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Skin Integrity in Hospitalized Infants and Children
A Prevalence Survey

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The purpose of this paper was to describe the spectrum of alterations in skin integrity and skin care needs of hospitalized infants and children. A 1-day skin prevalence audit was conducted in the spring of 2005 in a tertiary care university-affiliated children's hospital. Patient skin was assessed for any alterations. The Braden Q Scale was used to assess patient risk for pressure ulcer development. Alterations in skin integrity included diaper dermatitis, pressure ulcers, intravenous infiltrations, device-related injuries, and epidermal injuries. Many patients required additional skin care, including wound/incision care, ostomy care, and care related to invasive devices. Alterations in skin integrity represent a serious problem in the pediatric inpatient setting. The data presented identify skin integrity challenges in the hospitalized patient and can help guide staff education and resource allocation, encourage evidenced-based management protocols, and serve as a benchmark for similar pediatric facilities.

IT IS WELL known that alterations in skin integrity represent a serious and often preventable problem in the pediatric acute care environment. The negative effect of immobility and physiological instability on a patient's skin does not discriminate with regard to age or developmental level. Epidermal disruptions from medical devices, incontinence, wounds, and therapies can leave the child susceptible to infection. Although pediatric patients experience many of the same skin problems well described in hospitalized adult patients, unique challenges do present in the young population.

The cost of alterations in skin integrity is substantial, both in terms of human suffering and financial expense. At times, a bandage alone will not comfort the pain associated with skin breakdown. Although healthy skin decreases the patient's risk for infection and contributes to improved patient outcomes, interventions aimed at maintaining skin integrity are often used without evidence in the pediatric acute care environment and could be potentially harmful.

Although maintenance of skin integrity is a nursing research priority (Harrison, Wells, Fisher, & Prince, 1996) and an acute care nursing quality of care indicator (American Nurses Association, 1995), few data comprehensively describe this phenomena in the acute care pediatric setting. This paper will describe the prevalence of alterations in skin integrity and the spectrum of skin care needs in a large, tertiary care, university-affiliated children's hospital. Adequate description of the phenomena will help guide staff education and resource allocation, allow a pediatric comparison to comparable adult patient data, encourage evidenced-based treatment protocols, and serve as a benchmark for similar pediatric acute care facilities.

METHODS

A 1-day skin prevalence audit was conducted in the spring of 2005. Data were collected on all

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15 inpatient units in a university-affiliated tertiary care children's hospital. All patients listed on the 9:00 a.m. hospital census were included. Patients over 18 years of age on the day of hospital admission, patients who were dying after the redirection of life support, and patients hospitalized on the inpatient psychiatric unit were excluded. Patients over 18 years of age are not considered pediatric patients. Skin assessments requiring turning may be uncomfortable for dying patients and thus were deferred, and daily skin assessments on inpatient psychiatric patients are not considered a standard of care. The bedside nurses informed all patients and parents of the audit. An informational letter, available in English and Spanish, was distributed to all patients and/or their parents prior to the audit. The letter described the purpose and details of the audit and explained their right to refuse inclusion of their or their child's de-identified data. Interpreters were available for non-English- and/or non-Spanish-speaking patients and parents. Because this audit was a quality improvement initiative designed to improve clinical care to better conform to accepted standards of practice, it was not considered research in need of review by the Committee for Clinical Investigation.

Audit Tool

Skin integrity data were collected using an audit tool developed by the authors. Only de-identified patient demographic data were extracted from the medical record. Admission data were reviewed for any notation of preexisting pressure ulcers, diaper dermatitis, and/or peristomal skin compromise. Skin assessment data were collected during routine nursing care on the day of the audit.

The audit tool queried 12 data elements. Methodology involved direct physical examination, with comparison to established standards where applicable. We evaluated skin integrity in relation to (1) use of pulse oximetry, (2) peripheral intravenous catheters, (3) nasally inserted tubes, and/or (4) any other invasive tubes (excluding urethral catheters and oral endotracheal tubes). Prevalence of central venous catheters was collected; dressings were not removed for assessment. Also, skin integrity was assessed in relation to (5) incontinence, (6) tracheostomies, and/or other (7) ostomies. Specifically, the presence of irritant contact diaper dermatitis and peristomal skin breakdown were evaluated. Patients were also assessed for (8) presence of incisions/wounds, (9) epidermal stripping, (10) skin abrasions, (11) pressure ulcers, and/or (12) any other alterations in skin integrity.

