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Examining Prevalence and Risk Factors of Incontinence-Associated Dermatitis Using the International Pressure Ulcer Prevalence Survey

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ABSTRACT

PURPOSE: To evaluate prevalence and risk factors of incontinence-associated dermatitis (IAD).

DESIGN: Retrospective analysis of 2016 International Pressure Ulcer Prevalence survey data.

SUBJECTS AND SETTING: Adult patients who were in acute care, long-term acute care, long-term care, and rehabilitation facilities in the United States and Canada.

METHODS: IAD prevalence was calculated among all patients surveyed, among the incontinent patients only, across multiple care settings, and by incontinence type. A logistic regression examined risk factors for IAD in the incontinent population.

RESULTS: Nearly 1 in 5 incontinent patients had IAD documented. Incontinence-associated dermatitis prevalence in the entire patient population was 4.3% while incontinence prevalence was 18%. Of incontinent patients, prevalence of IAD ranged from 8.4% in long-term care facilities to 19% in acute care facilities. Facilities with higher rates of incontinence did not necessarily have higher prevalence of IAD. Incontinence-associated dermatitis prevalence by incontinence type ranged from 12% for patients with urinary incontinence to 26% for patients with fecal management systems. Regression results support the association of the following factors with an increased likelihood of IAD documented: all types of incontinence, fecal management systems, higher body weight, diminished mobility, additional linen layers, longer length of stay, and lower Braden Scale scores.

CONCLUSIONS: Incontinence-associated dermatitis remains a concern in acute care settings. Risk factors associated with IAD were similar to risk factors previously reported for hospital-acquired pressure injuries, such as limited mobility, longer lengths of stay, and additional linen layers. By consistently documenting IAD as well as pressure injury prevalence, facilities may benchmark overall skin prevention models.

KEY WORDS: IAD, Incontinence, Incontinence-associated dermatitis, Moisture-associated skin damage, Prevalence, Risk factors, Skin care.

INTRODUCTION

Incontinence-associated dermatitis (IAD) is one type of skin damage that is increasingly recognized by clinicians and researchers[1] and is defined as an inflammation and/or erosion of the skin associated with exposure to urine or stool.[2] The condition can be painful[3,4] and is a known risk factor for pressure injuries.[5,6]

A review of the emerging literature on IAD revealed a wide range of prevalence estimates from 5.2% to 46%.[6] The difference in rates is potentially due to differences in care settings studied, methods used to assess presence of IAD, and differences in how prevalence was reported. There are 2 general methods used to calculate the prevalence of IAD. The first is the percentage of the overall hospitalized population, which includes both continent and incontinent patients to better understand how common or prevalent IAD is. The second method is to measure the percentage of patients with IAD among the incontinent patient population. Because incontinent patients are the only patients at risk of developing IAD, it seems reporting this percentage would be a more accurate reflection of this condition. However, this study reports both numbers to enable comparisons to other studies.

Prevalence of IAD varies considerably across care settings. Some have posited that patients in long-term care settings are at greater risk of IAD because they are older and are more likely to be incontinent.[7,8] In a study of German long-term care facilities, 5.2% of the overall patient population was found to have IAD while prevalence among the incontinent sample was 21%.[9] In a study of long-term care facilities in the United States the overall prevalence of IAD was 5.7%; prevalence among the incontinent population was not reported.[8] Findings from a 2-arm interventional study conducted at a Belgian long-term care facility showed baseline IAD prevalence of 22.8% in the control group and 22.3% in the experimental

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group.[10] All subjects had to be chronically incontinent (urine, fecal, or dual) to be eligible for inclusion in the study.

Prevalence of IAD in various care settings varies. In a single US long-term acute care facility, Long and colleagues[4] reported an IAD prevalence of 22.8% in the continent and incontinent populations; IAD prevalence for the incontinent population only was not reported. Junkin and Selekof[11] reported that IAD prevalence was 20% in the incontinent population in 2 US acute care hospitals. The overall prevalence of IAD in the entire population was not reported but can be calculated (24 out of 608 patients surveyed) at 3.9%. In a study of acute care and long-term acute care facilities in Austria and the Netherlands, Kottner and colleagues[12] reported the prevalence of 2.3% for the entire patient population and 6.1% for the incontinent population. In US acute care settings, Gray and Giuliano[6] found an overall prevalence of 21.3% and a prevalence of 45.7% in the incontinent population. This analysis included acute care units that were selected by wound care nurses as being high risk for pressure injury.

