

Risk factors for incontinence-associated dermatitis: an evidence-based review

KEY WORDS

- ▶ Dermatitis
- ▶ Incontinence
- ▶ Moisture
- ▶ Risk
- ▶ Wound

Background: Incontinence-associated dermatitis (IAD) is skin breakdown resulting from incontinence and other risk factors. It is challenging to treat and costly to the NHS (Doughty et al, 2012). Understanding the risk factors for IAD can lead to evidence-based prevention strategies to prevent its development.

Aim: This article reviews critically and systematically the existing evidence base on risk factors for IAD, and reports these in a framework for clinicians.

Method: a literature review of risk factors for IAD, published in English between January 2007 and December 2011.

Results: The review identified 27 risk factors associated with IAD development. The most common risk factors were faecal incontinence, urinary incontinence, double incontinence, the use of absorbent products, absence of a structured skin care protocol, the perineal environment, toileting ability, tissue tolerance, skin pH, and ageing.

Conclusion: Of the 27 risk factors identified for developing IAD, seven of these are suggested as priorities to address in practice.

Incontinence-associated dermatitis (IAD) can be both painful and embarrassing for patients (Bianchi, 2012), and with a prevalence estimate of between 20% and 27%, it is an important tissue viability priority in acute hospitals (Junkin et al, 2005; Junkin and Selekof, 2007). It has been suggested that IAD develops when skin is damaged primarily by the reaction of urine and/or faeces (Gray et al, 2007a).

INTRODUCTION

Despite high IAD prevalence rates, there is little focus on this subject. In fact, relatively little is known about IAD. Furthermore, there are currently no evidence-based methods of assessing a person's risk of developing IAD. This is an important gap because if clinicians fail to correctly identify those at risk of IAD, preventative strategies may not be implemented, leading to skin breakdown. This article aims to fill this gap by identifying from the existing literature the risk factors for IAD development. The search strategy presented in this article builds on a systematic review on IAD by Beekman et al (2009).

METHOD

An evidence-based review (EBR) methodology, which uses systematic methods and a reproducible search strategy to review the evidence critically, was chosen as being the most robust method for the purpose described in this article.

A hierarchy of evidence is employed (*Table 1*), which was developed by grouping the articles retrieved according to a hierarchy of evidence developed by Guyatt et al (1995).

Terminology and definitions

The terminology used to describe IAD in the UK varies greatly, and to ensure that no key evidence was missed, all relevant terms to describe IAD had to be used during the search. In this review, 27 terms were searched for in publication titles and abstracts (*Table 2*) and they were combined using the Boolean operator 'or'. The terms were also mapped to thesaurus headings in the individual databases.

The evidence was then systematically compared against predetermined inclusion and exclusion criteria (*Table 3*). Only evidence published between January 2007 and December 2011 was considered for

NICOLA HEYWOOD
*Tissue Viability Nurse Specialist,
Royal United Hospital, Bath*

SAMANTHA HOLLOWAY
*Senior Lecturer,
Cardiff University School of
Medicine, Cardiff*

Table 1: Hierarchy of evidence for the articles extracted during the literature search.

Level	Evidence type	Evidence sub type
Level 1	Systematic review	
Level 2	Quasi-experimental	
Level 3a	Survey	Retrospective cohort
Level 3b	Survey	Mixed design
Level 3c	Survey	Prevalence
Level 4	Pragmatic trial	
Level 5a	Narrative review	Consensus based
Level 5b	Narrative review	Practice based
Level 5c	Narrative review	Expert opinion

inclusion because the term ‘incontinence-associated dermatitis’ was not coined until 2007 (Gray et al, 2007b). The literature review described in this article was carried out in December 2011.

Automated database search

The search strategy included both an automated and a manual database search to make sure that no relevant evidence was omitted (*Figure 1*). Searches were run to include the title and abstract, and title only where the abstract search function was unavailable.

The grey literature (unpublished reports, conference proceedings, theses) was also searched to minimise reporting bias (Farace and Schopfél, 2010). The British Library EThOS database, the Cardiff University library thesis database, Scirus and Greynet.org were also searched, however, these did not yield any additional results.