The patient's risk for pressure ulcer(s) development was scored using the Braden Q Scale (Curley, Razmus, Roberts, & Wypij, 2003; Quigley & Curley, 1996). The Braden Q is a seven-dimension risk assessment tool for pediatric pressure ulcers. Scores range from 7 to 28 with a score of 16 or less identifying pediatric patients at risk for pressure ulcers. Diaper dermatitis was staged according to the status of the epidermis and presence/absence of a *Candida albicans* skin infection (Table 1). The skin surrounding a peripheral intravenous catheter that was continuously infusing fluid and/or used for an intermittent infusion within the past hour was assessed. All peripheral intravenous infiltrates were staged according to the Intravenous Nursing

Table 1. Types of Diaper Dermatitis

Type 1: Epidermis intact and no candidal infection present
Type 2: Epidermis intact and candidal infection present
Type 3: Epidermis not intact and no candidal infection present
Type 4: Epidermis not intact and candidal infection present

Table 2. Staging of Intravenous Infiltrates (Intravenous Nursing Society, 2000)

Stage 0: No infiltrate
Stage 1: Skin blanched, cool to touch, with or without pain, edema <1 in. in any direction
Stage 2: Stage 1 + edema 1–6 in. in any direction
Stage 3: Stage 2 + skin translucent; mild to moderate pain; possible numbness, gross edema >6 in. in any direction
Stage 4: Stage 3 + skin tight, leaking; skin discolored, bruised, swollen, circulatory impairment; moderate to severe pain, infiltration of any amount of blood product, irritant, or vesicant

Note: The Intravenous Nursing Society infiltration scale, although widely used with children, has not been normalized for evaluation of the pediatric population. The dimensions of tissue involvement defining Grade 2–4 (1 to >6 in.) may not be applicable in small children. Therefore, intravenous infiltrates in children less than 10 years of age are staged without reference to the size of tissue involved; Stage 1 does not exist.

Table 3. Wound/Incision Care Dressing Definitions

Level I care: Observation Dressing requires observation, such as primary dressing, adhesive strips or sutures requiring no daily care; a semiocclusive transparent dressing
Level II care: Simple dressing Gauze with tape or transparent dressing; dry sterile dressing changed once or twice per day
Level III care: Complex dressing, Any dressing changed more than twice a day; any wound with packing; any type of dressing that surrounds an invasive drain or tube (enteral tubes excluded)
Level IV care: Vacuum Assisted Closure (VAC) dressing

Table 4. NPUAP Pressure Ulcer Staging (NPUAP, 1989, 1998)

Stage 1
The ulcer appears as a defined area of persistent redness in lightly pigmented skin, whereas in darker skin tones, the ulcer may appear with persistent red, blue, or purple hues.
Stage 2
Partial-thickness skin loss involving epidermis, dermis, or both. The ulcer is superficial and presents clinically as an abrasion, blister, or shallow crater.
Stage 3
Full-thickness skin loss involving damage to, or necrosis of, subcutaneous tissue that may extend down to, but not through, underlying fascia. The ulcer presents clinically as a deep crater with or without undermining of adjacent tissue.
Stage 4
Full-thickness skin loss with extensive destruction, tissue necrosis, or damage to muscle, bone, or supporting structures (e.g., tendon, joint, capsule). Undermining and sinus tracts also may be associated with Stage IV pressure ulcers.

Society Standards of Practice (2000) (Table 2). Wounds and/or incision care were categorized according to complexity (Table 3). Pressure ulcers were staged according to the National Pressure Ulcer Advisory Panel (NPUAP) (1989, 1998) staging guidelines (Table 4). A detailed manual of operations with color photographs was created to decrease variation in data collection.

