizziness.[16] Geriatric syndrome implies a challenge to either management and/or cure of PU or, alternatively in case of irreversibility, to improving QoL through palliative care.[17] Thus the development of PUs is considered multifactorial, combining the aging and pathology process, resulting in frailty and vulnerability of the elderly, making them prone to further PU development. PUs appear as a geriatric syndrome with the occurrence of medical deterioration.

Comprehensive approach

The optimal treatment for PUs requires a comprehensive management approach. Comprehensiveness involves looking beyond the wounds, assisting the patient through both local (skin) and systemic (medical condition) treatment, using a strategy of prevention, and supporting QoL. Within the multidisciplinary team approach, each professional discipline contributes its own task of expertise in coordination with other disciplines to address PU prevention, assessment, and treatment.[18] The assumption is that the development of PUs is based on multifactorial causes, and thus the optimal management for elderly patients requires a comprehensive approach ranging from multicomponent prevention to stabilizing chronic medical conditions, providing local wound treatment, and striving to provide QoL.

Strategic preventive interventions

The growing numbers of elderly people with PUs, and the associated serious implications, are in contrast with the fact that a considerable number of these ulcers are preventable. The common, current view stresses that the formation of PUs is multifactorial, and optimal management requires multicomponential prevention, not a single, solitary intervention. The key elements of multicomponential prevention include simplification, standardization, and documentation of PUs; involvement and leadership of the multidisciplinary team; the wound nurse prevention leader;

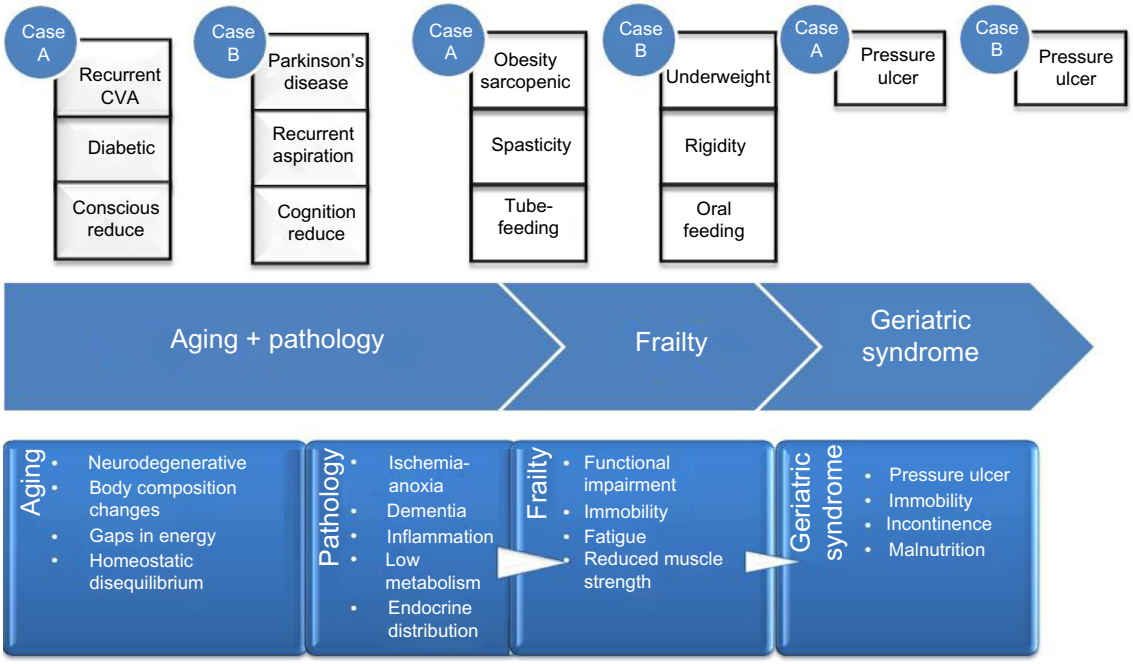


Figure 1 Model of different medical background with the same geriatric syndrome development.
Abbreviation: CVA, cerebrovascular accident.

