CNE Objectives and Evaluation Form appear on page 247.

Incidence, Correlates, And Interventions Used For Pressure Ulcers of the Ear

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Skin prevalence audits revealed annual increases in incidence of pressure ulcers of the ear. A research study was conducted to assess correlates of the problem. Study results guided clinical practice changes that reduced the incidence to zero.

Pressure ulcers once were considered an accepted evil that accompanied any prolonged hospital stay. In the past 25 years, however, they spawned a major health care industry of prevention and then were banished totally through inclusion on the "never" event list of the Centers for Medicare and Medicaid Services (Department of Health and Human Services, 2008). Throughout this evolution, the primary focus for wound care management and prevention has been on the lower half of the body (sacrum, hips, and heels) (Groeneveld et al., 2004). At this 550-bed level I trauma center and teaching hospital in the Midwest, however, quarterly performance improvement (PI) skin assessment audits indicated a need to focus attention above the waist, specifically the ear. Between 2003 and 2006, facility-based PI data showed a steady rise in the prevalence of pressure ulcers of the ear (from 2% to 12%). With patient acuity on the rise and more patients requiring the use of oxygen by nasal cannula, these prevalence data represent an emerging area of concern for skin care. The development, implementation, and results of a study concerning pressure ulcers of the ear are described in this article.

Background

Pressure ulcers are a visible sign of pathologic changes in the blood supply to dermal tissues. The chief cause is pressure, or force per unit area, applied to susceptible tissues. Pressure ulcers cause suffering for the patient that sometimes cannot be relieved (Fisher, 2004; Groeneveld et al., 2004). They are slow to heal, chronic, and costly. Cost includes not only consumption of health care resources, but also patient morbidity and quality of life (Clarke et al., 2005; Pieper, Langemo, & Cuddingan, 2009; Racco & Phillips, 2010). Pressure ulcers often recur, are painful, and present risk for secondary infection (Bolton et al., 2008; Lepisto, Eriksson, Hietanen, & Asko-Seljavaara, 2000; Pieper et al., 2009). With pressure ulcers of the ear in particular, the discomfort associated with the pressure of nasal cannula tubing can lead patients to remove the tubing, thereby compromising their oxygen therapy.

The identification of at-risk patients is the basis for prevention (Lepisto et. al., 2000). Studies have found patient-based risk factors include age (>65), immobility, loss of sensation, incontinence, malnutrition, a febrile condition, or a chronic illness such as diabetes (Bolton et al., 2008; Klizman, Kalinowski, Glasofer, & Rugan, 1998; Moore & Wise, 1997; Pieper et al., 2009; Racco & Phillips, 2010). Several clinicians have developed risk assessment scales for measuring the risk and actual severity of a pressure ulcer, such as the Braden and Norton scales (Bergstrom, Braden, Laguzza, & Holman, 1987; Braden & Bergstrom, 1987; Braden & Bergstrom, 1989; Hamilton, 1992). At the study facility, the Braden scale has been utilized to assess patient risk for skin breakdown. At the time of data collection, the Braden scale was documented weekly. Shortly thereafter, the frequency of Braden scoring increased

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to daily. This increase was due to the organization's goal of greater vigilance, not as a result of the study.

The most common body locations for pressure ulcers are the sacrum/coccyx and the heels (Groeneveld et al., 2004). Less common but equally serious are pressure ulcers on the ear. Groeneveld's team found approximately 13% of pressure ulcers occurred on the ear. The ulcers resulted from use of nasal cannula tubing for delivery of oxygen therapy. These ear ulcers were more common than ulcers on the elbows, buttocks, and ankle.

Apart from the Groeneveld study, the literature is very limited about pressure ulcers of the ear. The presence of the lesions is acknowledged but little else is known about them. The gap in knowledge about this phenomenon, coupled with the rising trend for pressure ulcers of the ear noted in the study facility's performance improvement data, led the authors to research this little studied area of pressure ulcer development.

