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Epidemiology of Incontinence-Associated Dermatitis and Intertriginous Dermatitis (Intertrigo) in an Acute Care Facility

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ABSTRACT

PURPOSE: The purpose of this study was to measure the prevalence of incontinence-associated dermatitis (IAD) and intertriginous dermatitis (ITD) upon admission, and the incidence of hospital-acquired IAD and ITD in a sample of acutely ill adults.

DESIGN: This was a descriptive, retrospective-cohort observational study.

SUBJECTS AND SETTING: The sample comprised 417 adults admitted to an urban community hospital licensed for 249 acute and 52 acute rehabilitation beds in Charleston, South Carolina, and referred to WOC nurses for evaluation and treatment.

METHODS: Prevalence and incidence rates were calculated from data previously collected for quality improvement purposes from January 1, 2014, to December 31, 2016, by the WOC nurses and documented in a secure, password-protected electronic spreadsheet. The prevalence of IAD/ITD was calculated as the proportion of patients diagnosed with IAD/ITD on admission to our facility. The incidence of IAD and ITD was calculated as percentage of patients who developed IAD/ITD during the course of their hospital stay. All units in the hospital were included.

RESULTS: The mean prevalence of IAD present on admission was 16%; the prevalence decreased over the data collection period; it was 21% in 2014, 15% in 2015, and 13% in 2016. The mean incidence of hospital-acquired IAD during the data collection period was 23%; the highest rate (26%) occurred in 2016. Patients classified as normal weight from their body mass index and patients 60 years and older had the highest incidence of hospital-acquired IAD. The mean prevalence of ITD for patients admitted to the hospital was 40% for the 3-year time; annual rates varied from a low of 36% in 2015 to a high of 42% in 2016. The mean incidence of hospital-acquired ITD was 33% over the data collection period; mean incidence rates were 32% in 2014, 39% in 2015, and 29% in 2016. The incidence of ITD was higher in patients classified as obese based on body mass index in patients 60 years and older. The most common location was the gluteal cleft.

CONCLUSIONS: The prevalence of IAD fell within the range of prior epidemiologic studies, but the facility-acquired IAD incidence rates were higher than other studies based in the acute care setting. The prevalence of ITD was higher than rates reported in prior studies; we searched the literature and found no previous reports of ITD occurrences over the course of a hospital stay. Additional research regarding IAD prevention and ITD in the gluteal cleft is needed. Data collection regarding IAD and ITD prevalence and incidence could be incorporated into the data collection tool used for pressure injury data collection for the National Database of Nursing Sensitive Indicators.

KEY WORDS: Epidemiology, Incidence, Incontinence-associated dermatitis, Intertriginous dermatitis, Intertrigo, Moisture-associated damage, Prevalence.

INTRODUCTION

Two forms of moisture-associated damage (MASD)—incontinence-associated dermatitis (IAD) and intertriginous dermatitis (ITD, also referred to as intertrigo)—are often mistaken for other forms of skin damage such as pressure injury, particularly in the sacral or gluteal region.[1-4] Incontinence-associated dermatitis has been identified as an independent risk factor to pressure injury,[4-7] and ITD has also been associated with an increased likelihood of pressure injury.[8] If the underlying cause of skin injury is incorrectly identified, treatment may be misdirected or ineffective. Obtaining data specific to IAD and ITD has been limited by lack of a unifying nomenclature.[9] No *International Classification of Diseases* (*ICD*) for IAD exists, and an *ICD* code for ITD (*ICD*-10 code L30.4, erythema intertrigo) was introduced recently.[8,10] Prior to the introduction of this code, ITD was classified using the less specific *ICD*-9 code 695.89 (erythematous conditions).[11] While multiple reports of IAD incidence and prevalence exist, most are point prevalence reports and reports of short-term incidence; many include sites other than acute care.[12-17] A recent cross-sectional IAD prevalence study, set in an acute care facility in Australia, reported an overall IAD prevalence rate of 10%, and a prevalence rate of 42% among patients with incontinence.[18] A second study set in Australia examined patients in 4 hospitals and reported an overall IAD prevalence rate of 9.2%, with the IAD prevalence rate of 20.7% among patients with incontinence.[19] Epidemiologic

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analysis of a multisite database revealed an overall IAD prevalence rate of 21.3%, and a rate of 45.7% among patients with incontinence.[7] Francis and colleagues[20] found an IAD incidence of 17.1% in a group of patients whose incontinence was managed with reusable cloth underpads. Other studies reporting IAD incidence in acute care[20-23] were limited to a single critical care unit.[20-23] The prevalence of ITD has been reported, but we searched the literature and found no studies reporting incidence rates of ITD in the acute care setting.[24,25]

