**Incontinence-Associated Dermatitis: A cross-sectional prevalence study in the
Australian acute care hospital setting.**

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ABSTRACT

The purpose of this cross sectional study was to identify the prevalence of incontinence and incontinence-associated dermatitis in Australian acute care patients, describe the products worn to manage incontinence, and products at the bedside to provide perineal skin care. Data were collected over two days at major Australian teaching hospital on 376 inpatients. The mean age of the sample was 62 years and 52% were male. The prevalence rate of incontinence was 24% (91/376). Urinary incontinence was significantly more prevalent in females (10%) than males (6%) ($\chi^2=4.458$, $df=1$, $p=.035$) Incontinence-associated dermatitis occurred in 10% (38/376) of the sample, with 42% (38/91) of incontinent patients having incontinence-associated dermatitis. Semi-formed and liquid stool were associated with incontinence-associated dermatitis ($\chi^2=5.520$, $df=1$ $p=.027$). Clinical indication of fungal infection was present in 32% (12/38) of patients with incontinence-associated dermatitis. Absorbent disposable briefs were the most common incontinence aids worn (80%, 70/91), with soap/ water and disposable washcloths the most commonly available (60%, 55/91) clean-up products present at the bedside. Further data are needed to validate this high prevalence. Studies that address prevention of incontinence-associated dermatitis and effectiveness of management strategies are also needed.

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56 **KEYWORDS**

57 Acute care

58 Cross-sectional study

59 Incontinence-associated dermatitis

60 Incontinence

61 Prevalence

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82 **KEY MESSAGES**

- 83 • Nearly 1 in 4 hospitalized adults experience incontinence with more than 40% of
84 those having incontinence-associated dermatitis (IAD).
- 85 • Semi-formed and liquid stool are associated with IAD.
- 86 • Older patients are significantly more likely to experience incontinence than
87 younger patients.
- 88 • More data are needed about IAD prevalence and management in the acute care
89 setting in Australia.
- 90 • This is the first Australian study to report both the prevalence of incontinence and
91 IAD in the acute care setting and to differentiate IAD from pressure injury and
92 clinical indication of fungal infection.

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95 INTRODUCTION

96 Incontinence-associated dermatitis (IAD) is a complex, painful condition that is
97 expensive and hard to treat (1, 2). It occurs in the perineum, labial folds, groin, upper
98 thighs, buttocks, rectal area and gluteal cleft, as well as areas where increased friction
99 occurs between skin and clothing or skin and absorptive devices (3, 4). IAD is
100 characterised by inflammation and erythema, and may have blisters, erosion, denudation or
101 serous exudate (2, 5). This results in high cost to the individual in pain and suffering,
102 increased morbidity, and increased length and cost of the hospital stay (5).

103 Until recently, there was no international agreement on the name of the condition, its
104 definition, or its implications for clinical practice. However, in 2007 a seminal consensus
105 document by Gray *et al* (2) defined IAD as the response of the skin to chronic exposure to
106 urine and faecal materials (inflammation and erythema with or without erosion or
107 denudation). This definition acknowledges the source of the irritant, the response of the
108 skin to that irritant and that an area beyond the perineum is commonly affected. The
109 standardised definition will allow researchers and clinicians to generate and compare data
110 using a uniform conceptualization of the condition.

111 Excess moisture on the skin acts as an irritant and contributes to skin breakdown
112 and increased susceptibility to pressure injury from friction and shear (1-4, 6, 7). Moisture
113 damaged skin can be vulnerable to secondary infection with *Candida albicans* or coliform
114 bacteria (3). Wearing an absorptive containment product (pad) causes occlusion, resulting
115 in increased (more alkaline) baseline skin pH, increased moisture from perspiration, and
116 compromised skin barrier function (2, 8). The alkaline pH of urine promotes activity of the
117 digestive enzymes lipases and proteinases in faeces, which in turn makes keratin in the
118 stratum corneum vulnerable to breakdown (3). Wet skin is less resistant to injury from
119 friction, and is at increased risk of erosion from rubbing on bed linens or incontinence pads
120 (3, 8, 9). Exposure to both faeces and urine is more damaging to skin than exposure to
121 urine alone (10).