Manual searches

Reference lists in key articles were manually searched and key authors were contacted to ascertain whether further relevant evidence existed. Other evidence-based sources were searched, including the Database of Abstracts and Review of Effects (DARE) for UK systematic reviews, and the Cochrane Collaboration for global systematic reviews. Other internet sites suggested by the Centre for Reviews and Dissemination were also searched. A total of 411 results were retrieved manually, however, when the abstracts were read for relevance, only one (Beeckman et al, 2009) related to IAD risk factors and this had already been identified. No new results were identified through manual searching.

RESULTS

The database searches identified 19 relevant pieces of evidence. However, none of the evidence retrieved

Table 2. Terms used in the literature to describe incontinence associated dermatitis.

Terminology
Incontinence-associated dermatitis (IAD)
Incontinence dermatitis
Diaper dermatitis
Napkin dermatitis
Nappy dermatitis
Containment brief dermatitis
Diaper erythema
Napkin erythema
Nappy erythema
Containment brief erythema
Diaper rash
Napkin rash
Nappy rash
Containment brief rash
Excoriation
Moisture-associated skin damage (MASD)
Areas exposed to incontinence
Moisture lesion
Moisture maceration injury
Perineal dermatitis
Irritant dermatitis
Contact dermatitis
Intertrigo
Intertriginous dermatitis
Heat rash

focuses primarily on the risk factors for IAD development.

Quality scoring

The results were compared against quality scoring criteria (*Table 4*). Two pieces of evidence provided

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insufficient data to enable a quality assessment and were excluded. Therefore, of the original 19 pieces of evidence, 17 were included for review. *Table 5* lists the evidence used. The evidence was reviewed to determine the most commonly reported risk factors relating to IAD.

1: Systematic review

The highest quality evidence identified (Beeckman et al, 2009) focused on the prevention and treatment of IAD. These authors are nursing academics who are

experts on IAD and who have published other IAD-related literature (Beeckman et al, 2010; 2011; 2014).

The systematic review methodology described is the most internally valid evidence retrieved. The review is rigorous, with comprehensive data sources included using a sensitive filter. Reporting is systematic and reproducible. Publication bias is limited by hand searching. To reduce selection bias, two independent researchers conducted the literature search, increasing internal validity. Of 2822 publications initially identified, only 25 met

Figure 1: Flowchart to illustrate the search strategy employed for this review.