The purpose of this study was to measure the prevalence of IAD and ITD upon admission, and the incidence of hospital-acquired IAD and ITD in a sample of acutely ill adults. We addressed the following research questions: (1) What is the prevalence of IAD in patients admitted to the hospital and referred to the WOC nurses? (2) What are the incidence rates of IAD during the hospital course of inpatients admitted to our hospital and referred to the WOC nurses? (3) What is the prevalence of ITD in patients admitted to the hospital and referred to the WOC nurses? (4) What are the incidence rates of ITD during the hospital course of inpatients admitted to our hospital and referred to the WOC nurses?

METHODS

This study is a secondary analysis of data collected for quality improvement (QI) purposes. These data were gathered prospectively by the 3 hospital-based WOC nurses from January 1, 2014, to December 31, 2016. The original QI data were stored in a secure, password-protected Excel spreadsheet.

Data were collected on inpatients at an urban community hospital licensed for 249 acute and 52 acute rehabilitation beds located in the Southeastern United States. Patients were referred to the WOC nurses for evaluation and management of skin damage including IAD or ITD. Patients were referred from any unit in our acute care facility. In 2014, this included 3 critical care units, a bone marrow transplant unit, 2 cardiac specialty units, an oncology specialty unit, 2 general medicine units, an orthopedic/neurospine medical surgical unit, a joint replacement unit, a postsurgical specialty unit, and 2 acute rehabilitation units. At the end of 2016, 2 of the critical care units merged to form a single unit.

The Roper Hospital Institutional Review Board reviewed study procedures and determined data were exempt from individual informed consent. All data were initially collected for purposes of routine QI stored in a protected Excel spreadsheet, and all data in this are reported in aggregate to ensure privacy of patient information.

Instrument

Data were collected using a secure, password-protected electronic spreadsheet created for purposes of the QI project. A QI analyst (C.G.) created a spreadsheet in Microsoft Excel 2016 (Microsoft Corporation, Redmond, Washington). The spreadsheet was modified by a QI analyst, the researcher (M.A.L.), and the statistician (E.J.) over time. The spreadsheet initially documented unit location, patient age, date of admission, date of identification of skin impairment, body mass index (BMI), and a comments section. The spreadsheet was modified to include diagnoses of IAD and ITD in 2013. The principal investigator (M.A.L.) modified the spreadsheet to identify whether IAD or ITD was present on admission. The statistician (E.J.) modified the spreadsheet to include sex. The researcher (M.A.L.) made a final modification to the spreadsheet to include the anatomical location of skin damage.

Study Procedures

The WOC nurses entered data into the spreadsheet following consultation, at the end of the same day, or when rounding on patients being followed up by the WOC nurses. If patients were discharged and information had not been entered into the spreadsheet, the patient's name, medical record, and account number were referred to a data analyst who retrieved the individual's medical record to enter the data in the spreadsheet. The data analyst retrieved only data documented by WOC nurses. The data analyst did not perform assessments or rely on notes from other care providers.

DATA ANALYSIS

Prevalence and incidence rates were estimated per year and overall for the 3-year period. Prevalence was calculated as the number of existing diagnoses of IAD or ITD divided by the total number of patients admitted to the facility during the period of data collection. Incidence was calculated as the number of patients diagnosed with IAD or ITD during their hospital course divided by the total number of patients. The overall 3-year rates were also estimated for each age group (age 40-49, 50-59, 60-69, 70-79, and over 80 years), sex (male and female), body location, and BMI category based on Centers for Disease Control and Prevention classifications: underweight ($<$18.5), normal weight (18.5-24.9), overweight (25-29.9), and obese ($\geq$30). All rates were described with frequencies and χ^2 analysis was completed to compare group differences. P values $< .05$ were deemed statistically significant. Analyses were completed using Statistical Analysis Software, version 9.4 (SAS Institute, Cary, North Carolina).

RESULTS

Table 1 summarizes demographic data, prevalence, and incidence of IAD and ITD during the 3-year data collection period. One hundred five patients admitted to our facility were referred to WOC nurses in 2014, 141 patients were referred in 2015, and 171 patients were referred in 2016. The average age of our sample was 71 years (SD 13.04); 60% were female. The average BMI of our sample was 33.9 (SD 12.09).