Staff Training and Interrater Agreement

One month prior to the audit, at least one nurse auditor from each participating unit attended a 2-hour training program. Only two sessions were offered to ensure educational consistency. At the completion of the program each participant completed a 16-item posttest to assess interrater agreement on the Braden Q scale, identifying type of diaper dermatitis and staging of intravenous infiltrates. When presented with a short scenario on each subscale of the Braden Q, participants in each session were independently able to reach 100% agreement within one point on the Braden Q scale. Analysis of other test items indicated >90% agreement when identifying type of diaper dermatitis, but neither group was able to independently reach >90% agreement when staging intravenous infiltrates. Given the nuances of staging intravenous infiltrates, a pediatric intravenous nurse reviewed the staging system, was tested, and reached 100% agreement with the staging standards for intravenous infiltrates. This intravenous nurse then staged all intravenous infiltrates on the day of the audit. All pressure ulcers were staged by two experts in pressure ulcers: a plastic surgery nurse practitioner and a certified wound, ostomy, and continence nurse (CWOCN). Prior to the audit, the two reached 90% agreement in staging 50 pressure ulcer photographs.

RESULTS

Of the 283 inpatients listed on the 9:00 a.m. hospital census, 31 patients were excluded. Specifically, 30 patients were 18 years of age or older and 1 patient was status post redirection of life support and moribund. The demographic characteristics of the 252 surveyed patients are presented in Table 5.

No patient was admitted with a pressure ulcer, 5 patients (2%) were admitted with diaper dermatitis, and 60 patients, almost a quarter of all patients, were admitted with some form of stoma (tracheostomy, gastrostomy, and/or ostomy). One of the 60 patients was noted to have peristomal skin compromise on admission, which was resolved by the day of the audit 2 months later.

Nearly 60% of patients (n = 148) were incontinent of urine and/or stool. Of these, 16%

Table 5. Patient Demographics (N = 252)

Age in years, median (IQR)	4.5 (0.6–11)
Newborn on admission, *n* (% total)	31 (12)
Gestational age on admission, mean ± *SD*	36 ± 4.3
Male gender, *n* (%)	132 (52)
Hispanic/Latino ethnicity, *n* (%)	27 (11)
Race, *n* (%)*	
White	186 (74)
Black	37 (15)
Asian	9 (4)
Middle Eastern	8 (3)
American Indian	1 (0.4)
More than one race	5 (2)
Age-appropriate functional health,† *n* (%)	130 (52%)
Primary service, n (%)	
Medical	94 (37)
Surgical	58 (23)
Medical–surgical	45 (18)
Intensive care (medical–surgical, cardiac, neonatal)	55 (22)
Ward patients transferred from the ICUs, *n* (%)	36 (19)
Operative procedure during hospitalization	124 (49)
Length (hours) most recent operative procedure, median (IQR)	4 (2–5)
Number of services involved, median (IQR)	4 (2–6)
Length of stay (days) prior to audit, median (IQR)	4 (2–12)

Note: Race and ethnicity categorized by data collectors; if unclear, patients were categorized by mother's race and ethnicity.

*Total does not equal 100%; race in 2% (n = 6) of patients could not be determined.

†Functional health categorized using the Pediatric Overall Performance Category score that ranges from 1 (*good overall performance*—healthy, alert, and capable of normal activities of life) to 5 (*coma or vegetative state*) (Fiser, 1992).

Table 6. Invasive Tubes (*N* = 252)

Nasally inserted tubes	41 (16%)
Breakdown at nares	2/41 (5%)
Unable to visualize because of taping	2/41 (5%)
Tracheostomy	11 (4%)
Breakdown present	1/11 (9%)
All other invasive tubes (transabdominal, chest, drainage tubes)	69 (28%)
Breakdown at site	11/69 (16%)
Primary dressing—unable to visualize	7/69 (10%)

(*n* = 24) developed contact diaper dermatitis after admission (63% epidermis intact/no *Candida*, 12% epidermis intact/*Candida*, 25% epidermis not intact/no *Candida*).

A total of 66% (*n* = 166) of patients had intravenous catheters: 38% (*n* = 96) had a peripheral intravenous catheter used within the previous hour, and 34% (*n* = 84) had a central venous catheter; 6% (*n* = 14) of these patients had both. Five patients had a second peripheral intravenous catheter also used within the previous hour. Four peripheral intravenous sites were infiltrated at the time of the audit: two Stage II infiltrates and two Stage IV infiltrates. Two of 12 recently used intravenous sites with vesicant infusions were infiltrated and constitute the two Stage IV infiltrates. Of those with a central venous catheter (*n* = 84), most were percutaneously placed, whereas 23% were peripherally inserted central catheters and 21% were implanted devices.