ongoing staff education; and sustained audit and feedback.[19] The combination of diverse strategic interventions was found to be beneficial, practically and clinically, for the prevention of the formation of a PU. In a systematic study limited to randomized control trials, strategy interventions were found beneficial in providing devices for redistributing the patients' weight in bed or in a chair, whether via a special mattress or a special seat cushion; frequent repositioning; optimizing the nutritional status; and applying moisturizing creams on dry sacral skin.[20]

At each visit with the physician or nurse, the skin of the immobile and disabled elderly patient is examined for PUs, particularly where bony prominences are in contact with hard surfaces, such as the coccyx, trochanters, and heels. Prevention includes all levels of care setting: community, hospital, and LTC facility.

On the community level, the family physician and the community nurse are committed to the patient and lead the prevention and care. Since PU development is related to extrinsic factors, the importance is stressed to educate patients, families, and caregivers in the home regarding the provision of pressure relieving devices and frequent repositioning. Intrinsic risk factors attributing to PU formation include bed-bound immobility, urinary incontinence, advanced dementia, anemia, low BMI, and poor nutritional intake; the family and caregiver need to be aware and highly suspicious of these factors. The family physician's role is to stabilize chronic conditions relating to PU and provide immediate treatment to avoid acute conditions that accelerate the formation of ulcers. Pertinent to treatment and nutrition, difficulties in swallowing resulting in recurrent aspiration pneumonia are preventable by identification and appropriate mixture intake.[21]

At the general hospital level, prevention is more complex as patients are admitted in an acute state, which overwhelms the chronic background problems. An extended stay in the emergency room poses a threat to the elderly patient including falls, factures, infections, delirium, and ulcer formation.[22] Even the initial phase of admission into the ward is critical in terms of ulcer formation.[23] All of these locations require the hospital staff to be highly aware of the elderly patient's PU risk during the acute state. Therefore, the family physician must consider and balance the benefits versus these potential risks for elderly patients prior to referring them to hospital. New rulings for reduction of Medicare payment in US hospitals stress non-reimbursement for "preventable complications" and thus serves as an economic reality for staff to prevent development of PU.[24]

On the LTC level, the medical condition is less acute; therefore, the strategy of preventive intervention is to be included in the daily routine of the medical and nursing staff. Ongoing education is an important requirement for all staff, and especially with the aides providing the basic daily physical care (repositioning, bathing, diaper changing). Examples of intensive education address the identification of skin exhibiting nonblanchable erythema (PU stage I) and notifying the nurse without delay, remembering to activate the pressure relieving dynamic mattress, and correctly positioning seating in a chair. Awareness of medical device use ensures that tubes are not placed or routed under exposed skin or across bony surfaces and masks, stomas, and drains are not over-tightened when fixed. Application of physical restraints is to be avoided.[25]

Each vulnerable elderly patient, either at home or upon admission to hospital or LTC facility, requires risk assessment to identify the level or potential for development of PUs. The Braden scale has been reported to be superior in sensitivity and specificity compared to other screening tools.[26] The Braden score, assessing six subscale risk factors includes sensory perception, skin moisture, activity levels and mobility, observed nutritional intake, friction and shearing forces. The Braden score indicates levels of risk, ranging from a maximum normal score of 23 (no risk), a value of 18 or less identifies being at risk, and a score of 12 or less is considered high risk.[27] Friction and shearing forces are the highest predictive risk factors and require specific intervention.[28] Pressure Ulcer Scale Healing was developed by the National Pressure Ulcer Advisory Panel as a quick and reliable tool to monitor changes in PU wound status occurring over time. It is composed of three elements: length × width scored from 0 to 10, exudate amount scored from 0 to 3, and tissue type scored from 0 to 4. These scales are important for communication and sharing information among the multidisciplinary team.