Identification of IAD depends on skin inspection and accurate differentiation between other skin lesions, particularly pressure injury. Studies indicate that the differential diagnosis between a pressure injury and IAD is difficult, with IAD frequently misclassified by nurses as a pressure injury (1, 11). In fact, the National Pressure Ulcer Advisory Panel (NPUAP) recommends that the stage II pressure injury category should not be used to describe skin tears, tape burns, perineal dermatitis, maceration or excoriation (12). IAD also needs to be differentiated from intertriginous dermatitis, a moisture associated skin injury resulting from trapped moisture and friction in skin folds. (1, 3, 6, 13). IAD has further been confused with fungal or bacterial infections as well as other dermatological conditions (14). Misclassification of these lesions can result in poor patient outcomes as well as in inappropriate and ineffective use of health care resources (15). The primary goal of prevention and treatment for IAD is to minimise skin exposure to irritants (3).

Understanding IAD requires an appreciation of incontinence, a condition associated with significant morbidity, decreased quality of life as well as being a burden for carers and the health care system. Urinary incontinence is an involuntary leakage of urine (16) and while no consensus definition exists for faecal incontinence, its generally accepted definition is involuntary loss of solid or liquid stool (17). Incontinence occurs more frequently in older adults, although it can affect any age group (9, 18). Further, faecal incontinence is the second leading cause of admission to long-term care in the United States (19).

Prevalence of incontinence among patients in the acute care setting is estimated to range from 10 to 37% (9, 18, 20). Incontinence in the critical care environment ranges from 12% to 30% (21, 22) and in long-term acute care settings is 22% for urinary incontinence and 57% for faecal incontinence (23). Limited data exists identifying the scope of incontinence or demographic variables associated with incontinence in the Australian acute care setting.

IAD also presents challenges for the acute care setting where the prevalence ranges from 20 to 50% (8, 9, 22-24). The prevalence of IAD in adults in Australian acute care hospitals is not known. Prospective Australian data are needed to provide insights into the scope of both incontinence and IAD in the acute care setting to aid health care providers in the development of prevention and management strategies.

AIMS

The purpose of this study was to explore incontinence and IAD in the Australian acute care hospital setting. Specific research aims were to:

- identify the prevalence of incontinence (urine and faecal),
- identify the prevalence of IAD, and
- describe the products worn to manage incontinence and products at the bedside to provide perineal skin care.

METHODS

Study Design

A cross-sectional study design was used.

Study setting and sample

This study was conducted at a 929-bed major acute care teaching hospital in southeast Queensland, Australia. The facility provides acute care over a comprehensive range of specialities including medicine, surgery, orthopaedics, oncology, obstetrics, gynaecology, intensive care, burns and trauma. It is the largest tertiary referral hospital in Queensland, providing care in 2012 to almost 94,000 inpatients (25).

Hospitalized adults aged 18 years and older admitted to the facility were eligible for inclusion. Patients were surveyed from Internal Medicine, Surgery, Critical Care (which includes a 36 bed intensive care unit and an 18 bed transit ward attached to the emergency department), Cancer Care and Women's and Newborns (only adults were surveyed from this service) admitting services. Patients from maternity and mental health services were excluded from the study.

176 **Operational definitions**

- 177 • Incontinence is the inability to control the flow of urine and/or stool any time in the
178 preceding 24 hours (9). Patients with indwelling urinary catheters were deemed
179 continent of urine for the analysis. The presence of a urinary catheter prevents urine
180 from coming into contact with skin, and therefore removes the source of irritation
181 (urine) necessary for the development of IAD. Patients with faecal containment
182 devices were deemed incontinent of faeces due to the high likelihood of faecal
183 leakage from the containment device resulting in faecal contact with skin. These
184 categorisations are consistent with previous studies (9, 26).
- 185 • IAD is the presence of any skin redness with or without erosion due to skin contact
186 with urine and/or faeces (rather than other sources of moisture) on the buttocks,
187 coccyx, rectal area, scrotum, labia, lower abdomen, upper thighs, gluteal cleft or
188 groins in an incontinent patient (2).
- 189 • Fungal infection is based on the clinical presentation of a central maculopapular
190 rash with characteristic satellite lesions in patients with IAD (3, 27). No
191 microbiological testing was performed to confirm the presence of a fungal infection
192 in this study. This is consistent with current clinical practice, as well as a previous
193 IAD study (9). Diagnosis of superficial fungal infection relies more heavily on
194 clinical findings and less on laboratory support (28, 29).
- 195 • Pressure injuries are a localised injury to the skin and /or underlying tissue, usually
196 over a bony prominence, as a result of pressure, or pressure in combination with
197 shear (12). Pressure injuries were staged according to the Australian pressure injury
198 staging guidelines at the time of data collection (30).