Risk factors for IAD related to patient characteristics include increased age,[11] higher body mass index,[4,9,12] female gender,[9] and diabetes.[12] It has been posited that increased age is positively associated with IAD because the skin's ability to act as a moisture barrier degrades over time.[13,14] However, other study data suggest that IAD is not a result of age alone.[15] A few multivariable regression analyses examining IAD factors have not found a statistically significant relationship with age when controlling for other factors correlated with age such as mobility.[8,9]

Decreased mobility[6,12] and diminished sensory perception[4] are well-documented clinical factors associated with IAD. Others clinical factors include increased friction and shear[4,12] and bathing with soap and water[4]—both of which interrupt the skin's structural integrity. Finally, some data suggest fecal incontinence has an even greater impact on developing IAD than urinary incontinence[8,12] while others dispute this relationship.[9,11] Lastly, environmental factors such as layers of linen (number of layers between the patient's skin and the support surface) and how usage of incontinence management systems impacts IAD have received less study.

Information about the prevalence of IAD is needed to inform policy and benchmark prevalence over time. The influence of facility and patient attributes on incidence of IAD also allows caregivers to better target prevention measures. To address these needs, the following research questions were posed:

1. What is the overall prevalence of IAD in a large sample of patients?
2. What is the prevalence of IAD among incontinent patients, across various care settings, and types of incontinence?
3. Which patient and facility attributes affect the likelihood of having IAD?

METHODS

This study was a retrospective analysis of data collected from the 2016 International Pressure Ulcer Prevalence (IPUP) survey. The IPUP is a voluntary point prevalence survey conducted to help facilities benchmark pressure injury prevalence changes year over year. The addition of an IAD question in 2016 allowed facilities to also benchmark IAD prevalence. Methods and earlier results from IPUP surveys have been previously published.[16-20] Briefly, each participating facility designates a survey coordinator who facilitates patient skin assessments on the day of the survey. The coordinator has 24 hours to collect information on all patients. Each year, the survey takes place in February for consistency across years. The coordinators are provided with written instructions on how to answer the questions on the survey. However, the accuracy of the responses—particularly when it involves identifying whether the patient has IAD or the stage of pressure injury—depends on the experience and knowledge of the survey coordinator.

Study Procedures

The data we collected for our study were limited to adults 18 years and older who were hospitalized in acute care, long-term acute care, or resided in long-term care, and rehabilitation facilities located in the US or Canada. Analyses were limited to 2016 data because the IAD question appeared for the first time that year. Analyses were further limited to patients with complete data for all variables in the analyses listed in Table 1. The primary outcome variable was whether the patient had IAD (1 = yes, 0 = no). If a patient was incontinent, survey coordinators were instructed to answer whether the patient had IAD. However, they were instructed to skip the IAD question if the patient was continent. Thus, given the survey design, it was not possible to have a continent patient with IAD.

For each patient surveyed, survey coordinators were instructed to select all types of incontinence that applied to the patient during their stay. They could select from the following types including urine, fecal, indwelling catheter, ostomy, fecal management system, or continent. For these analyses, patients with urinary and/or fecal incontinence, or fecal management systems, were considered incontinent. Patients with only ostomies or indwelling catheters were not included in the incontinent sample. Ostomies are thought to contribute to

TABLE 1.
Characteristics of Patients With Completed Records[a]

Characteristics	n (%) or Mean ± SD
IAD	2,406 (4.3)
Incontinent	
Urine, no fecal	3,948 (7.0)
Fecal, no urine	3,814 (6.7)
Urine and fecal	5,451 (9.6)
Fecal management system	586 (1.0)
Participant characteristics	
Age, y	65 ± 17
Female	28,777 (51)
Patient weight, kg	87 ± 33
Mobility status, bed	28,557 (51)
Braden Scale score	18 ± 3.4
Care setting	
Acute care	49,784 (88)
Long-term acute care	894 (1.6)
Long-term care	3,551 (6.3)
Rehabilitation	1,980 (3.5)