In addition to preventive measures prior to wound development (primary prevention), it is equally important to apply these measures once PU appears (secondary prevention). The ongoing prevention is necessary in order to prevent additional appearance of new PUs and to promote intensified treatment for the newly existing PU.

By implementing preventative strategies, early detection and identification is carried out comprehensively in all medical settings to identify those elderly persons at risk for the formation of PUs. These strategies should therefore be employed to optimize functional levels as well as intervene favorably in nutritional status and stabilize acute and chronic underlying medical conditions.

Systemic medical factors

Systemic factors affecting the patient include chronic comorbidities, functional impairment, and poor nutritional status. In reviewing the medical literature from January 1990 through December 2005, 12 studies reported that risk factors for PUs included impaired mobility, older age, low nutritional status, low body weight, impaired cognition, and the coexistent of systemic medical and geriatric conditions as the most common risk factors for the formation of PU.[9] Chronic diseases such as advanced dementia were shown to be associated with PU development. The study described a clinical course of advanced dementia, disclosing nearly 40% of elderly patients in nursing homes developed PUs before death.[29] A recently published study identified specific systemic factors associated with the existence of PUs;[30] advanced dementia, low BMI, anemia, and use of a urinary catheter were found to be significantly high in multiple regression analyses. This research also highlighted the association of low nutritional parameters with a higher frequency of antibiotic use in the PU group. Also, the median survival time of patients with PUs was significantly lower.[30] Allman established evidence of risk factors among hospitalized patients with activity limitation, including immobility and fecal incontinence.[31] Margolis discussed multiple medical conditions in regression analysis as risk factors for PUs in an outpatient setting.[32] These studies highlight distinct systemic factors (aging-related conditions, diseases, and frailty dysfunction) contributing to the development of PU.

Local treatment

Local treatment is an integral process combined with other factors to facilitate whole care of the patient with PU. Without optimal prevention and systemic care as well, the wound will not improve, even if local care is administered. For example, a heel PU in an edematous leg (congestive heart failure, hypothyroid) will worsen without both prevention (pressure relieving devices) and systemic treatment (appropriate medication). Several parameters are to be considered in providing local care of PU. Since it is presumed that the PU wound is colonized by infection, addressing the bioburden of infection is the paramount factor in establishing the local care plan. Debridement is the cornerstone of local treatment, whereby removing and cleaning necrotic tissue and secretions reduces the infectious burden and enables the healing process. Debridement is not mandatorily surgical but may involve, singly or in combination, all types of debridement: mechanical, autolytic, enzymatic, biologic, or chemical. Consequently, the primary local care principles consist of debridement and cleansing of the wound and application of dressing for protection of the wound.[33]

Once the wound is "clean", granulation tissue is to be protected by dressings and the timely changes of these dressings according to the amount of secretions. Adequate moisture is to be provided if the wound is dry. This phase is lengthy, and every change in the patient's condition may impact whether the wound deteriorates to its previous infectious stage. Therefore, the local care plan is not fixed but changes according to the patient's condition by either improving, deteriorating, or remaining static. In addition to the standard local modalities, there are local agents and adjuvant treatments aimed to accelerate the healing process or offer alternate treatment in cases without improvement. The role of adjuvant treatments in the elderly patient becomes important when the wound appears during a hip fracture or after episodic deconditioning. There is logic in accelerating healing when the elderly patient awaits discharge to home. Elderly, bedridden patients, in the author's experience, remain in immobile situations; therefore, those elderly patients will benefit from the standard treatment modality including debridement and local care dressing.[34]

Quality of life

The comprehensive approach to PU patient well-being and that of their families addresses QoL;[35] the goal is to minimize the number and frequency of care episodes in order to lessen interruption in the patient's life and their family's routine.

Symptom controls for pain, discomfort, dyspnea, insomnia are an important part of improving QoL and require careful attention. In managing these symptoms, an elderly patient who is restless and agitated with a PU due to pain and receiving analgesics will become restful and cooperative in contrast to exhibiting disruptive behavior or delirium. Loneliness, social isolation, and depression are often caused by noxious odors, secretions, or reduced self-image of the patient.