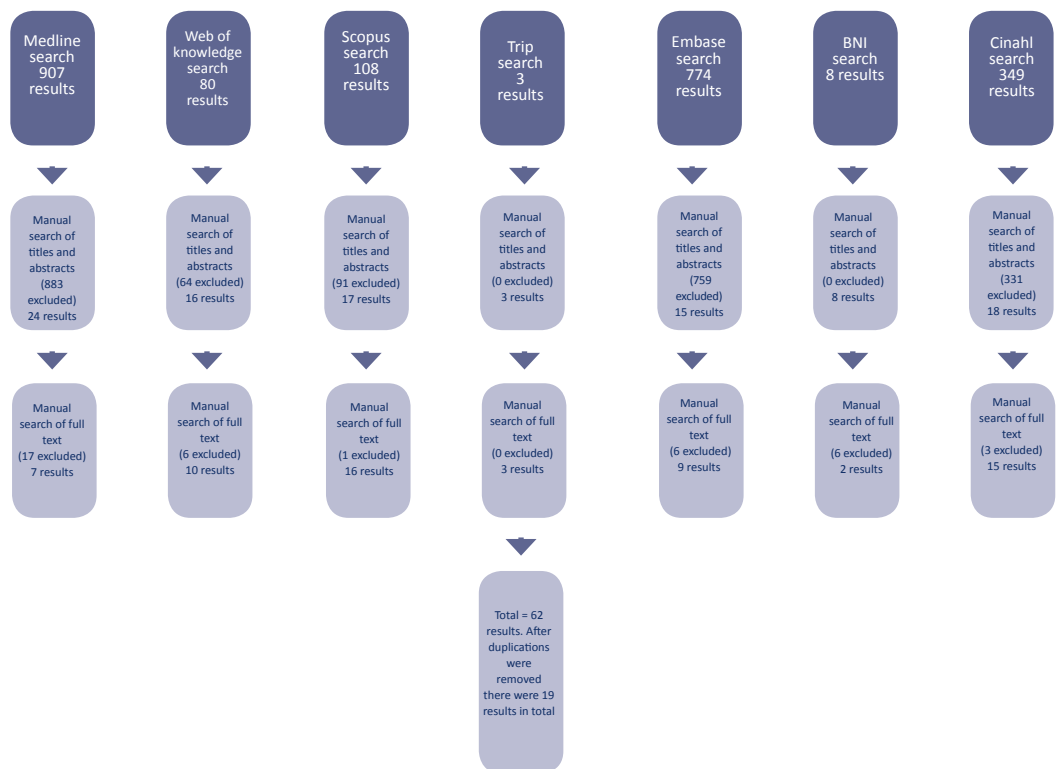


Table 3: Inclusion and exclusion criteria.

Inclusion criteria	Exclusion criteria
Published between January 2007 and December 2011	Published before January 2007 or after December 2011
Full text available	Full text not available
Published in English	Published in a foreign language
Unpublished literature in English	Unpublished literature in a foreign language
Related to adults	Related to only neonates/children
Identifies risk factors for incontinence-associated dermatitis	Identifies risk factors for other wound types

Table 4: Quality scoring criteria.

Study type	Quality checklist employed
Systematic review	Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA, 2014)
Case control, cohort and reviews	Critical Appraisal Skills Programme (CASP, 2014)
Randomised controlled trials/quasi-experimental	Consolidated Standards of Reporting Trials (CONSORT, 2010)

the inclusion criteria cited. They identified poor methodological quality of the evidence and many small studies.

Beeckman et al (2009) suggested that IAD can be prevented and healed with structured skin care and that the perineal environment may be a risk factor for IAD development.

2: Quasi-experimental

Denat and Khorshid (2011) reported on the effect of adult incontinence pads and peri-anal pouches on hospitalised patients in Turkey. The trial addressed a clearly-focused issue using a PICO (population,

interventions, comparators and outcomes) approach (Schulz et al, 2010). Inclusion criteria were well designed, including inpatients over 18 years old that are bedridden, with faecal incontinence and intact skin.

The results of Denat and Khorshid's (2011) study showed that IAD occurred in 66.7% of patients with a peri-anal pouch and 100% of patients with pads ($p=0.04$). They also found that IAD occurred slightly later in the group using peri-anal pouches ($p=0.011$).

3a: Retrospective cohort survey

Toth et al (2008) presented a retrospective cohort

Table 5: Final evidence used to determine the most common risk factors for developing incontinence associated dermatitis.

Evidence level	Evidence type	Evidence sub-type	Author	Title
1	Systematic review		Beeckman et al (2009)	Prevention and management of incontinence-associated dermatitis: literature review
2	Quasi-experimental		Denat and Khorshid (2011)	The effect of two different care products on incontinence-associated dermatitis in patients with faecal incontinence
3a	Survey	Retrospective cohort	Toth et al (2008)	Validating minimum data set (MDS) data about risk factors for perineal dermatitis by comparing with nursing home records
3b	Survey	Mixed design	Borchert et al (2010)	The incontinence-associated dermatitis and its severity instrument: development and validation
3c	Survey	Prevalence survey	Junkin and Selekof (2007)	Prevalence of incontinence and associated skin injury in the acute care inpatient
			Bliss et al (2011)	Incontinence-associated dermatitis in critically ill adults: time to development, severity and risk factors
4	Pragmatic trial		Palese and Carniel (2011)	The effects of a multi-intervention incontinence care program on clinical, economic and environmental outcomes
5a	Narrative review	Consensus based	Gray et al (2007b)	Incontinence-associated dermatitis. A consensus
			Black et al (2011)	MASD part 2: Incontinence-associated dermatitis and intertriginous dermatitis. A consensus
5b	Narrative review	Practice based	Farage et al (2007)	Incontinence in the aged: contact dermatitis and other cutaneous consequences
			Nazarko (2007)	Managing a common dermatological problem: incontinence dermatitis
			Junkin and Selekof (2008)	Beyond diaper rash: incontinence associated dermatitis, does it have you seeing red?
			Gray (2010)	Optimal management of incontinence-associated dermatitis in the elderly
			Nix and Haugen (2010)	Prevention and management of incontinence associated dermatitis
5c	Narrative review	Expert opinion	Gray (2007)	Incontinence-related skin damage: essential knowledge
			Beeckman et al (2011)	Incontinence-associated dermatitis: step-by-step prevention and treatment
			Langemo et al (2011)	Incontinence and incontinence-associated dermatitis