Purpose

Concerned about the rising trend in the PI data about pressure ulcers of the ear, staff members and a clinical nurse specialist from a medical-surgical unit approached the Nursing Research Council (NRC) for assistance. Council members asked those nurses to form a research team to examine the phenomenon in depth. The team included the medical-surgical clinical nurse specialist, a staff nurse representative from the unit, and a doctorally prepared nurse research consultant, along with several members of the NRC. The purpose of this study was to describe the incidence, severity, and demographic and clinical factors associated with the development of pressure ulcers of the ear for patients using oxygen delivered by nasal cannula during hospitalization on an acute medical-surgical unit. The study also sought to develop a risk profile of patients who received oxygen via nasal cannula and were most vulnerable to developing pressure ulcers of the ear. In addition, the study proposed to identify any interventions in use with patients at the time of data collection for prevention of pressure ulcers of the ear.

Research Questions

Three specific research questions were addressed. For adult patients receiving oxygen via nasal cannula:

1. What is the incidence of pressure ulcers on the ear?
2. What co-morbid and demograpic variables are associated with development of pressure ulcers on the ear?
3. What are the extent and type of interventions used to prevent pressure sores on the ear?

Literature Review: Incidence and Prevalence of Pressure Ulcers

Pressure ulcers occur across all health care settings, with the highest incidence in the hospital. Older sources note the incidence in hospitalized patients is 3%-30%, with most estimates at 9%-13% (Bolton et al., 2008; Clarke & Kadhom, 1988; Gerson, 1975; Thomas, 2001). More recent data, however, estimate 57%-60% of ulcers occur in the hospital (Holst et al., 2010), usually within the first 2 weeks of admission. The incidence differs by care area, with patients in orthopedics and intensive care at greatest risk. Up to 66% of orthopedic patients develop pressure ulcers of varying severity (Versluysen, 1986). The highest prevalence is in long-term care facilities (Holst et al., 2010; Racco & Phillips, 2010). Although studies report some differences, the overall prevalence rates originating in the United States were 8.5%-15% (Amlung, Miller, & Bosley, 2001; Aronovitch, 1999; Holst et al., 2010; Meraviglia, Becker, Grobe, & King, 2002; Pieper et al., 2009; Racco & Phillips, 2010; Whittington, Patrick, & Roberts, 2000).

Pressure ulcers are used as indicators of poor-quality care, but this assessment may not be accurate (Thomas, 2001). Rather, the occurence of ulcers results from ischemic injury. Evidence for this is pressure ulcers occur within the first 2 weeks of hospitalization, rather than uniformly throughout hospitalization. Empirical evidence and the experience of the authors indicate pressure ulcers are more common in the presence of a greater number of co-morbid conditions and higher acuity (Harrison, Mackey, & Friedberg, 2008; Holst et al., 2010; Kottner, Raeder, Halfens, & Dassen, 2009; Pieper et al., 2009).

Although the literature is abundant in describing pressure ulcers of the lower body, pressure ulcers of the ear have been identified more recently as an important problem (Curley, Quigley, & Lin, 2003; Gilston, 1972; Groeneveld et al., 2004; Staiano, Richard, & Graham, 2004; Willock, Harrison, & Poole, 2005). Literature was culled from the following databases for 1972–2010: CINAHL, EMBASSE, Medline, Medscape, the Cochrane Central Register of Controlled Trials (CENTRAL), and the Wounds Group Specialized Register. Three types of pressure ulcers of the ear were described in the literature. A pressure ulcer resulting from the ear resting for long periods on a nasogastric tube was presented in a case study (Gilston, 1972). Similarly, a pressure ulcer of the helical rim of the ear also appeared in a case study (Staiano et. al., 2004). These ulcers resulted when patients were ventilated in the prone position to improve respiratory function, which inevitably required them to lie on one side of their heads, directly on the ears. The study by Groeneveld and colleagues (2004) cited the ear as a fairly frequent location for pressure ulcers, but the authors did not mention the specific location on the ear of those lesions. The researchers surmised these ulcers resulted from use of oxygen therapy delivered by a nasal cannula.

Groeneveld and co-authors (2004) presented a comprehensive and systematic literature review to provide the rationale for a prevalence study of ear lesions in 263 patients with a pressure ulcer. They noted previous studies did not identify the ear as a common site for pressure ulcers. However, the most common body locations for pressure ulcers were the

sacrum (22.1%), the heels (14.8%), and the ears (13%). This prevalence of the ear lesions was even higher for the seven children in the study, with ear lesions present for 33.3% of them.