Forty-three percent of patients (*n* = 108) were noted to have a wound and/or surgical incision (median 1; Interquartile range [IQR], 1 to 8 wounds per patient). Most wounds (71%; *n* = 77) required nursing observation, 22% required twice daily dressing changes, 5% required complex dressing care, and 2% were managed using Vacuum Assisted Closure (VAC, Kinetic Concepts, Inc., San Antonio, TX) dressings.

Table 6 presents the prevalence of invasive tubes and the skin breakdown occurring with these devices. An additional 4% (*n* = 10) of patients had a gastrointestinal or urinary diversion ostomy; 7 patients had one stoma and 3 patients had two stomas. Half of the patient's ostomies were created during the current hospitalization. Ostomy care in 9 of the 10 patients was described as routine, qualified as once daily change in newborns or every other day change in all other age groups. No patient exhibited peristomal skin compromise around their gastrointestinal or urinary diversion ostomy at the time of the audit.

Patient risk for pressure ulcers was identified using the Braden Q scale (Curley, Razmus, et al., 2003; Quigley & Curley, 1996). The median Braden Q score was 26, with a range of 11 to 28. Approximately 6% (*n* = 14) of patients had a Braden Q score of 16 or lower, thereby identifying them to be at high risk for pressure ulcers. On the day of the audit, four pressure ulcers were identified, resulting in a 1.6% prevalence rate. One patient had a Stage II pressure ulcer over the knuckles on both hands, and one patient had a Stage II pressure ulcer on their right heel. Two infants had occipital ulcers; one was Stage I, and one ulcer could not be staged because it was covered with eschar. Although 3% of the patients were on a pressure relief or reduction mattress/overlay, none of these patients were identified to be at risk for pressure ulcers according to their Braden Q score.

Whereas 44% (*n* = 110) of all patients were monitored with pulse oximetery, 9% (*n* = 10) of these patients had pressure-related skin injury on fingers or toes from the saturation probes. An additional 3 patients were found to have pressure-related skin injury from other medical devices; specifically, from an intravenous catheter hub, a leg cast, and electroencephalogram electrodes.

Auditors also noted a variety of other alterations in skin integrity. Eight percent of patients (*n* = 20) were noted to have skin abrasions, 8% (*n* = 20) had epidermal stripping from tape products, and 10% (*n* = 24) had "other" skin compromise consisting of ecchymosis, dryness, eczema, rashes, contact dermatitis, skin fold compromise, and multiple lesions covering the entire body in one oncology patient.

From a system's perspective, the median unit census was 20 patients (5–36 patients per unit), and a total of 35 nurse auditors (1–4 nurses per unit) participated in the audit. Median time required for audit completion was 7 hours per unit (1–11 hours per unit).

DISCUSSION

These data illuminate, for the first time, the phenomena of alterations in skin integrity while also assessing skin care needs in an acute care pediatric population. Strengths of this audit include 100% eligible patient sampling and the use of nationally recognized operational definitions that will allow interinstitutional benchmarking. Also unique is the concurrent report of patient risk for and prevalence of pressure ulcers in this pediatric population. Low patient enrollment and inadequate risk adjustment

limit the generalizability of previous reports (Amlung, Miller, & Bosley, 2001; McLane, Bookout, McCord, McCain, & Jefferson, 2004; Zollo, Gostisha, Berens, Schmidt, & Weigle, 1996).

Typical of most tertiary-level children's hospitals, the patient population in this sample was complex. For example, 24% of patients were admitted with some form of stoma (tracheostomy, gastrostomy, and/or ileostomy), 49% of patients had experienced a surgical procedure, almost half of the patients were reported to be functioning lower than their age-appropriate norm, and most patients required the care of at least four medical/surgical services during their admission.

