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Fall risk assessment and injury prevention in the Mohs surgery clinic: a review of the literature and recommendations for improving patient safety

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Abstract

Background: Patient falls remain a major cause of adverse events in the medical setting. Many patients receiving Mohs micrographic surgery are at high risk, both for falling and resultant injuries. Although the incidence of patient falls in dermatologic surgery is low, falls can have significant consequences for both patient and provider. Therefore, effective interventions to improve organizational safety are critical. Though there is a considerable amount of research pertaining to fall prevention strategies, the majority of studies have been confined to the inpatient setting and long-term care facilities. Implementation of fall prevention initiatives in the outpatient setting has rarely been evaluated and no studies have focused on the Mohs patient population to date.

Methods: We reviewed the literature pertaining to fall risk and prevention guidelines in the inpatient and outpatient settings as it applies to the dermatologic surgery environment.

Results: Herein we will discuss patient risk factors for falling relevant to the Mohs setting and review existing validated fall risk assessment tools and strategies for fall prevention.

Conclusion: Identifying fall risk factors can improve patient safety and reduce falls in the dermatologic surgery clinic.

Introduction

Patient falls are a major cause of adverse events in the community and medical setting, which can result in significant injury [1, 2]. In the United States, it is estimated that treatment associated expenditures from falls cost over \$19 billion annually [3]. Although the economic burden of fall related injuries is substantial, falls may also have a profound impact on psychologic well-being, mobility, and function in the elderly [4, 5]. In addition, providers may subsequently be faced with threat of litigation and/or disciplinary action.

Each year, approximately 700,000 to 1,000,000 patients fall in healthcare facilities [6, 7]. With the majority of these incidents occurring during the course of patient hospitalizations, a considerable amount of research has been conducted on fall prevention and patient risk assessment in the inpatient setting [8, 9]. The number of falls and/or fall related injuries occurring outside the inpatient setting is unknown. However, it has been estimated that 20% of all patient falls occur in outpatient medical facilities [8].

Many falls that occur in both the inpatient and outpatient setting are preventable [10]. Although hospitals have been recognized as high-risk environments for falls, patient fall risk reduction in outpatient clinics have received little attention. However, in 2017 the 6th edition of Joint Commission International Accreditation Standards for Hospitals

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calls for development and implementation of measures to reduce patient falls in the outpatient setting where appropriate [11]. Decades of research evaluating safety action programs within other 'high hazard industries,' such as aviation, suggest that errors most commonly occur owing to faulty organizational systems and not from negligence [12, 13]. Though the incidence of patient falls in dermatologic surgery is low, the growing expectation of 'zero-error' medical care warrants regular evaluation of clinical practice and development of systems-oriented approaches to reducing risk globally [14]. Whereas risk management within healthcare remains largely 'reactive' in nature, adoption of proactive practices are necessary for continued improvement in patient safety [15].

The outpatient dermatology surgery clinic is a potentially high-risk location for patient falls. Dermatologic surgeons in the U.S. perform approximately 3.2 million surgical procedures each year [16]. Patients undergoing Mohs micrographic surgery represent a specific subset of patients in dermatology clinics who are often at increased risk of falling for a variety of reasons. Herein, we will discuss the relevant fall risk factors in patients undergoing Mohs micrographic surgery, review the literature regarding use of fall risk assessment tools, and offer suggestions for ways providers may mitigate fall risk and improve patient safety in their surgical practice.

Methods

We reviewed the literature pertaining to fall risk and prevention guidelines in the inpatient and outpatient settings as it applies to the dermatologic surgery environment.

Discussion

Fall risk in Mohs surgery patient population

Age is a well-known risk factor for falls. Approximately one third of adults ≥ 65 years of age and half of adults ≥ 80 years of age fall at least once per year [17, 18]. Elderly individuals who fall once are 2-3 times more likely to fall again within one year

[18]. With older adults among the fastest growing age groups, and representing a significant portion of the patients undergoing Mohs micrographic surgery, this population is inherently predisposed to falls [19].