Literature Review: Co-Morbid Variables and Interventions for Pressure Ulcers

Contributing clinical risk factors for the development of pressure ulcers in an acute care setting include impaired nutritional status, low body weight, immobility, loss of sensation, a febrile condition, altered level of consciousness, incontinence, friction or shear, moisture, a chronic illness, and decreased fluid intake. Contributing demographic risk factors for the development of pressure ulcers are advanced age and male sex (Holst et al., 2010; Lepisto et al., 2000; Papanikolaou, Lyne, & Anthony, 2007; VanGilder, Amlung, Harrison, & Meyer, 2009.).

Poor nutrition (low levels of protein, vitamins, and minerals) as well as malnutrition are central to the development of pressure ulcers. Patients with pressure ulcers are often undernourished, exhibiting a low serum albumin due to inadequate protein intake. Also, they frequently have deficiencies of vitamin C, zinc, iron, and other minerals (Langemo et al., 1991; Papanikolaou et al., 2007; Pieper et al., 2009). Thomas (2001) reviewed various treatment strategies and suggested nutrition is the most important reversible host factor contributing to wound healing (Pieper et al., 2009; VanGilder et al., 2009).

An important impetus to study pressure ulcers is their difficulty to heal. Once they develop, these chronic wounds are very resistant to any known medical therapy. Estimates of complete healing for pressure ulcers are as low as 10% (Harrison et al., 2008; Kottner et al., 2009; Michocki & Lamyu, 1976). Healing rates for stage 3 pressure ulcers may be as high as 59% in 6 months, but other patients require treatment duration of up to 1 year (Harrison et al., 2008; Kottner et al., 2009; Michocki & Lamyu, 1976). Prevention thus offers the best opportunity for management of the ulcers (Bolton et al., 2008; Harrison et al., 2008; Pieper et al., 2009). A well-educated staff who actively utilize preventive techniques is central to the identification of pressure ulcer risk and prevention of pressure ulcer development (Anthony, Parboteeah, Saleh, & Papanikolaou, 2008; Harrison et al., 2008; Holst et al., 2010; Pieper et al., 2009; Thomas, 2001).

Assessment Tools

The Braden and the Norton scales were recommended by the Agency for Health Care Policy and Research (AHCPR, now the Agency for Healthcare Research and Quality) (Fisher, 2004). Developed in the 1960s, the Norton scale was the first recognized pressure ulcer risk assessment instrument (Norton, McLaren, & Exton-Smith, 1975; Norton, 1996). In this scale, the total risk score is a linear function of five risk factors considered important by Norton. The total score indicates the risk of pressure ulcer development based on assessment of five factors: general physical condition, activity, mobility, incontinence, and mental state (Anthony et al., 2008; Moore, Cowman, & The Cochrane Collaboration, 2008; Pancorbo-Hidalgo, Garcia-Fernandez, Lopez-Medina, & Alvarez-Nieto, 2006; Papanikolaou et al., 2007). The Braden scale has been used more widely to examine factors associated with pressure ulcers. This tool, which first was tested in hospitalized patients in intensive care units, was found to be highly reliable, especially when used by registered nurses (r=0.99). It was derived from a conceptualization of etiologic factors in pressure ulcer formation (AHCPR, 1994; Bergstrom et al., 1987; Bergstrom, Demuth, & Braden, 1987; Braden & Bergstrom, 1987).

A third tool is the Guideline for Staging of Pressure Ulcers scale described in the Wound, Ostomy, and Continence Nurses Society's 1992 Standards of Care (AHCPR, 1994; Panel for the Prediction and Prevention of Pressure Ulcers in Adults, 1992). This tool established the standard for defining the characteristics of various stages of pressure ulcers. It is the definitive tool utilized by nursing and health care industries for staging and consequently treating pressure ulcers. Since 1989, the staging system developed by the National Pressure Ulcer Advisory Panel (NPUAP) has been one of the most widely used pressure ulcer classification systems (Maklebust & Margolis, 1995). The staging system was developed originally to guide clinical description of the depth of tissue destruction that occurs with pressure ulcers. In February 2007, the NPUAP revised the definition of a pressure ulcer and the stages of pressure ulcers, adding two stages on deep tissue injury and unstageable pressure ulcers (Black et al., 2007; NPUAP, 2007).