Abbreviations: IAD, incontinence-associated dermatitis; SD, standard deviation.
[a]N = 56,209. Of the 586 patients with a fecal management system, 184 have an additional type of incontinence.

peristomal moisture-associated dermatitis, not IAD.[13] Patients with indwelling catheters were not included in the incontinent sample because a catheter is thought to divert the moisture away from the skin and therefore these patients might not have been at risk of developing IAD.[11,12] Fecal management systems divert feces away from the skin, but they often leak leaving patients at risk for skin irritation.[11,21] Thus, patients with fecal management systems were considered at risk of developing IAD and were included in the incontinent sample. For the final analysis, types of incontinence included in the analyses were urine only, fecal only, combination of urine and fecal, and presence of a fecal management system.

Patient characteristics included in the model were age, gender, weight, mobility status, and total Braden Scale for Predicting Pressure Sore Risk score.[22] Age was censored at 90 years to protect patient information. Patient weight less than 34 kg and more than 430 kg was excluded as these values corresponded to the 0.5th and 98th percentiles of the incontinent sample, and were likely documentation errors. Mobility status was defined as restricted to bed (restricted to bed = 1, not restricted to bed = 0). The Braden Scale score documented upon admission was used in the model analysis. While the model included measures of incontinence and mobility, which are each contributing factors to the Braden Scale score, the IPUP survey does not collect data on the patient's sensory perception, activity, nutrition status, or the amount of friction and shear the patient is subjected to. Including the Braden Scale score indirectly controls for those missing risk factors. Only patients with valid Braden Scale scores between 6 and 23 were included.

Characteristics of the patient's stay included length of stay and number of layers of linens on the bed. To prevent undue influence of outliers while preserving those observations, length of stay was censored at the 90th percentile. Survey coordinators reported number of linens as 1, 2, 3, 4, 5, 6, or more than 6 layers. The coordinator was to "count each item (including diapers/briefs) between support surface and patient." "Each fold in the linen should be counted as a layer" per survey instructions.

Characteristics of the facility included the type of care setting, the number of patients surveyed at the facility, and whether the facility was in the US or Canada. Types of care settings were acute care, long-term acute care, long-term care, and rehabilitation, where long-term acute care hospitals specialize in treating patients requiring extended hospitalization. Long-term acute care hospitals serve as a bridge from acute care to rehabilitation, long-term care, or home care. The number of patients surveyed at each facility was included as an approximation for the size of the facility. The facility's country of location was included to account for the impact of different care practices.

Data Analysis

Table 2 illustrates which data were selected to address each of the 3 research questions. Prevalence of IAD was calculated in 2 ways. First, we calculated the percentage of patients with IAD among all patients meeting inclusion criteria. This "overall prevalence" is meant to provide an understanding of how common IAD is in the US and Canada and across various care settings. Second, we calculated the prevalence of IAD among incontinent patients, since this is the population at risk of developing IAD.

Risk factors for IAD were modeled using logistic regression. The sample used in the regression was limited to incontinent patients, which allowed us to answer our third research question of which patient and facility attributes affect the likelihood of a patient having IAD. It is impossible to examine why continent patients would be more likely to develop IAD, because they were not at risk of developing the condition. Thus, they were excluded from the analysis.

The sample was characterized by descriptive statistics using means and standard deviations for continuous variables and percentage of the sample with the characteristic for binary variables. Significance was set to α equals .05 for all analyses. Odds ratios (ORs), 95th percentile confidence intervals, and *P* values were reported for all risk factors. Nagelkerke's R^2 and a C-statistic are reported for measures of the model's goodness of fit. Continuous variables were scaled such that units represented clinically meaningfulness. Scaling impacts the magnitude of the effect size to aid interpretation of the results, but it does not impact *P* values. Age was converted to 10-year increments, weight to 20 kg, length of stay to 5 days, and number of patients surveyed to 50-patient increments. This study was reviewed by the Schulman Institutional Review Board (reference # 201605347) and found to be exempt. All analyses were performed using Stata 14.2 software (College Station, Texas).[23]

RESULTS

The 2016 survey included 117,988 patients admitted to or residing in 1115 facilities worldwide. After limiting the sample to adult patients in US or Canadian facilities with complete records, the final sample included 56,209 patients from 818 facilities. There were 13,615 incontinent patients in 753 facilities (Table 2).