Numerous systematic reviews and meta-analyses have identified a variety of factors, both intrinsic and extrinsic, associated with fall risk. In addition to age, frequently cited intrinsic risk factors for falls include lower extremity weakness, history of falls, polypharmacy (≥ 6 medications of any kind), diabetes, peripheral neuropathy, gait/balance deficit, use of assistive device, visual impairment, arthritis, cognitive impairment, medications, and incontinence [20-30]. Frequently cited extrinsic factors associated with falls include improper footwear/clothing and environmental hazards [31]. Although many independent risk factors have been linked to increased incidence of falls, the majority of falls in elderly populations are likely multifactorial in nature [32].

With elderly individuals comprising a significant portion of patients in a Mohs practice, it is important physicians assess ways in which patient fall risk can be mitigated in this setting. There are a variety of factors specific to Mohs micrographic surgery that warrant consideration for implementation of fall risk prevention measures. Owing to the surgical set-up required for Mohs micrographic surgery, patient examination rooms potentially contain numerous hazards such as loose tubing, wet floors, and wiring. With many patients requiring multiple stages for tumor removal, numerous transfers between surgical rooms and the waiting area potentially represent increased opportunity for fall and injury [33]. Depending on the operative site, bandages may obstruct the visual field, thereby creating new visual deficits which were not present previously. In addition, patients are at risk for vasovagal reactions during Mohs micrographic surgery and prone to fatigue given the potential for multiple stages [34, 35]. All of these variables may interact with preexisting patient characteristics that may increase a patient's risk of falling.

Early identification of fall risk can potentially prevent patient injury and it is incumbent on providers to ensure they are practicing the highest level of

patient safety. Given the potential hazards in the Mohs environment, as well as the high prevalence of patients possessing numerous risk factors for falls, it is prudent for dermatologic surgeons to consider the implementation of measures to reduce the risk of patient falls in their practice.

Risk assessment tools

Identifying effective strategies to prevent patient falls has been a major area of research within geriatrics. Numerous fall assessment instruments have been developed as a means to risk stratify patients according to fall risk. Although there are many fall risk screening tools available, most have been validated for use in the acute care setting, inpatient setting, or the emergency department [36-39]. Several systematic reviews of fall risk assessment tools have been conducted, with the Morse Fall Scale (MFS), the Hendrick II Fall Risk Model (HFRM), and the St. Thomas Risk Assessment Tool in Falling Elderly Inpatients (STRATIFY) being among the most cited.

The MFS was developed after analyzing variables and patient characteristics of 100 patients who fell and 100 patients who did not fall across three clinical settings: acute care, long-term care, and rehabilitation clinic areas [40]. Six variables were identified as being risk factors for falls including prior history of falls, secondary diagnoses (i.e. peripheral neuropathy, muscle weakness, vision impairment), ambulatory aid, presence of IV, issues with gait, and mental status. Each variable was designated a weighted value and summed to calculate a composite risk score. The composite score was then correlated with a risk level ranging from low to high [41]. The MFS has a reported sensitivity of 78% and specificity of 83% for accurate fall risk prediction [40].

The HFRM is another commonly used risk assessment tool that was originally developed in the acute care setting [36]. In a large case control study, 355 fall patients and 780 non-fall patients were assessed for more than 600 intrinsic and extrinsic risk factors for falling. A stepwise logistic regression analysis was used to develop a risk factor model comprised of 8 assessment parameters for high-risk fall identification. Fall-associated factors included confusion/disorientation, depression, altered

elimination (i.e. urinary/fecal incontinence, urinary urgency/frequency), dizziness/vertigo, male gender, taking prescribed antiepileptics or benzodiazepines, and low "Get-up-and-go" test score based on a patient's ability to rise from a chair, walk three meters, turn around, and sit back in a chair. Each factor was ascribed a weighted point value and summed to reach a composite risk score in which a score ≥ 5 corresponded to high fall risk. The HFRM was reported to have a sensitivity of 74.9% and specificity of 73.9% for fall prediction [36].