199 **Measures**

200 Continence Status and Products: Continence status, incontinence containment, clean-up
201 and skin protection products as well as demographic data were recorded on a data
202 collection instrument that was designed by the Principal Investigator (JC), based on a

literature review. The instrument was pilot tested with 10 registered nurses at the research site and face validity established. Minor changes to the wording and layout of the continence section of the tool were made based on feedback from the pilot group. Demographic data collected were age, gender and admitting service.

Stool Quality Assessment. Stool quality was measured based on the Bristol Stool form scale, but collapsed into dichotomous variables; formed, which equates to type 1- 4 on the Bristol Stool form scale, and semiformal-liquid; equates to type 5-7 (31).

IAD Severity: IAD severity was measured by clinicians with the Skin Assessment Tool (SAT) (32). This tool does not require the patient to report symptoms (5, 6), nor does it assess pain. The SAT was designed to derive a cumulative IAD severity score with a numerical score assigned according to severity within each of three categories: skin redness, area of skin breakdown (cm²) and erosion. A cumulative severity score (maximum score = 10) is the sum of the scores for the three categories. It has good inter-rater reliability ($\kappa = 0.81$ 95% CI, 0.69-0.87) (33). Word descriptors were assigned to match numerical severity categories. Numerical cut-off points for each category were determined by consensus from a panel of experts comprising the authors and three wound care clinicians with 40 combined years of experience in the specialty. The cut points are 0 = no IAD, 1-3 = mild IAD; 4-6 = moderate IAD; 7-9 = severe IAD, 10 = extreme IAD.

PROCEDURES

Prior to data collection, all research assistants (RAs) (n=30; 28 RNs, an occupational therapist and a medical practitioner) were trained in identification of IAD, pressure injury, and fungal infection. Interrater reliability was established at the conclusion of the education session by scores on a multiple-choice test of clinical photographs of a variety of IAD lesions, pressure injuries and fungal infections. The test required participants to differentiate between IAD, pressure injury, and a fungal infection as well as classify the IAD images according to the study instrument. A score of 80% was required

for the RA to participate in the study. The use of photographs to test inter-rater reliability has previously been used (11, 34, 35). RAs also were trained in study procedures.

This study was conducted over two consecutive days in November 2011 by the principal investigator (JC) and 30 RAs. Skin inspections were conducted by the RAs on all eligible, consenting patients. The incontinent management product the patient was wearing was recorded. Each patient's buttocks, coccyx, rectal area, scrotum, labia, lower abdomen, upper thighs, gluteal cleft and groins was inspected and loss of skin integrity classified as IAD, pressure injury, or clinical indication of fungal infection. Continence data were collected and for those who were incontinent, type of incontinence was obtained from the patient, primary nurse and/or clinical records. Stool quality and frequency data collected were collected for faecally incontinent patients from the patient, primary nurse and/or clinical records. Data were also recorded on the type of incontinence clean up and skin protection products at the bedside. When patients were absent from the ward at the time of data collection, the RAs returned and included those present when possible. Demographic data were collected on all patients. To assure accuracy, the principal investigator who is a skin integrity expert conducted an independent pelvic girdle inspection on all cases identified by the RAs as having IAD and validated the SAT score.

ETHICAL CONSIDERATIONS

The study was approved by the Human Research Ethics Committees for both the research site and the university. Written information about the study was distributed to all eligible patients the day prior to data collection. Patients provided verbal consent as required by the Human Research Ethics Committees.