Diaper Dermatitis

Although a specific risk prediction tool for the occurrence of diaper dermatitis does not exist, known risk factors include the use of oral antibiotics, gastrointestinal surgical procedures, and a change in usual urine or stool content or pattern. The 17% prevalence of diaper dermatitis is lower than the 25% predicted to be found in children in the general diaper-wearing pediatric population (Ward, Fleischer, Feldman, & Krowchuk, 2000). Zollo et al. (1996) reported a 14% incidence of skin breakdown in the buttock/groin region, although the exact cause of their breakdown is unclear. McLane et al. (2004) reported a 42% prevalence of skin breakdown caused by excoriation/diaper dermatitis in their pediatric sample, but clear definition and varied location of skin compromise prevents a direct comparison.

Implications for Nursing Care

Diaper dermatitis is one of the most common dermatologic disorders in infants and diapered children. Nurses should be aware of risk factors, preventative measures, and treatments. Implementing consistent prevention strategies can greatly reduce the incidence of contact diaper dermatitis (Borkowski, 2004). Identifying known risk factors and standardizing prevention and treatment via algorithms have proved useful in our institution. Treatment of diaper dermatitis should depend on the severity and on the absence/presence of candidal infection.

Intravenous Catheters

This audit provides, for the first time, data about the prevalence of vascular catheters in hospitalized pediatric patients. There are no adult comparative data. Nearly 40% percent of patients had at least one peripheral venous catheter that was infusing fluids or intermittent infusions within an hour of the audit. This large percentage of patients, added to the 34% of patients with a central venous catheter, suggests a significant amount of nursing care dedicated to the management of these patients, specifically, vigilance, skin assessment related to the devices, and dressing changes. Data were collected only on peripheral venous catheters used with the last hour to meet the requirements of a National Database of Nursing Quality Indicators (NDNQI). If the data included peripheral venous catheter used within the previous 24 hours, our prevalence would be higher.

Four patients were found to have a peripheral intravenous infiltrate at the time of assessment, despite the fact that 13% of patients had a vesicant infused within the last hour. Extravasation rates as high as 15% have been reported (McLane et al., 2004). The number of children with a peripheral intravenous infusing a vesicant is concerning because extravasation of a vesicant can cause significant skin damage. Phlebitis is another common complication from peripheral intravenous therapy, although it was not found in any patients on the day of the survey (Lamagna & MacPhee, 2004).

Implications for Nursing Care

Infiltration and extravasation are frequent complications of peripheral intravenous therapy. Vigilant assessments and use of a standardized assessment tool aids in proper diagnosis, staging, and management of therapy and its associated complications (Lamagna & MacPhee, 2004). Centrally placed intravenous catheters should be considered for vesicant infusions when possible.

Wounds and Incisions

We describe the prevalence of wounds/incisions and invasive tubes in a hospitalized pediatric population. Although many patients had one or more wounds/incisions, data were collected on the nursing care required of the most complex dressing. Again, the large number (43% of patients, $n = 108$) noted to have a wound and/or surgical incision demonstrates a large portion of nursing time dedicated to management of the patient's skin.

Implications for Nursing Care

Pediatric patients are at risk for physiologic instability. Nonintact skin can increase the risk of instability and is a portal for infection. All wounds/

incisions require visual assessment at minimum. Careful attention to nutrition, oxygenation, and fluid balance can enhance wound healing and should be evaluated in any patient with a wound or surgical incision.

Invasive Tubes

Nearly 50% (n = 121) of patients had some type of indwelling invasive tube on the day of the audit, including tracheostomies, enteral tubes, and/or nasally inserted tubes. Compared with previous reports (Zollo et al., 1996), of 30%, only 5% of patients had nasal skin breakdown related to a nasally inserted tube. However, 16% of patients with other types of tubes did have breakdown (n = 11), whereas 10% (n = 7) of patients with tubes could not have the skin area examined secondary to taping. Many of these patients had indwelling enteral tubes (such as gastrostomy tubes). Our institution has guidelines and algorithms to guide the care of the skin around these tubes.

Implications for Nursing Care

Invasive tubes are common in the hospitalized pediatric patient. In one study, the nose was the most common area for altered skin integrity, although it is not clear if this was related to the use of nasally inserted tubes (Zollo et al., 1996). There is a risk of skin compromise related to the use of invasive tubes. Nurses should follow preventative measure such as the taping without tension and protective barriers under tape, as well as frequent assessment. In our institution these tubes are taped without tension to the skin covering the maxilla and routinely assessed, which can prevent nasal pressure.