The STRATIFY tool was first evaluated in the inpatient setting. Following a prospective case control study, 7 risk factors were identified to be significantly and independently more prevalent among fallers than controls [42]. Five of these variables, including agitation, frequent toileting, unstable gait, visual impairment, and fall as presenting complaint, were selected for use in a risk assessment tool. An unweighted scoring system based on the presence or absence of each risk factor (yes=1, no=0) was used to calculate a risk score. The risk assessment tool was used 395 times on 217 patients, among whom, 71 falls occurred in the week following the assessment. Of the 71 patients who fell, 66 patients had a risk score ≥ 2 . In patients who did not fall, only 40 of 324 had a risk score ≥ 2 . Therefore, a risk score of ≥ 2 was determined as the cut off value with a sensitivity of 93% and specificity of 88% of fall prediction [42].

Although fall risk screening tools have been shown to be effective in predicting patient fall risk, their utilization in isolation is likely insufficient. In a Cochrane review, 60 trials evaluating fall reduction interventions were evaluated with 43 trials occurring in care facilities and 17 trials conducted in hospitals [43]. Multifactorial interventions in hospitals were shown to reduce the rate of falls (rate ratio 0.69, 9% CI 0.49–0.96; 4 trials, 6478 participants) and risk of falling (RR 0.71, 95% CI 0.46–1.09; 3 trials, 4824 participants) [43]. In general, staff education and awareness has been shown to be a critical component of effective multifactorial fall prevention programs. Numerous studies have identified the importance of staff training and involvement to ensure program adherence and program success [44-46].

Fall prevention in the outpatient setting

Although several fall prevention assessment tools and strategies have been successfully implemented in the inpatient setting, development of a standardized assessment tool for use in outpatient facilities is lacking [47]. To date, only two studies have been performed in outpatient medical facilities to assess the utility of a fall prevention program.

In one large retrospective study, a questionnaire was administered to patients before their radiographic imaging procedure [48]. Questions assessed how the patient was feeling at the moment (i.e. weak, dizzy, lightheaded, fine), whether they used an assistive device for ambulation, if they had fallen within the past three months, if they needed help with walking or had a fear of falling, and whether they took an anxiolytic before their procedure. If the patient had a 'positive' response to any question, patients received a yellow sticker on their ID band and were provided with a pamphlet on risk reduction of falls. In addition, precautions were taken to ensure patient supervision as necessary. The electronic incident reporting system was then searched for falls and fall related variables after implementation of the fall prevention protocol. A total of 327 falls occurred during 5,080,512 radiology examinations over the span of 8 years. Whereas there was a statistically significant increase in the number of falls between years 2-3, the fall incidence plateaued between years 3-6, and was followed by a statistically significant decrease in the number of falls between year 6-7 ($P=0.01$). The authors of this study hypothesize that the initial increase in falls can be explained by the Hawthorne effect (alteration of behavior of study subjects related to their awareness of being observed), the plateau is the value closest to the true incidence, and the decrease reflects the effect of the fall program [48].

Fall prevention has also been assessed in the outpatient hemodialysis setting [49]. Following a root cause analysis of fall incidents within an outpatient hemodialysis center, a targeted intervention comprised of staff education, modification of environmental hazards, and development of a patient fall risk assessment tool were implemented. Patients who scored ≥ 3 out of 19

on the fall risk assessment tool were considered high risk for falls. After the intervention period, there was a statistically significant decrease in the incidence of falls from 50 falls per 100,000 dialysis treatments to 14 falls per 100,000 dialysis treatments ($P=0.01$) [49].

Healthcare facilities have been recognized as a high-risk environment for falls. In particular, the Mohs clinic is a setting that is vulnerable to fall related adverse events — primarily owing to its elderly patient population. Because of the safety of Mohs surgery, incidence of adverse events is generally low. This high margin of safety has gradually led to the expectation that outpatient dermatologic surgery should be essentially adverse event-free. Thus, continuous development of processes to improve patient safety are necessary and implementation of practice measures with potential to improve patient safety should be considered.