The mean prevalence of IAD present on admission was 16% over the 3-year data collection period; it was 21% in 2014, 15% in 2015, and 13% in 2016. The prevalence of IAD was higher in females with the exception of 2014; nevertheless, inferential analysis indicated these differences were not statistically significant ($P = .07$).

The mean incidence of IAD (proportion of patients diagnosed with IAD during their hospital stay) from 2014 to 2016 was 23%; the highest rate (26%) occurred in 2016. Females had higher IAD incidence rates in all 3 years of data collection, but these differences were not statistically significant ($P = .72$). Patients classified as normal weight from their BMI had the highest IAD incidence; a statistically significant difference in incidence rates was noted when normal, overweight, and obese patients were compared ($P = .001$). Patients 60 years and older had significantly higher IAD incidence rates than younger patients ($P = .03$).

The mean prevalence of ITD was 40% for the 3-year period; rates ranged from 36% in 2015 to 42% in 2016. Analysis revealed no significant differences in ITD prevalence based on sex. In contrast, patients classified as obese based on BMI were more likely to be diagnosed with ITD than were patients with lower BMI ($P = .01$).

TABLE 1.
Population Characteristics: IAD and ITD Incidence and Prevalence

	Total[a] (n = 417)	2016 (n = 171)	2015 (n = 141)	2014 (n = 105)
IAD prevalence, %	*65 (16)*	*22 (13)*	*21 (15)*	*22 (21)*
Sex				
Male	29 (45)	9 (41)	6 (29)	14 (64)
Female	36 (55)	13 (59)	15 (71)	8 (36)
BMI				
Under	2 (3)	1 (5)	1 (5)	0 (0)
Normal	17 (26)	6 (27)	6 (29)	5 (23)
Overweight	13 (20)	2 (9)	3 (14)	8 (36)
Obese	17 (26)	7 (32)	6 (29)	4 (18)
Age, y				
40-49	0 (0)	0 (0)	0 (0)	0 (0)
50-59	3 (5)	1 (5)	0 (0)	2 (9)
60-69	22 (34)	4 (18)	7 (33)	11 (50)
70-79	22 (34)	12 (55)	5 (24)	5 (23)
≥80	15 (23)	5 (23)	7 (33)	3 (14)
IAD incidence, %	*95 (23)*	*45 (26)*	*29 (21)*	*21 (20)*
Sex				
Male	38 (40)	15 (36)	13 (45)	10 (48)
Female	57 (60)	30 (65)	16 (55)	11 (52)
BMI				
Under	4 (4)	1 (2)	2 (7)	1 (5)
Normal	24 (25)	10 (24)	7 (24)	7 (33)
Overweight	21 (22)	6 (13)	9 (31)	6 (29)
Obese	21 (22)	9 (21)	7 (24)	5 (24)
Age, y				
40-49	3 (3)	1 (2)	1 (3)	1 (5)
50-59	9 (9)	8 (19)	1 (3)	0 (0)
60-69	28 (30)	13 (27)	12 (41)	3 (14)
70-79	22 (23)	10 (22)	7 (24)	5 (24)
≥80	25 (26)	9 (21)	6 (21)	10 (48)
ITD prevalence	*164 (40)*	*71 (42)*	*51 (36)*	*42 (40)*
Sex				
Male	60 (37)	23 (32)	15 (29)	23 (55)
Female	104 (63)	48 (68)	36 (71)	19 (45)
BMI				
Under	3 (2)	2 (3)	1 (2)	0 (0)
Normal	10 (6)	5 (7)	2 (4)	3 (7)
Overweight	24 (15)	9 (13)	4 (8)	11 (26)
Obese	91 (56)	39 (55)	31 (61)	22 (52)
Age, y				
40-49	7 (4)	3 (4)	3 (6)	1 (2)
50-59	12 (7)	5 (7)	5 (10)	2 (5)
60-69	63 (38)	26 (37)	21 (41)	16 (38)
70-79	45 (28)	18 (25)	12 (24)	15 (36)
≥80	29 (18)	14 (20)	8 (16)	7 (17)
ITD incidence	*137 (33)*	*49 (29)*	*55 (39)*	*33 (32)*
Sex				
Male	58 (42)	23 (47)	20 (36)	15 (45)
Female	79 (58)	26 (53)	35 (64)	18 (55)
BMI				
Under	2 (2)	0 (0)	2 (4)	0 (0)
Normal	18 (13)	6 (12)	4 (7)	8 (24)
Overweight	28 (20)	9 (18)	10 (18)	9 (27)
Obese	65 (48)	16 (33)	34 (68)	16 (48)
Age, y				
40-49	9 (7)	2 (4)	4 (7)	3 (9)
50-59	16 (12)	5 (10)	7 (13)	4 (12)
60-69	31 (23)	12 (24)	11 (20)	8 (24)
70-79	43 (31)	12 (24)	20 (36)	11 (33)
≥80	33 (24)	16 (33)	10 (18)	7 (21)

Abbreviations: BMI, body mass index; IAD, incontinence-associated dermatitis; ITD, intertriginous dermatitis.
[a]Due to missing BMI and age data, all of the frequencies and percentages do not add up to the total/aggregate counts.