STATISTICAL METHODS

Participants were assigned a study number and all data were de-identified. Data were entered into Statistical Packages for Social Sciences (SPSS) (Version 20.0, Armonk, NY, USA). A random 10 per cent of data entry was crosschecked for accuracy. Incomplete data were coded as missing data.

Descriptive statistics were used to describe study variables (means and standard deviations for continuous variables; frequencies and percentages for categorical variables). Prevalence of incontinence was calculated by the total number of incontinent patients in the sample divided by the total number of study patients. Prevalence of IAD was calculated by the total number of IAD cases in the sample divided by the total number of study participants. Prevalence of IAD among incontinent patients was calculated by the total number of IAD cases divided by the total number of incontinent participants. Bivariate analysis using descriptive correlational statistics (Chi-square test for independence with Yates continuity correction and Fisher's exact test where expected cell counts were less than five) were used to explore characteristics of sample with incontinence and IAD. *p* values less than 0.05 were considered statistically significant. Direct logistic regression analysis was performed to predict whether independent variables gender, admitting service and age predict the outcome, incontinence. The variables entered into the model were based on what is known about incontinence, in particular association with increasing age, association with being female and the prevalence of geriatric syndromes, specifically incontinence in medical patients (18). In addition, selection of these independent variables facilitates comparison of our results with other studies providing clinical applicability. The Hosmer-Lemeshow test was used to examine the goodness of fit of the logistic regression model.

RESULTS

Of the 552 patients assessed for eligibility (Table 1), 545 patients were eligible, 379 patients consented to take part and were surveyed. Data for 376 patients were included in the analysis (Figure 1). Three patients were excluded from analyses, as the screening tool was not completed. The mean age of the sample was 62 (SD 19.3) years and 52% (n=194) of patients were male. Patients were admitted most frequently to the internal medicine (44%, n= 167) and surgical services (39%, n=146) (Table 2). The Hosmer-Lemeshow test

was used to examine the goodness of fit of the logistic regression model. The result was non-significant, $\chi^2 (8) = 3.03, p = .932$, indicating that the model fit was satisfactory.

Prevalence of Incontinence

The prevalence of incontinence was 24% (91/376) (Table 2). Double incontinence (urinary and faecal) was most common (12%, 46/376), followed by faecal incontinence (8%, 32/279), with the prevalence of urinary incontinence only was 3.5% (13/376). Urinary catheters were present in 13% (49/376) of patients. Faecal incontinence was more prevalent in females (11%, 43/376) than males (9%, 35/376). Urinary incontinence was significantly more prevalent in females (10%) than males (6%) ($\chi^2=4.458, df=1, p = .035$), however, the reason for urinary catheter placement was not determined by this study, so the prevalence of urinary incontinence may be underestimated. Direct logistic regression was performed to assess the impact of a number of factors on incontinence. The model contained three independent variables (age, gender and admitting service). The full model containing all predictors was statistically significant $\chi^2 (6, N=376) = 31.48, p < 0.001$. Gender made no difference to the odds of having incontinence ($OR = 0.85, p = .516$) (Table 3). Older patients had a greater likelihood of having incontinence compared to younger patients ($OR = 1.03, p < .001$). Patients in the Surgical admitting service were less likely to have incontinence, compared to patients in the Internal Medicine admitting service ($OR = 0.51, p = .029$). Internal medicine and other admitting services showed no difference in the likelihood of patients having incontinence ($p > .05$) (Table 3).

Prevalence of Incontinence-Associated Dermatitis

IAD was present in 10% (38/376) of the sample and the prevalence of IAD in those who were incontinent was 42% (38/91) (Table 2). Among incontinent patients, chi-square analysis showed that there was no significant association between type of incontinence (urinary verses faecal) and IAD ($\chi^2 = 7.237, df = 1, p = .007$). Among patients with IAD, chi-square analysis showed that patients with semi-formed or liquid stool were more likely to have IAD than those patients with formed stool ($\chi^2 = 5.520, df = 1, p = .027$). Faecal

frequency and IAD were not significantly associated ($\chi^2 = 3.536$, $df = 1$ $p = .116$) (Table 4). Mild skin redness was present in 84% (32/38) of patients with IAD, a small area of skin breakdown occurred in 32% (12/38), mild erosion was present in 32% (12/38) of patients, while 50% (19/38) of patients had no erosion. The most common anatomical locations for skin injury were buttocks (42%, 16/38), followed by the rectal area (34 %, 13/38). The SAT severity score showed 82% (31/38) were suffering from mild IAD, 13% (5/38) were suffering from moderate IAD, 6% (2/38) were suffering from severe IAD, and no patients suffering from extreme IAD (Table 5).