Advanced directives, patient's wishes, and preferences involve issues relating to the PU condition, including potential limb amputation, invasive procedures, do not resuscitate, power of attorney, living will, and religious requirements. In case of persistent, incurable ulcers, or upon deterioration of the patient's condition, the goal requires change from healing the wound to palliative care, with the aim of symptom control and patient comfort.

Multidisciplinary team

A reasonable prevention strategy for intervention requires the involvement and cooperation within a multidisciplinary team. The responsibility for detecting and identifying a PU is shared by the physician, nurse, orderlies, and the

multidisciplinary team. The entire medical staff and the multidisciplinary team work together and communicate frequently in order to halt PU at an early stage and to provide healing in a timely fashion.[36] Nurses have largely taken over PU caretaking decisions and are enrolled in continuing education courses for the diagnosis, management, and periodic reassessment of PU. Many hospitals utilize a designated "wound nurse" in charge of overseeing this care. The role of the nurse practitioner in the PU prevention program has proven to be successful in reducing PU prevalence, increased risk assessment, and use of appropriate pressure-relieving devices leading to beneficial cost savings.[37]

The emphasis for doctors is placed on increased attention to preventive PU responsibilities and does not rely on limited local care. Equally important is the increased involvement with the multidisciplinary team in taking greater initiative acquired with the detection and treatment of PU.[38] The priority for the physician is to be involved in the patient's care before the onset of a PU in order to prevent its formation. Alternatively, in severely deep ulcers associated with deterioration of the patient condition, the physician's role is directed to providing palliative care. Ideally, the underlying pathologic processes are identified and treated optimally as geriatric syndromes. These processes include illnesses resulting in ischemia or hypoxia, malnutrition, edema, immunodeficiency as well as limitations in level of consciousness, and/or motor or sensory disability. The precipitating factors (eg, infection, metabolic insult, and trauma) are identified and treated immediately, with the goal of averting additional geriatric syndromes. Optimizing treatment is recommended at the community level, avoiding hospitalization, and maintaining medications at a minimum. The physical and occupational therapists play an important role in releasing the patients' contracted joints and relaxing spasticity. Swallowing ability and poor nutrition necessitates the speech therapist and dietician both making an initial evaluation of the patient's swallowing ability, and thus helping to train the patient to eat more effectively. Dietary supplements are given whenever appropriate. The social worker supplies social and psychological support and serves as a liaison and resource for the community, hospital, and LTC facility.

The family role focuses on awareness of the patient's whole medical situation, potential alternatives, and assisting the patient in making appropriate clinical decisions.

Summary

PU is a common occurrence and poses serious problems for the frail elderly with implications for functional disability and reducing QoL. Traditionally, recognition and treatment of PU focused on localized mechanical factors and overlooked the occurrence of associated systemic influences, requiring the attention of only a single health professional. Current progress in PU management recognizes the sources stemming from interaction between the aging process, multiple comorbidities, and the effects of frailty and immobility. Thus, the combination of these multifactorial sources requires involvement beyond the limitation of one discipline and emphasizes expansion necessitating a multidisciplinary team and stresses a comprehensive approach (systemic factors, local treatment, prevention, and providing QoL) integrating the various influences. The majority of cases with PU development are reducible by anticipatory screening and forming a prevention strategy for elderly persons at risk. These preventive aspects are accomplished by addressing the underlying conditions and the contributing causes of the associated PU geriatric syndrome. Limiting the formation of PUs is assisted through early identification, treating contributing causes, eliminating all unnecessary medications, and instituting supportive multidisciplinary interventions (off-loading pressure devices, adequate nutrition and hydration, administering blood products and antibiotic, sufficient oxygenation, and support for the family).

The growing occurrence of PU within the elderly population is recognized as treatable and preventable through the multifactorial process involving comprehensive and multidisciplinary approaches including both local care, systemic factors, prevention, and QoL considerations.

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