The mean incidence of ITD was 33% for the 3-year period; it was 32% in 2014, 39% in 2015, and 29% in 2016. The incidence of ITD did not significantly differ based on sex or BMI. Patients 60 years and older had significantly higher incidence rates of ITD when compared to younger patients ($P = .01$).

Location

Table 2 summarizes anatomic location of IAD and ITD. The buttocks were the anatomical location most often noted as the site of IAD (Table 2). Skin damage occurred on the buttocks in 54% of IAD cases present on admission as compared to 39% of facility-acquired IAD cases. The perineum (26% of cases) and the perianal (20% of cases) were also common locations for IAD present on admission. In contrast, the perianal was the other most common location for facility-acquired IAD (23% of cases). Incontinence-associated dermatitis was found to occur in more than one location.

The gluteal cleft was the most common anatomical location of ITD. Skin damage occurred in the gluteal cleft in 39% of cases of ITD present on admission and 41% of facility-acquired cases. The second most common location of ITD present on admission was beneath the pannus (28% of cases). The groin (28%) was the second most common location for facility-acquired ITD. Intertriginous dermatitis occurred in more than one location. We also found that some patients had both IAD and ITD.

DISCUSSION

We measured the prevalence of IAD and ITD present on admission and the incidence of these forms of MASD during the hospital course of a group of patients admitted to an acute care facility in the Southeastern United States over a 3-year period. We found a decrease in the prevalence of IAD on admission, and an increase in the incidence of hospital-acquired IAD (Table 1). The prevalence of IAD present on admission (13%-21%) is equivalent to the overall prevalence rate of 19.7% reported by Junkin and Selekof[16] in 2007, and the 21.3% prevalence rate reported by Gray and Giuliano[7] in 2018. In contrast, our rates are higher than the prevalence rate of 10% reported by Campbell's group in 2016,[18] and the 9.2% prevalence rate reported by Barakat-Johnson and colleagues[19] in 2018 (Table 3).

In contrast to these trends in IAD prevalence and incidence, we observed an increase in the prevalence of ITD upon admission, but a decline in hospital-acquired ITD rates during the same period (Table 1). The prevalence of ITD we found (36%-42%) exceeds point prevalence rates reported in prior studies (6%-20%) in three studies set in a hospital, nursing home, and home care agency.[24,25] We searched the literature and found no studies reporting the incidence of ITD in the acute care setting.

Whether the increase in hospital-acquired IAD was influenced by the current best practice of more rapid removal of indwelling urinary catheters as an attempt to decrease catheter-acquired urinary tract infections or an increase in hospital-acquired *Clostridium difficile*-associated diarrhea (CDAD) is unknown.[26,27] Our facility-acquired incidence of IAD rose despite replacing reusable with disposable incontinence pads (a strategy reported to decreased hospital-acquired pressure injuries and length of stay)[20] and implementing a CDAD preventive intervention bundle in 2015, along with use of indwelling fecal management systems for acute diarrhea management.

In 2015, an antimicrobial wicking fabric (InterDry, Coloplast Corp, Humlebæk, Denmark) was placed on formulary

TABLE 2.
IAD and ITD by Location

Location	IAD Prevalence, % n = 65	IAD Incidence, % n = 95	ITD Prevalence, % n = 164	ITD Incidence, % n = 137
Between thighs	11 (17)	0 (0)		
Buttocks	35 (54)	37 (39)		
Groin	8 (12)	4 (4)	39 (24)	39 (28)
Perianal	13 (20)	22 (23)		
Perineum	17 (26)	16 (17)	7 (4)	6 (4)
Sacrum	4 (6)	3 (3)		
Thighs	11 (17)	8 (8)		
Beneath pannus			62 (38)	26 (19)
Gluteal cleft			64 (39)	56 (41)
Abdominal skinfold			10 (16)	5 (4)
Axilla			3 (2)	1 (1)
Back skinfold			6 (4)	3 (2)
Beneath breasts			32 (20)	12 (9)
Buttock thigh fold			6 (4)	5 (4)
Leg folds			2 (1)	0 (0)
Neck			1 (1)	0 (0)
Scrotum			6 (4)	8 (6)

Abbreviations: IAD, incontinence-associated dermatitis; ITD, intertriginous dermatitis.