Clinical indication of fungal infection was present in 32% (12/38) of patients with IAD. However, presence of fungal infection may have been over or underestimated as no microbiological testing to confirm the diagnosis of fungal infection was undertaken in this study. Pressure injuries were present in 6% (22/376) patients, with 21% (8/38) patients with IAD having a pressure injury (Table 5).

Products worn to manage incontinence and products used to provide perineal skin care.

Wrap-around incontinent briefs or pads (i.e. those aids worn as an alternative to underwear) were worn by 77% (70/91) of incontinent patients at the time of evaluation (Table 6). Soap/water and disposable washcloths were the most common incontinence clean-up products at the bedside for incontinent patients (60%, 55/91). Moisturising agents were present at the bedside in 34% (31/91) of incontinent patients. Skin protection products were present at the bedside in 57% (52/91) patients. Examples of these products are 3M™ Cavilon™ No Sting Barrier Film (3M, Saint Paul, MN) and Skin Basics™ Zinc and Castor Oil Cream (Biotech Pharmaceuticals, Victoria, Australia).

DISCUSSION

Incontinence occurred in 1 in 4 patients hospitalised in a major acute care setting in Australia, indicating it is a frequent and serious problem. IAD occurs in 42% of those who are incontinent, demonstrating that IAD is a prevalent and under-appreciated skin injury in

hospitalized patients. The most common incontinence aid worn was an incontinent brief (80%), with soap/water and disposable cloths the most common incontinence clean-up present at the bedside (60%). This is the first Australian study to report both the prevalence of incontinence and IAD in the acute care setting and to differentiate IAD from pressure injury and fungal infection.

Incontinence-Associated Dermatitis

Acute care patients are subjected to treatment regimes that may result in IAD, for example, antibiotics, changes in dietary intake and enteral feeds. Thus, acute care patients are a unique population that are at increased risk. IAD has been under-appreciated as is not the primary reason for admission. Anecdotal evidence suggests it is not only accepted, but actually expected that older patients will be incontinent.

IAD prevalence data for the general acute care setting is limited. The majority of published data are drawn from specialised settings such as critical care or the aged care setting. A study in three urban hospital critical care units found an IAD prevalence of 36% (36) and prevalence in a long-term acute care setting was 23%, (23). Prevalence of IAD ranges in aged care from 6%-22% (10, 37).

An important finding to emerge from our study is that liquid and semi-formed stool was associated with IAD compared to formed stool. No other published studies examined the association between stool quality and IAD. Congruent with our finding, the extensive review by Gray and associates (8) identify that stool is implicated as an aetiological factor in IAD; with clinical experience strongly suggesting that liquid stool is more irritating than solid or formed stool. Further research is warranted to determine if stool quality, particularly semi-formed/liquid stool, promotes the development of IAD.

Most IAD severity in our study was mild (82%, 31/38). Junkin and Selekof (9) classified IAD as red and dry, red and weepy, or having blisters in the areas likely to be exposed to urine or faeces. Of the patients with IAD, 75% (18/24) had red and dry skin, with 25% (6/24) having red and weepy skin. Both of these categories could be interpreted

as being at the less severe end of a severity continuum, which correlates with the severity of IAD in our study. The natural history of IAD is poorly understood (2), but progression from 'mild' through to 'severe' IAD is inevitable in the presence of persisting incontinence, inadequate management of incontinence and inadequate or inappropriate incontinence clean-up, skin protection and treatment of any secondary cutaneous infections. Early recognition and treatment thus is optimum.

IAD needs to be differentiated from other skin lesions, especially in the pelvic girdle. Pressure injuries historically have been confused with IAD. The NPUAP and the European Pressure Ulcer Advisory Panel (EPUAP) have specifically stated that IAD is not a pressure injury (12). A strength of this study is that both IAD and pressure injury were identified, so accurate prevalence of each could be determined. Future pressure injury prevalence studies would benefit from also measuring incontinence and IAD.