Research Design

The current study utilized a descriptive, correlational design. The dependent variable was the presence of a pressure ulcer of the ear, operationally defined by the 1992 Standards of Care of the Wound, Ostomy, and Continence Nurses Society (WOCN). Correlate variables were co-morbid and demographic variables that have been linked in the literature to increased risk of pressure ulcer development (Holst et al., 2010; Lepisto et al., 2000; Papanikolaou et al., 2007; VanGilder et al., 2009)

Setting, Sample, and Sampling Procedures

The setting for this study was a 42-bed acute care medical-surgical unit at a 550-bed level I trauma center and teaching hospital in the Midwest. At the time of data collection, the unit's average daily census was 32 patients and the average length of stay was 3.7 days. Average patient age was 72. Approximately 55 patients were discharged from the unit per week.

The research team recruited a convenience sample of 100 subjects. Respiratory staff provided a daily list of all patients on the study unit

receiving oxygen via nasal cannula. All English-speaking patients who were receiving oxygen delivered by nasal cannula during hospitalization and who consented to participate in the study were eligible for inclusion. Exclusion criteria included non-English-speaking and hospice patients.

Instruments

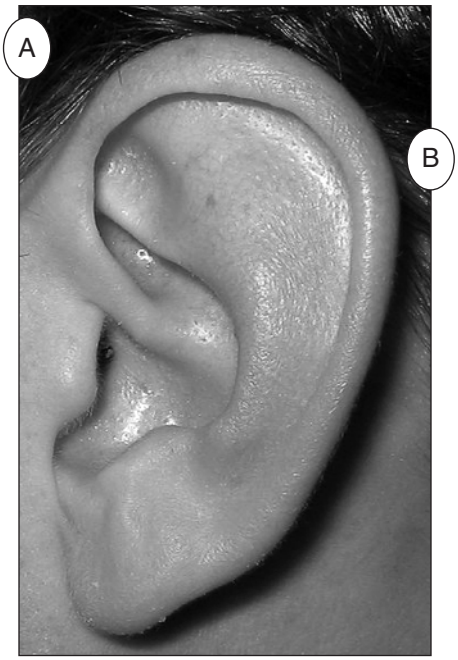
The Turjanica Pressure Ulcer of the Ear Data Collection Tool was designed specifically for this study to address demographics, including patient name, age, sex, weight, admission date, and medical record number. In addition to skin assessment data for two targeted areas around the ear, the tool includes assessment of any patient discomfort in the area where the nasal cannula rests on the ears (otobasion superior and post-auricular areas) (Weerda, 2007) (see Figure 1). The tool identifies the approximate length of time the patient has received oxygen via nasal cannula for the current admission, possible use of oxygen at home/place of residence, the patient's use of eyeglasses, and any other skin ailment that might impact the skin condition around the ears, such as psoriasis.

A second source of information for this study was completion of the Braden scale (Bergstrom et al., 1987; Braden & Bergstrom, 1987; Braden & Bergstrom, 1989). The scale has been used at the study facility for more than 4 years. At the time of the study, nurses documented the patient's Braden score on admission and weekly via the computer. Other co-morbid conditions identified through the literature review include low body weight, febrile condition during hospitalization (defined as a temperature greater that 100.4˚ F), and primary/secondary diagnoses.

Data Collection Procedures

A main goal of the research team was involvement of staff nurses on the study unit. The team included a staff nurse as co-investigator who participated in all planning sessions, served as unit champion, and assisted with educating peers. Members of the research team coordinated and provided unit-based education to staff on all shifts about the study and their roles. The team stressed the value of staff nurse participation and the minimal demands on nurses' time. For improved assessment consistency, the education also included a review of pressure ulcer staging. Each nurse received a laminated card with both visual and written descriptions of pressure ulcer staging based on the WOCN/NPUAP Guidelines (Black et al., 2007) along with Braden scale criteria. The cards were provided by Hill-Rom and attached to employee identification badges.