TABLE 3.
Select Nonlabor Expenses Associated With Incontinence (2016)[a]

Product	Cost
Disposable underpads	$138,196.00
Disposable fluff pads (procedure pads)	$1336.00
Fecal management system (including extra pouches)	$60,274.00
External fecal pouch	$754.00
Male urinary pouches	$231.00
Condom catheters	$13,599.00
Urinary drainage bags	$3,272.00
3-in-1 incontinence wipes	$57,936.00
Barrier products	$26,421.00
Adult undergarment (rehab only)	$5,640.00
Total	$307,659.00

[a]Linen costs were not included as they could be variable based on other issues such as wound drainage, emesis, patient transport, and patient and personnel preference.

as an option for skinfold management. This, in addition to increased education by the WOC nurses, in-servicing by the product representative, particularly to the patient care technicians, and heightened awareness of the issues of ITD may have contributed to the decline in hospital-acquired ITD rates despite an increase in the rates of ITD present on admission.

STRENGTHS AND LIMITATIONS

To our knowledge, this is the first multiyear, longitudinal study reporting prevalence of IAD and ITD on admission along with the incidence of facility-acquired IAD and ITD. This study also has limitations that may influence external validity of findings. We did not use a validated instrument to diagnose IAD or ITD. Nevertheless, data were collected by three WOC nurses with expertise in this area of assessment and management. In addition, the WOC nurses examined patients together and reached consensus on the form of skin damage if the initial diagnosis was not apparent. Our sample included only patients referred to the WOC nurses and documented in the spreadsheet; some patients with IAD or ITD in hospital may not have been referred to a WOC nurse. In addition, it is not known whether patients identified as having IAD or ITD present on admission were discharged from hospital and readmitted later without resolution of hospital-acquired intertriginous or incontinence-associated skin damage. During the three years of this study, two products were introduced into standard patient care that may have influenced hospital-acquired IAD and ITD rates. In January 2015, incontinence underpads were changed from a reusable, laundered cloth product to a disposable pad (CovidienWings, Minneapolis, Minnesota). In March 2015, a silver-impregnated wicking textile fabric was added to product formulary to aid in prevention and management of ITD.

CONCLUSIONS

We evaluated prevalence and incidence rates of IAD and ITD in a single acute care facility over a 3-year period. The prevalence of IAD fell within the range of prior epidemiologic studies, but the facility-acquired IAD incidence rates were higher than prior studies based in the acute care setting. The prevalence of ITD was higher than rates reported in prior studies; no prior studies of ITD occurrences over the course of a hospital stay were located. Additional research regarding the epidemiology of IAD and ITD is needed. We further recommend inclusion of IAD and ITD prevalence in the data collection instrument used by the National Database of Nursing Sensitive Indicators for pressure injury.