Although most studies have evaluated fall risk and prevention in the inpatient hospital setting, fall prevention initiatives in outpatient medical facilities have been infrequently studied. Multiple fall risk screening tools have been developed for use in hospital and long-term care facilities; however, none have been validated for use in the outpatient setting. In the absence of controlled trials evaluating the utility of fall risk screening interventions in outpatient clinics, the available evidence from other studies should be considered and used to inform clinical practice.

The literature suggests that a critical component of preventing falls is to implement interventions that are tailored specifically to a particular patient population. With this in mind, the MFS, HFRM, and STRATIFY tools are not entirely appropriate for use in the Mohs clinic setting. Though the aforementioned fall risk screening tools have demonstrated to be effective in the inpatient setting, the sensitivity and specificity for fall risk prediction may vary when used in different patient populations and environments. In addition, one or more components of the three assessment tools discussed in this review can be considered irrelevant or impractical for use in the Mohs clinic. For example, the presence of an IV — a criterion assessed in the MFS tool — is generally always absent in patients undergoing Mohs

micrographic surgery. Per the HFRM, providers would require an unobstructed location to conduct a “Get-up-and-go” test, as well as time, which may be impractical for implementation in a busy surgical practice. For the STRATIFY assessment, one of the scoring criteria is ‘fall as presenting complaint,’ which again is not applicable for patients being treated with Mohs surgery.

Although none of the presently available fall risk assessment tools are fully appropriate for use in Mohs surgery, aspects of each screening protocol can be considered in devising a novel fall assessment tool. Based on the review of the literature and clinical experience, we feel that certain fall risk factors should be assessed when patients are being seen in the office for Mohs surgery. Specifically, we have identified several risk factors that may be helpful in informing the clinician that a patient is at risk for falling during their Mohs surgical encounter (**Table 1**). These criteria may be used as a basis to create an instrument, which would require further study to validate in order to assess a patient’s risk of falls during Mohs surgery. Ultimately, providers will use their clinical judgement to make the final determination of whether a patient is to be considered a high-fall risk.

Table 1. Potential dermatologic surgery fall risk factors.

Risk Factors
History of falls in the past 12 months
Requiring assistance with walking or standing
Using an assistive device for ambulation (e.g.: walker, cane, wheelchair)
History of bladder incontinence or urinary urgency
Problems with memory or thinking (e.g.: dementia)
Impaired hearing or vision at baseline
Age greater than 80 years
Procedure/bandage that will result in temporary partial obstruction of vision
History of a movement disorder (ex: Parkinson’s disease)
Identification of medications that may increase risk of falls (i.e. diuretics, antihypertensives, antipsychotics, benzodiazepines, antidepressants, antiepileptics, insulin)
History of limb amputation

Implementation of new patient safety practices can be complex and challenging. Given multifactorial fall prevention interventions have been demonstrated to be the most effective in preventing patient falls, it is crucial that support staff within the Mohs clinic receive proper training and education on patient fall risk assessment and prevention measures. Interventions that can be successfully implemented include clearly identifying patients at risk for falls with a bright label/wristband to make staff aware, providing patient with information on fall risk and prevention, increasing patient supervision when transferring from surgical suite to waiting areas, providing wheelchair assistance if necessary, providing assistance with changing and bathroom activities, and encouraging patients to notify staff if feeling weak or unsteady [48]. With appropriate identification of patients at high risk for falls, standardized interventions and practices can be implemented effectively with the goal of improving patient safety.

Conclusion

Falls are recognized as a major health concern among older persons and are associated with significant morbidity. Although there is strong evidence for the benefits of patient fall prevention initiatives in other healthcare situations, evidence-based screening protocols and fall risk assessment tools in the outpatient setting are lacking. The aging population and frequency of elderly individuals receiving Mohs micrographic surgery is increasing. However, patient fall risk assessment is not currently a standard practice in dermatologic surgery clinics. Though the incidence of patient falls in the majority of dermatology surgery clinics is low, nevertheless, we feel there is minimal risk with such interventions and they may have potentially significant benefits. Development of validated, appropriate, fall risk assessment tools for use in the outpatient setting is essential for improving patient safety and additional research is required.

Potential conflicts of interest

The authors declare no conflicts of interests.

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