Presence of urine and faeces on denuded skin creates a favourable environment for development of fungal infection, with fungal infection frequently reported as a potential complication of IAD (2, 7, 27). The presence of a secondary fungal infection needs to be differentiated from IAD. Presence of fungal infection for our study was determined based on clinical presentation of a central maculopapular rash with characteristic satellite lesions (3). No quantitative microbiological testing was undertaken. According to Professor Jack Sobel (personal email, jsobel@med.wayne.edu, 3rd April 2014) the fungal rash may also present as non-specific, confluent and papular, creating some difficulty in clinical diagnosis. The presence of a secondary fungal infection would require treatment, but is desirable obtain a microbiological culture prior to commencing anti-mycotic therapy (28, 29, 38). Accordingly, the presence of a secondary fungal infection may have been under or overestimated in our study. Our data showed 32% (12/38) patients with IAD demonstrated clinical evidence of a fungal infection. This is higher than the United States data from Junkin and Seleko (9) that showed 10% of incontinent patients had a fungal rash (based on clinical examination). The higher prevalence of suspected fungal infection in our study

may be associated with the higher IAD prevalence rate. These infections are a serious threat to patient outcomes because of the possibility of under-diagnosis or missed diagnosis, and the potential for delay in treatment. It is not clear whether a fungal infection may have an aetiological role in IAD, rather than being a secondary infection.

Pressure injuries were present in 6% of our entire sample, with 12% of incontinent patients having a pressure injury. This prevalence is lower than that reported by Junkin and Selekof (9) where 22% of incontinent patients had a pressure injury. In part, our lower pressure injury rate may reflect the increased emphasis on pressure injury prevention in recent years.

One of the issues in the literature continues to be the lack of a universal definition for IAD prevalence. That is to say, should the denominator be the entire sample, or only those with incontinence? Since IAD cannot occur without incontinence (that is, skin exposure to urine and or faeces) (2), the number of incontinent patients logically would be the denominator. Most studies report IAD prevalence with the denominator being the number of incontinent patients (9, 22, 33), but a consistent standard needs to be established. However, we recommend that until a standard definition is accepted, that researchers present the IAD rate for the entire sample and for those who are incontinent to ensure clarity and accuracy. We have used that approach in this paper.

Incontinence

The definition of incontinence for an IAD prevalence study needs further clarification, specifically, how to categorise patients who have a urinary catheter. The presence of a urinary catheter prevents skin exposure to urine – a known cause of IAD. Previous studies have categorised patients with urinary catheters as continent (9, 26). However, it should be acknowledged that categorising patients with a urinary catheter as continent can result in an underestimation of incontinence prevalence. In the acute care setting, patients can be catheterised for a multitude of reasons including incontinence. For

example in this study, 11 of 15 patients surveyed in ICU had urinary catheter. The use of a urinary catheter in ICU is to monitor kidney function, fluid balance in the critically ill.

Our data show a significant association between increasing age and incontinence. Junkin and Selekof (9) found the odds of older patients having incontinence were greater (OR 4.979, 95% CI 1.015-22.427). Incontinence is recognised as one of the geriatric syndromes (18, 39) and has been associated with longer length of hospital stay and greater risk of being discharged to a residential care setting (40-42). Ageing of the global population (43) coupled with the rising cost of health care (43-45) means that managing incontinence in the acute care setting is an ever-increasing challenge.

The limited prospective prevalence data for incontinence in the acute cares setting in Australia is noteworthy, since incontinence is associated with significant morbidity and decreased quality of life for individuals (39). Health care providers require an understanding of the magnitude of a condition to provide appropriate care. We are not certain why the probability of incontinence is lower in the surgical admitting service than the Internal Medicine admitting service, although there is some evidence supporting increased prevalence of geriatric syndromes (including incontinence) in older medical patients in acute care setting (18). Our study adds important results that assist in understanding the burden of incontinence in the Australian acute care setting.

Products worn to manage incontinence and products used to provide perineal skin care.