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REFERENCES

1. Mahoney M, Rozenboom B, Doughty D, Smith H. Issues related to accurate classification of buttocks wounds. *J Wound Ostomy Continence Nurs*. 2011;38(6):635-642.
2. Voegeli D. Moisture-associated skin damage: an overview for community nurses. *Br J Community Nurs*. 2012;18(1):6-12.
3. Mahoney M, Rozenboom B, Doughty D. Challenges in classification of gluteal cleft and buttocks wounds: consensus session reports. *J Wound Ostomy Continence Nurs*. 2013;40(3):239-245.
4. Beeckman D, Campbell J, Campbell K, et al. Proceedings of the Global IAD Expert Panel. Incontinence associated dermatitis: moving prevention. https://multimedia.3m.com/mws/media/1048834O/incontinence-associated-dermatitis-best-practice-principles.pdf. Accessed June 28, 2015.
5. Beeckman D, Van Lancke A, Van Hecke A, Verhaeghe S. A systematic review and meta-analysis of incontinence-associated dermatitis, incontinence, and moisture as risk factors for pressure ulcer development. *Res Nurs Health*. 2014;37:204-218.
6. Lachenbach C, Ribble D, Emmons K, VanGilder C. Pressure ulcer risk in the incontinent patient: analysis of incontinence and hospital-acquired pressure ulcers from the International Pressure Ulcer Prevalence™ Survey. *J Wound Ostomy Continence Nurs*. 2016;43(3):235-241.
7. Gray M, Giuliano KK. Incontinence-associated dermatitis, characteristics and relationship to pressure injury: a multisite epidemiologic analysis. *J Wound Ostomy Continence Nurs*. 2018;45(1):63-67.
8. Arnold-Long M, Emmons K, Chovan JD. Incontinence-associated dermatitis and intertriginous dermatitis as nurse-sensitive quality indicators. *J Wound Ostomy Continence Nurs*. 2018;45(3):221-226.
9. Gray M, McNichol L, Nix D. Incontinence-associated dermatitis: progress, promises, and ongoing challenges. *J Wound Ostomy Continence Nurs*. 2016;43(2):188-192.
10. ICD10Data.com. 2018/2019 ICD-10-CM Diagnosis Code L30.4. https://www.icd10data.com/ICD10CM/Codes/L00-L99/L20-L30/L30-/L30.4. Accessed November 1, 2018.
11. ICD9Data.com. 2012 ICD-9-CM Diagnosis Code 695.89. http://www.icd9data.com/2012/Volume1/680-709/690-698/695/695.89.htm. Accessed November 1, 2018.
12. Gray M, Bliss DZ, Doughty DB, Ermer-Seltun J, Kennedy-Evans KL, Palmer ML. Incontinence-associated dermatitis: a consensus. *J Wound Ostomy Continence Nurs*. 2007;4(1):45-54.
13. Gray M, Beeckman D, Bliss DZ, et al. Incontinence-associated dermatitis: a comprehensive review and update. *J Wound Ostomy Continence Nurs*. 2012;39(1):61-74.
14. Long MA, Reed L, Dunning K, Ying J. Incontinence-associated dermatitis in a long-term acute care facility. *J Wound Ostomy Continence Nurs*. 2012;39(3):318-327.
15. Bliss D, Zahrer C, Savik K, Smith G, Hedblom E. An economic evaluation of four skin damage prevention regimens in nursing home residents with incontinence: economics of skin damage prevention. *J Wound Ostomy Continence Nurs*. 2007;34(2):143-152.
16. Junkin J, Selekof JL. Prevalence of incontinence and associated skin injury in the acute care inpatient. *J Wound Ostomy Continence Nurs*. 2007;34(3):260-269.
17. Beeckman D, Woodward S, Gray M. Incontinence-associated dermatitis: step-by-step prevention and treatment. *Br J Community Nurs*. 2011;16(8):382-389.

18. Campbell JL, Cover FM, Osborne SR. Incontinence-associated dermatitis: a cross -sectional prevalence study in the Australian acute care hospital setting. *Int Wound J*. 2016;13(3):403-411.
19. Baarakat-Johnson M, Barnett C, Lai M, Wand T, White K. Incontinence-associated dermatitis and pressure injuries in a health district in Australia. *J Wound Ostomy Continence Nurs*. 2018;45(4):349-355.
20. Francis K, Pang SM, Cohen B, Salter H, Homel P. Disposable versus reusable absorbent underpads for prevention of hospital-acquired incontinence associated dermatitis and pressure injury. *J Wound Ostomy Continence Nurs*. 2017;44(4):374-379.
21. Zhou X, He Z, Chen Y, Zuo L. Effect of a 1-piece drainable pouch on incontinence-associated dermatitis in intensive care unit patients with fecal incontinence. *J Wound Ostomy Continence Nurs*. 2017;44(6):568-571.
22. Bliss DZ, Savik K, Thorson MA, et al. Incontinence-associated dermatitis in critically ill adults: time to development, severity, and risk factors. *J Wound Ostomy Continence Nurs*. 2011;38(4):433-445.
23. Driver DS. Perineal dermatitis in critical care patients. *Crit Care Nurse*. 2007;27(4):42-46.
24. Mistiaen P, van Halm-Walters M. Prevention and treatment of intertrigo in large skin folds of adults: a systematic review. *BioMed Central Nurs*. 2010;9(12):1-9.
25. Brown J, Wimpenny P, Maughn H. Skin problems in people with obesity. *Nurs Stand*. 2004;18(35):38-42.
26. Magers T. Using evidence-based practice to reduce catheter-associated urinary tract infections. *Am J Nurs*. 2013;113(6):34-42.
27. Vindigni SM, Surawicz CM. C. difficile infection: changing epidemiology and management paradigms. *Clin Translational Gastroenterol*. 2015;6(7):e99. doi:10.1038/ctg.2015.24.