The characteristics of the patients are summarized in Table 1. The overall prevalence for incontinent patients was 18%. For the sample of both incontinent and continent patients (n = 2406 patients of entire final sample of patients with complete records—n = 56,209) who were both incontinent or continent, the overall prevalence was 4.3%. For patients meeting inclusion criteria, there were 7.0% (n = 3,948) with urinary incontinence, 6.7% (n =3814) with fecal incontinence, 9.6% (n = 5451) with both urine and fecal incontinence, and 1.0% (n = 586) with a fecal management system.

Table 3 reports IAD prevalence by care setting. Incontinence-associated dermatitis prevalence among all patients was highest in long-term acute care settings (9.1%, n = 10/1204)

TABLE 2.
Description of Samples Used in Analyses

Research Question	Description of Sample	Patients
1. Prevalence of IAD among entire sample	Overall sample meeting inclusion criteria	56,209
2. Prevalence of IAD among incontinent sample	Sample size for question 1 that includes only patients who were urine and/or fecal incontinent or had a fecal management system	13,615
3. Risk factors that contribute to IAD	Sample size for question 2	13,615

Abbreviation: IAD, incontinence-associated dermatitis.

TABLE 3.
Incontinence-Associated Dermatitis Prevalence by Care Setting and Incontinence Status

Care Setting	Patients	Incontinent Patients	Incontinent, %	IAD	Overall IAD Prevalence, %	Incontinence Prevalence, %
Acute care	51,045	10,807	21	2,094	4.1	19
Long-term acute care	1,204	609	51	110	9.1	18
Long-term care	3,035	1,900	63	160	5.3	8.4
Rehabilitation	925	299	32	42	4.5	14
Entire sample	*56,209*	*13,615*	*24*	*2,406*	*4.3*	*18*

Abbreviation: IAD, incontinence-associated dermatitis.

and lowest in acute care settings (4.1%, n = 2094/51,045). The percent of patients who were incontinent varied from 63% (n = 1900/3035) in long-term care facilities to 21% in acute care facilities (n = 10,807/51,045). Incontinence-associated dermatitis prevalence among the incontinent sample was highest in acute care (19%, n = 2094/10807) and lowest in long-term care (8.4%, n = 160/1900). Prevalence for IAD among the incontinent sample for all care settings was 18% (n = 2406/13,615). Table 4 reports IAD prevalence by type of incontinence. The prevalence ranged from 26% (153/586) for patients with fecal management systems to 12% (486/3948) for patients having incontinence of urine, but not fecal incontinent.

Table 5 reports the results of the logistic regression modeling IAD risk factors among the incontinent patients (n = 13,615). The overall model fit was 0.054 (Nagelkerke's R^2) and the C-statistic was 0.64, which indicated moderate to poor fit. As compared to patients with urine incontinence, patients with fecal incontinence only (OR = 1.61; <.001), fecal and urine incontinence (OR = 1.55; $P < .001$), and fecal management systems (OR = 1.65; $P < .001$) were more likely to have IAD.

Each additional 20 kg of weight increased a patient's likelihood of having IAD by 7.1% (OR = 1.07; $P < .001$). Patients who had mobility restricted to the bed (OR = 1.22; $P < .001$) and were in US facilities (OR = 1.31; $P = .003$), were more likely to have IAD. Each additional 5 days of stay increased the likelihood of IAD by 11% (OR = 1.11; $P < .001$) and each additional layer of linen on the bed increased the likelihood by 8.3% (OR = 1.08; $P < .001$) (Table 6). Patients with higher Braden Scale scores meaning lower risk of IAD (OR = 0.96; $P < .001$) and patients in facilities with a greater number of patients surveyed (OR = 0.86; $P < .001$) were less likely to have IAD. Age was not significant.

Controlling for all other factors in the model, patients in long-term care facilities were 66% less likely than their counterparts in acute care settings to be identified as having IAD (OR = 0.34, $P < .001$), indicating that for 2 patients who are otherwise the same according to the factors in the model (ie, both urinary incontinent only, same weight) patients in the long-term care facility were 66% less likely to have IAD documented. Patients in rehabilitation facilities were 33% less likely (OR = 0.77, $P = .027$) to have IAD documented. The factor of residing in a long-term acute care facility was not significant.