Ostomies/Tracheostomies

In the adult population, peristomal skin compromise is not uncommon (Ratliff, Scarano, & Donovan, 2005; Roberston et al., 2005), but very few data exist about the prevalence of this phenomenon in the pediatric patient. Our patient population had no skin breakdown around gastrointestinal or urinary diversion ostomies (n = 10). We attribute these results to our standardized guidelines and algorithms relating to peristomal skin care. Chandramouli, Srinivasan, Jagdish, and Ananthakrishnana (2004), found a 30% peristomal excoriation rate and a 4% infection rate in their series of 146 pediatric colostomy creations.

Skin breakdown around tracheostomies is a fairly common problem. In one pediatric study (Carr et al., 2001), 27% of complications before first tube change were related to skin breakdown, and 3% of the patients developed cellulitis after the first tube change. In the current study, one of the patients (9%, n = 11) with a tracheostomy had skin breakdown. Again, our institution has a standardized guideline and algorithms relating to tracheostomy skin care.

Implications for Nursing Care

Skin care is essential for children with ostomies. In particular, meticulous tracheostomy site care is essential before the first tube change (Carr et al., 2001). Our low rate of peristomal skin compromise demonstrates that standardized and widely used skin care guidelines are effective in a large pediatric institution.

Pressure Ulcers/Braden Q Scores

Although the Braden Q scale identified 6% of our patient population to be at risk for pressure ulcers, our pressure ulcer prevalence rate was 1.6%. Thus, our severity-adjusted pressure ulcer ratio (observed over predicted) was 0.26. Until recently, pressure ulcers in the pediatric population were not recognized as different from adults. Initial studies combined pediatric with adult data, and although pediatric pressure ulcer prevalence was reported, the age groups of each study varied. Specifically, previous National Pressure Ulcer Surveys reported a 1% prevalence in the 0–19 years age group, whereas a later national survey reported the same 1% prevalence but in a 0–10 years age group (Barczak, Barnett, Childs, & Bosley, 1997; Meehan, 1994). More recent pediatric studies report pediatric prevalence rates raging from 4% to 13% (Groeneveld et al., 2004; McLane et al., 2004; Waterlow, 1997; Willock et al., 2000). In the hospitalized adult population, pressure ulcer rates up to 29.2% are reported (Amlung et al., 2001; Groeneveld et al., 2004). In the critically ill pediatric population a 27% incidence is reported (Curley, Quigley, & Lin, 2003). These data are difficult to evaluate without the concurrent reporting of pressure ulcer risk.

The location of pediatric pressure ulcers is comparatively different than the adult population. Adult pressure ulcers are usually found on the lower half of the body, specifically the heels and sacrum, whereas pediatric ulcers are often found on the occiput, ears, sacrum, and scapula (Amlung et al., 2001; Zollo et al., 1996). We report two infants with occipital pressure ulcers; this type of

pressure ulcer has been well described in critically ill newborns (Gershan & Esterly, 1993). The hand pressure ulcers in one patient occurred after a 7-hour operative procedure and were noted retrospectively to be caused by positioning.

Regardless of age, most pressure ulcers are partial thickness (Stage I or Stage II) (Amlung et al., 2001; Barczak et al., 1997; Meehan, 1994), which are easier to identify in Caucasians (Powers, 1997; Zollo et al., 1996). We report four patients with pressure ulcers. All were Caucasians, most non-Hispanic (n = 3), and had partial-thickness ulcers.

Implications for Nursing Care

Children are susceptible to pressure ulcers in areas different from those of the adult. Knowledge of the more common pressure ulcer sites in children should help guide preventative measures. Proper identification of at-risk patients and implementation of pressure reduction or relief strategies are essential for pressure ulcer prevention. For example, careful attention should be paid to frequent repositioning (Harris et al., 2003). Risk assessment methods should be specific to pediatric patients (Zollo et al., 1996). One such assessment tool is the Braden Q (Curley, Razmus, et al., 2003). Aggressive preventative measures should be utilized if a risk assessment tool indicates high risk. For example, a Braden Q score of 16 or lower should prompt the user to initiate a proper bed surface (Curley, Razmus, et al., 2003). Standardizing preventive and therapeutic strategies is cost saving. For example, none of the at-risk patients in this study were on specialty support surfaces, although three patients not at risk (according to the Braden Q score) were on these surfaces. Standardizing guidelines regarding specialty surface use would prevent this problem, and we hope to institute this based on our results.