FIGURE 1.
Two sites assessed for skin breakdown: (A) otobasion superior and (B) post-auricular area



Once the study received approval from the NRC and full review and approval from the institutional review board, the research team began data collection. Data collection involved enrolling and consenting the patients, asking patients/families a few brief questions about oxygen use, visually assessing skin condition at two specific points around the ear, identifying use of any skin protection measure, and retrieving computer data. A graduate nursing student was available to assist with locating, enrolling, consenting, and interviewing patients. In addition, the graduate student and patient's staff nurse jointly assessed the skin condition around the patient's ears, providing greater inter-rater reliability on the assessment. If skin breakdown was present, the nurses appropriately staged and documented lesions on the Turjanica Pressure Ulcer of the Ear Data Collection Tool based on the WOCN/NPUAP Guidelines (Black et al., 2007). This brief assessment piece allowed greater staff involvement without putting undue burden on the nurse's time. Data for the correlate variables were collected by the research team from patients' electronic medical records.

Results

Among the assessed patients (n=100, using a confidence interval of 95%), the incidence of skin breakdown was 37%, with a range of 28%-47%. Only one patient exhibited pressure ulceration proximal to the ear on admission. Remaining cases were iatrogenic. The hospital-acquired incidence of right and left ear ulceration was similar, with a slightly higher rate observed in the otobasion superior region when compared to the post-auricular region. Only two patients had ear protectors in place. Stage I ulcers predominated in the series; no stage III or IV pressure ulceration was observed.

No statistically significant associations existed between skin integrity and patient demographics (age, sex, body mass index) or numerous other variables (use of glasses, pain at site, other skin condition at site, febrile status, Braden score). One variable only – lack of home oxygen use – predicted the presence of ear pressure ulcers (chi square=6.113, p=0.013) (see Table 1). The rate of ulceration among non-home oxygen users was 47.4% (n=27/57); whereas, the rate of ulceration among patients with home oxygen was 23.3% (n=10/43). Although not statistically significant, the number of days with oxygen use was lower

TABLE 1.
Presence of Ear Pressure Ulcers and Home Use of O_2

Presence of Ear Pressure Ulcer and *No Home Use of O_2*	Presence of Ear Pressure Ulcer and *Home Use of O_2*
N=27/57	N=10/43
47.4%	23.3%

$X^2 = 6.113$, $p = 0.013$

among patients with skin breakdown, compared to those without skin breakdown, 146 ± 365 days vs. 280 ± 517 days, respectively (Student's t test=1.351, p=0.180).

Discussion

Results demonstrated an incidence of pressure ulcers of the ear three times higher than noted on the facility's quarterly skin assessment audits (37%). The research team questioned this result and investigated further by questioning several nurses and the graduate student who participated in data collection. All involved were able to describe accurately the various stages of pressure ulcer development. Upon subsequent quarterly skin assessment audits, this result was validated by an incidence of 36%.

The one finding of statistical significance indicated patients who are new to oxygen delivery via nasal cannula are the most susceptible to skin breakdown of the ears. The principle finding suggests nurses should intervene early with the use of ear protectors. The research team anticipated a strong correlation between Braden scores and risk for breakdown on the ears, but data did not support this expectation.

As a result of this study, nursing staff collaborated with wound care and respiratory staff to advocate for and purchase ear protectors for use with nasal cannula. The ear protectors serve to preempt any skin breakdown. After study results were disseminated via the nursing council structure, ear protectors were stocked on each inpatient unit adjacent to the nasal cannula tubing. This change in clinical practice occurred throughout the system's three acute care facilities. After this practice change was implemented, further skin assessment audits revealed no additional occurrence of pressure ulcers of the ear.

Nursing Implications

Nurses may not assess the condition of skin around the ear unless a patient complains of a problem in that area. Medical-surgical nurses play an important role in preventing this type of skin breakdown due to the volume of patients who require oxygen via nasal cannula. Assessment of skin condition around the ears needs to become common practice. Early intervention, especially for susceptible persons, can minimize the discomfort, tissue damage, and infection risk from these lesions.

Conclusion

Performance improvement data can serve as a rich medium for the creation, development, and implementation of a research study. At the study facility, PI data provided the impetus for further investigation through the nursing research process of this problem of pressure ulcers of the ear. Over one-third of patients in this study demonstrated some level of tissue damage around the ears. Changes instituted as a result of this study have brought that number to zero. Findings supported a necessary change in clinical practice, and interdisciplinary collaboration provided the means to establish the change. MSN

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