TABLE 4.
Incontinence-Associated Dermatitis Prevalence Incontinence Type

Incontinence Type	Patients	With IAD	IAD, %
Urine, no fecal	3948	486	12
Fecal, no urine	3814	836	22
Urine and fecal	5451	982	18
Fecal management system[a]	586	153	26

Abbreviation: IAD, incontinence-associated dermatitis.
[a]Of the 586 patients with a fecal management system, 184 have an additional type of incontinence.

DISCUSSION

Our study findings from data we analyzed from the 2016 IPUP survey suggest that the overall prevalence of incontinent patients with IAD in the 4 study settings in the US and Canada was 18%, a much higher percentage of patients 4.3% found in the final sample of patients with complete records (n = 56,209) who were both incontinent or continent. In the literature, IAD prevalence ranges from 5.2% to 46%.[6] This wide range is largely due to differences in patient populations studied and whether the data were reported for the overall prevalence of IAD or a prevalence of IAD among incontinent patients. We provide the percentage of all patients with IAD and the percentage of incontinent patients with IAD to enable comparisons to be made to existing and future studies. For similar reasons, we also provide these numbers by care setting and type of incontinence.

We found substantial differences in IAD prevalence by care setting. Prevalence of IAD among all long-term care patients was 5.3%, a rate considerably lower than IAD prevalence in long-term acute care facilities at 9.1%.[8] However, long-term care facilities had a much larger percentage of incontinent patients compared with our overall percentage in the incontinent population. Despite the long-term care population being at risk of IAD, relatively fewer were recorded having it. There are at least 2 possible explanations. First, long-term care facilities might have better standard care prevention strategies in place to prevent IAD, because incontinence is more commonplace. The second explanation may be that long-term care facilities may not document IAD as frequently. Future work that tracks IAD consistently across facilities is needed.

To our knowledge this is the first study to include fecal management systems as a risk factor for IAD. Prevalence of IAD was highest (26%) for patients with fecal management systems, highlighting the importance of including patients with fecal management systems in prevalence studies. One of the limitations regarding this finding could be that the coordinator collecting data may have misclassified device-related ulcerations as IAD. Consistent with other study findings, we

TABLE 5.
Logistic Regression[a]

	OR (95% CI)	P
Incontinence		
Urine, no fecal	*Baseline comparison*	
Fecal, no urine	1.612 (1.418-1.833)	<.001
Urine and fecal	1.549 (1.371-1.748)	<.001
Fecal mgmt. system	1.652 (1.339-2.039)	<.001
Participant characteristics		
Age, 10 y	1.028 (0.996-1.060)	.084
Female	1.104 (1.008-1.211)	.034
Weight, 20 kg	1.071 (1.045-1.097)	<.001
Mobility restricted to bed	1.215 (1.072-1.377)	.002
Braden Scale score	0.960 (0.947-0.973)	<.001
Facility stay characteristics		
Length of stay, 5 d	1.110 (1.076-1.144)	<.001
Layers of linen	1.083 (1.043-1.125)	<.001
Facility characteristics		
Acute care	*Baseline comparison*	
Long-term acute care	0.806 (0.628-1.034)	.090
Long-term care	0.342 (0.279-0.421)	<.001
Rehabilitation	0.767 (0.606-0.971)	.027
US facility	1.314 (1.101-1.568)	.003
Number surveyed (50 patients)	0.859 (0.797-0.925)	<.001
Constant	0.095 (0.076-0.118)	<.001

Abbreviations: CI, confidence interval; OR, odds ratio.
[a]N = 13,615.

found fecal incontinence had a larger effect on the likelihood of having IAD than urinary incontinence.[8,12] Thus, patients with fecal incontinence and fecal management systems might require additional protective measures to prevent skin damage.