Our study showed disposable incontinence briefs were the most common incontinence aids worn (77%), soap/water and disposable washcloths the most common clean-up products at the bedside (60%), and skin barrier protection available at the bedside of 57% of patients. A consistent, structured approach to prevention and treatment of IAD is required (2, 3). Having supplies at the bedside provides an efficient approach and ensures that a consistent strategy is used. Three steps are recommended: (i), gentle cleansing, using a soft disposable washcloth and cleansers without perfumes or irritants and close to skin

pH (a no rinse formulation is suggested); (ii) moisturisation to preserve the lipid barrier (3), and (iii), application of a skin barrier product is required to protect the stratum corneum from moisture and irritants (3, 6). Lack of bedside supplies suggests there is a gap between available products/recommendations and care. Further research is needed to identify how products are used, as well as their effectiveness in preventing and treating IAD.

LIMITATIONS

Several limitations need to be noted. This is a cross-sectional study and no cause and effect can be inferred. Every effort was made to recruit eligible participants; however, direct clinical examination of patients in this type of study can be intrusive and may have limited enrolment, (in our study, this was 69%). Data was not recorded as to why patients refused to participate. This study did not have ethical approval to collect data from those patients who did not consent. The IAD Severity Assessment tool was chosen in this study to classify severity of the condition. However, this scale does not include a measure of patient pain. IAD and faecal quality analysis was conducted at a bivariate level as the amount of missing data in these variables made adjusting for confounders and logistic regression analysis unfeasible. Clinical inspection was used to determine the presence of fungal infection in this study. The prevalence of fungal infection may have been over or underestimated as no quantitative laboratory measure was used to confirm the diagnosis. Future research needs to use appropriate quantitative measures to confirm the presence of fungal infection.

CONCLUSION

This is the first Australian study to report both the prevalence of incontinence and IAD in the acute care setting and to differentiate IAD from pressure injury and fungal infection. Almost one quarter of hospitalized adults were incontinent, and of the incontinent patients in the study, more than 40% developed IAD. Faecal incontinence occurred more frequently than urinary incontinence. Liquid and semi-formed stool was

significantly associated with IAD compared to formed stool. In addition, our data confirmed that the likelihood of incontinence increases with age, especially in those >80. Products for incontinence containment, clean up, and skin protection need to be available at the bedside to facilitate incontinence management. Further, prospective observational prevalence studies are essential to confirm these data in hospitalized Australian adults. The availability of results informing the prevalence of both incontinence and IAD is essential to measure the scope of the problem. More research addressing the effectiveness of treatment of incontinence and IAD in the acute care setting is needed. Additional research examining the aetiology of IAD and the role of fungal infections is warranted.

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Figure1. Patient recruitment and participant diagram.

Table 1; Characteristics of patients assessed for eligibility (n = 552)

Admitting Service	Male Number (%)	Female Number (%)	Patients assessed for eligibility	Age (mean)	Standard deviation
Internal Medicine	100 (46.3)	116 (53.7)	216	68.2	17.2
Surgical Services	140 (65.4)	74 (34.6)	214	55.5	19.4
Cancer Care	39 (58.2)	28 (41.8)	67	61.3	17.8
Critical Care (includes Intensive Care and Emergency Medicine)	19 (47.5)	21 (52.5)	40	48.8	19.3
Women's and Newborn*	0 (0)	15 (100)	15	50.4	18.4
Total	298	254	552	56.8	22.7

* Only adults were evaluated from this admitting service.

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Table 2. Sample characteristics

	Sample n=376	Incontinent patients n=91	Patients with IAD n=38
Age (mean, standard deviation)	62 (19.3)	70 (17.4)	74.8 (15.3)
Gender, number (%)			
Male	194 (51.6)	41 (45)	13 (34.2)
Female	182 (48.4)	50 (54.9)	25 (65.8)
Indwelling urinary catheter present number, (%)	49 (13)	23 (25.3)	9 (23.7)
Admitting Service (number, %)			
Internal Medicine	167 (44.4)	55 (60.4)	23 (60.5)
Surgical Services	146 (38.8)	21 (23.1)	8 (1.1)
Critical Care (includes Intensive Care and Emergency Medicine)	21 (7.7)	6 (6.6)	3 (7.9)
Cancer Care	29 (7.7)	6 (6.6)	2 (5.3)
Women's and Newborns*	13 (3.5)	3 (3.3)	2 (5.3)

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* Only adults were evaluated from this admitting service.