Implementing evidenced-based practice guidelines can decrease variations in care. If possible, wound management experts may be involved in a patient's care, but all nurses should be knowledgeable about the wound care products and surfaces used by their institution.

Device-Related Skin Injuries

Similar to previous reports (Curley, Quigley, & Lin, 2003), medical devices contributed to pressure-related skin injury in our population. This type of skin injury has not been well described in either the adult or the pediatric hospitalized populations, and description of the phenomena is plagued by the use of ambiguous terms, such as skin breakdown, erythema, and/or pressure abrasions. Previous reports have described pressure-related injuries from casts and cervical collars in adults (Powers, 1997; Wukich & Motko, 2004), spinal immobilization boards in children (Murdoch, 2002), a continuous positive airway pressure device (Dixon & Ratliff, 2005), and spinal braces and casts in children (Matsumura, Makino, & Watanabe, 1995; Muller & Nordwall, 1994). In their 20-year review of patients with myelomeningocele (ages unknown), Okamoto, Lamers, and Shurtleff (1983) reported a 23% incidence of pressure-related skin injuries from casts or orthotics. Similar to the current study, Zollo et al. (1996) reported a 6% incidence of pressure-related skin injury related to pulse oximetry. Curley, Quigley, & Lin (2003) reported a 9% incidence of pressure-related skin injuries from medical devices in the critically ill pediatric patients. In the current study, 9% of patients monitored with a pulse oximetery developed a pressure-related skin injury from the saturation probe.

Implications for Nursing Care

The mechanism of device-related pressure injury is similar to pressure ulcers caused by immobility, but prevention methods are different (Curley, Quigley, & Lin, 2003). Early staff identification of device or usage problems can help prevent device-related injuries (Feigal, Gardner, & McClellan, 2003). Pulse oximeter probes commonly cause pressure-related skin injury. Daily checks and care of the skin under continuous monitoring devices attached to the skin can be preventative. Our institution routinely changes continuous oximeter probe sites every 2 hours. Nurses must be aware that restrictive medical devices (such as braces and orthotics) can cause skin injury. Local red areas indicate pressure and require device adjustment (Muller & Nordwall, 1994). Utilizing correct placement technique with any device can help prevent skin injury. Inserting pressure-relieving materials between the patient and a device can be useful, but care must be used not to cause further pressure.

Other Skin Conditions

Interestingly, we found little evidence of common pediatric dermatologic skin issues in our population. The prevalence of contact dermatitis, eczema, and/or rashes, which are often found on

routine pediatric health care visits, was extremely low. The prevalence of epidermal stripping was 8%; McLane et al. (2004) found 17%. Our lower rate may be related to the routine practice of using skin barrier protective films and avoiding direct tape to skin contact.

Implications for Nursing Care

Epidermal stripping can be a common problem in hospitalized patients. Using skin barrier protective films and pectin-based "anchors" for tape can prevent epidermal stripping by eliminating direct tape-to-skin contact.

There were several limitations to this study. Prevalence audits are subject to seasonal variation. We audited our practice in the spring, which does not capture the fall/winter viral illnesses and their concomitant increase in use of antibiotics that may impact the diaper dermatitis rate. The use of unit-based data collectors increased the validity of data collection, but numerous data collectors might have decreased the reliability of the data. Also, some epidermal injuries develop over time and may not have been fully evident on the day of the survey. Prevalence audits can also be affected by preventative measures already in place.

CONCLUSION

Skin integrity is a well-established quality indicator of the nursing care provided in acute care settings (American Nurses Association, 1995) The paper describes the prevalence of a variety of alterations in skin integrity in a large tertiary care university-affiliated children's hospital. A description of skin alterations and skin care needs reflects and validates the complexity of inpatient nursing care and can help guide nursing staff education and resource allocation. We encourage the use of evidenced-based treatment protocols, for example, use of the Braden Q Pressure Ulcer Risk Assessment to identify children at risk for pressure ulcers and to drive decisions regarding alternative bed surfaces and other preventative measures. We invite replication of this audit so that similar pediatric acute care facilities can benchmark their data.

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