Results of the regression modeling highlighted several important IAD risk factors. We found the likelihood of IAD increased with weight, a finding consistent with results reported in other studies.[4,9,12] A 20-kg increase in weight was associated with a 7.1% increase in the likelihood of IAD. Good hygiene practices can be problematic for patients who are severely or morbidly obese, in part because repositioning, and access to the perineum for cleaning, is challenging. Braden Scale score was significantly associated with IAD, where an increase in the score by 3 points would be associated with a 12% decrease in the likelihood of having IAD. Similar to results of other studies, our data did not show a significant relationship between age and IAD.[8,9] This finding suggests that age alone is not a risk factor for skin damage, but rather, conditions such as incontinence or diminished mobility are associated with skin breakdown.[15] Finally, it is important to note that 12% of patients with urinary incontinence alone in our study had IAD and research has shown that exposure to urine can lead to skin breakdown in as little as 15 minutes.[24] Individuals with higher weight and reduced mobility may be at even greater risk of developing IAD more quickly due to lack of ability to promptly remove urine from the skin or change position.

TABLE 6.
Odds of Having IAD as the Number of Layers Increases[a]

Layers	Increase in Odds, %	Odds of Having IAD, %
1		9.5
2	8.3	10.3
3	17	11.1
4	25	11.9
5	33	12.7
6	42	13.4
>6	50	14.2

Abbreviation: IAD, incontinence-associated dermatitis.
[a]9.5% is the constant from the logistic regression, which represents the baseline odds of having IAD for 1 layer of linen.

Each additional layer of linen was associated with increased likelihood of having IAD. Thus, an increase from 1 to 6 layers would be associated with a 42% increase in the likelihood of having IAD. Additional linen layers can increase interface pressure between the patient and the support surface and can reduce the surface's microclimate management properties.[25,26] Pressure injury prevention programs cite reducing linen layers[27] and evidence suggests that additional linen layers are associated with a heightened risk of developing hospital-acquired pressure injuries.[17] Thus, reducing linen layers may also reduce the likelihood of IAD.

Previous reports have shown that IAD and pressure injuries are positively correlated[5,6] Results from our study indicate that IAD and pressure injuries share many risk factors including reduced mobility, incontinence, additional linen layers, longer lengths of stay, and Braden Scale score. Our findings provide further evidence of the association between IAD and pressure injuries; however, more research is needed to examine whether IAD leads to a pressure injury if the IAD is not properly managed.

Limitations

The study has several limitations. Distinguishing IAD from superficial pressure injuries is challenging and data from the survey were not monitored for accuracy.[1,28,29] Thus, we cannot know whether prevalence rates varied across care settings because IAD was less likely to occur in certain types of facilities, or whether certain types of facilities were less likely to identify the condition. Moreover, it was not possible to establish causal relationships between factors such as having a fecal management system and IAD. Whether or not this finding is related to the functionality of the fecal management device or whether the patient received the device for care of IAD cannot be determined. Furthermore, the IPUP survey data did not distinguish between present on admission or facility-acquired IAD. Sampling bias may inflate our estimates of IAD prevalence, since facilities that opt to take the IPUP survey are more likely to consistently track skin breakdown issues. Making comparisons of prevalence rates to the existing literature was difficult, as some studies did not clearly define the population studied or provide the definition for incontinence. Finally, like other regression analyses used to examine IAD, our model had poor measures of fit.[12] A low C-statistic (0.64) and Nagelkerke's R^2 (0.054) indicated that our model was missing important risk factors. For example, we lacked a measure to indicate the patient's susceptibility to skin damage.[13] Future work is needed to determine what other individual and facility characteristics explain why certain patients with incontinence were more likely to develop IAD.

CONCLUSIONS

This study represents a large-scale report of IAD on the prevalence of IAD in multiple care settings in the US and Canada analyzing data from 2016 IPUP survey. We found that 18% of the incontinent sample had IAD and 4.3% of the overall patient sample of both incontinent and continent patients had IAD. The percentage of patients with IAD ranged from 4.1% for all patients in acute care settings to 26% for patients with fecal management systems. The wide range of prevalence demonstrates this large variability can vary substantially depending on whether continent patients were included in the analysis, the types of care setting studied, and the types of incontinence included. These results present a call to action for the need to standardize the definition of IAD prevalence and reporting guidelines. We suggest the report of IAD prevalence to be defined as the percentage of incontinent patients, as these are the only patients at risk of developing the condition.

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