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Characteristics and Intercept	Coefficient β	Standard Error	Wald Chi-Square	<i>P</i> value	OR	95% CI
Intercept	-2.750	.617	19.226	<.001	.067	
Gender (Ref: Female)						
Male	-.168	.259	.421	.516	0.85	(0.51, 1.4)
Age	.029	.008	13.610	<.001	1.03	(1.01, 1.05)
Admitting service (Ref: Internal Medicine)						
Critical Care	.272	.537	.257	.612	1.31	(0.46, 3.76)
Surgery	-.670	.308	4.745	.029	0.51	(0.28, 0.94)
Cancer Care	-.508	.496	1.048	.306	0.60	(0.23, 1.59)
Women and Newborns [†]	-.189	.712	.070	.791	0.83	(0.2, 3.34)

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[†] Only adults were evaluated from this admitting service.

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Table 4. Clinical characteristics of incontinent patients (n=91)
and patients with IAD (n=38)

Variable	Incontinent patients n=91	Patients with IAD n=38
Urinary Incontinence		
Male, number (%)	6 (6.6)	1(2.6)
Female number (%)	7 (7.8)	0 (0)
Faecal Incontinence		
Male number (%)	18 (19.8)	5 (13.1)
Female number (%)	14 (15.4)	10 (26.3)
Double (urine and faecal) incontinence		
Male	17 (18.7)	7 (18.4)
Female	29 (31.9)*	15 (39.5)*
Faecal Quality number (%)		
Formed	5 (5.5)	0 (0)
Semi-formed or liquid	36 (39.6)	19 (50)
Missing	50 (54.9)	19 (50)
Faecal Frequency number (%)		
< 3 day	13 (14.3)	5 (13.2)
3 or more per day	28 (30.8)	17 (44.7)
Missing	50 (54.9)	16 (42.1)

578 *Percentages may not add up to 100 due to rounding
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Table 5. Characteristics, location and severity of IAD (n=38)

	n	%
Skin Redness		
Mild	32	84.2
Moderate	4	10.5
Severe	2	5.3
Area of skin breakdown		
None	19	50.0
Small	13	34.2
Moderate	2	5.3
Large	4	10.5
Skin Erosion		
None	19	50.0
Mild	18	47.4
Moderate	1	2.6
Severe	0	0
Extreme	0	0
Area Affected *		
Buttocks	16	42.1
Coccyx	5	13.2
Gluteal Cleft	4	10.5
Groins	6	15.8
Lower abdomen	3	7.9
Rectal	13	34.2
Scrotum/labia	7	18.4
Upper thighs	2	5.3
IAD Severity Score		
1-3 Mild IAD	31	81.6
4-6 Moderate IAD	5	13.1
7-9 Severe IAD	2	5.3
> 9 Extreme IAD	0	0
Pressure injury	8	21.1
Clinical indication of fungal infection	12	31.6

*Total > 100% as patients may have more than one area affected.

602 Table 6. Products worn to manage incontinence and products used to provide perineal skin
603 care (n = 91)

Variable	n	%
Incontinent aid worn		
Urinary incontinence		
• None	2	2.2
• Wrap around pad	4	4.4
• Pull up pad	5	5.5
• Insert pad	1	1.1
Faecal incontinence		
• None	11	12.1
• Wrap around pad	10	11.0
• Pull up pad	8	8.8
• Insert pad	1	1.1
Double Incontinence		
• None	1	1.1
• Wrap around pad	21	23.1
• Pull up pad	22	24.2
• Insert pad	1	1.1
Incontinent aid- missing	4	4.4*
Incontinence clean-up (number, %)		
• Soap/water and disposable cloth	55	60.4
• Missing	36	39.6
Moisturiser (number, %)		
• Yes	31	34.1
• No	22	24.2
• Missing	38	41.7
Skin protection products (number, %)		
• Yes	52	57.1
• Missing	39	42.8*

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604 Percentages may not add up to 100 due to rounding

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