survey of nursing home residents in North America. However the authors were funded by a continence-related company, risking sponsorship bias. The small sample ($n=43$) also limits the generalisability of the findings. The authors identified a high level of agreement of tissue tolerance, the perineal environment and toileting ability in those with IAD, suggesting these are valid risk factors in this population.

3b: Mixed design survey

Borchert et al (2010) carried out a cross-sectional survey to test the validity and reliability of *The IAD and its Severity Instrument*. The results indicated that the tool has face validity, high content validity, excellent criterion validity (correlation coefficient of 0.98 ($p=0.0008$)) and robust inter-rater reliability. The instrument includes tissue tolerance, perineal environment and toileting ability as risk factors for IAD development.

Level 3c: Prevalence survey

A large survey of hospital inpatients in North America ($n=608$) established the prevalence of incontinence and IAD (Junkin and Selekof, 2007). The overall point prevalence of incontinence was found to be 19.7%. A skin injury was identified in 42.5% of incontinent participants. This 42.5% comprised an IAD prevalence of 20%, a pressure ulcer prevalence of 21.7% and a fungal rash prevalence of 10%, indicating that some participants had two types of skin damage. IAD risk factors identified were: low serum albumin blood level (40 times greater risk) (CI 19.6-80.3); decreased mobility (61% increased risk); faecal incontinence; poor nutritional status; compromised mobility; friction; shear and ageing.

Bliss et al (2011) reported on another prevalence survey of intensive care unit patients in North America that clearly outlines the development time, severity and risk factors for IAD. However they surveyed a smaller ($n=45$), less general population than Junkin and Selekof (2007). Although the inclusion and exclusion criteria were not clearly reported by Bliss et al (2011), risking selection bias and limiting the generalisability of results, they identified that impaired cognition, perfusion, faecal incontinence and liquid stools are associated with a risk of IAD.

Level 4: Pragmatic trial

Palese and Carniel (2011) investigated the pre- and post-intervention effects of adult incontinence pads, structured skin care and nursing advice in nursing home residents with IAD and urinary incontinence ($n=63$) in Italy. Attempts were made to reduce confounding variables by excluding participants with clinical complexities even though this may be the group with the highest risk. Palese and Carniel (2011) found the use of containment briefs and structured skin care reduces the incidence of IAD from 100% at baseline to 31.7%.

Level 5a: Consensus-based narrative review

A review by Gray et al (2007b) described a literature search that is reproducible and well designed. Gray et al (2007b) identified a lack of evidence concerning the management of IAD. They outline risk factors for IAD including: urinary, faecal and double incontinence; absorbent products; structured skin care; comorbidities; chronic ill health; skin pH; poor skin oxygenation; compromised mobility; ageing; and fever.

A consensus review on IAD and intertriginous dermatitis by Black et al (2011) presented the prevalence of IAD across different populations. A quality improvement project is outlined (Driver, 2007), suggesting that 31% of those with faecal incontinence in intensive-care-developed IAD. Urinary, faecal and double incontinence, tissue tolerance, perineal environment and toileting ability were identified as risk factors.

5b: Practice-based narrative review

Farage et al (2007) presented a review of IAD in elderly people. Of note is that at the time of publication all the authors in this review were employed by a company that manufactured incontinence-related products, risking sponsorship bias. No quality appraisal was conducted, therefore this paper may have overestimated the value of some of the evidence presented. Farage et al (2007) identified that double incontinence, absorbent products, moisture, skin pH and bacterial colonisation all contribute to IAD.

Nazarko (2007) presented a review of risk factors for IAD. Although in the conclusion, Nazarko (2007) stated the most significant risk factors, there is no explanation as to where these are derived and

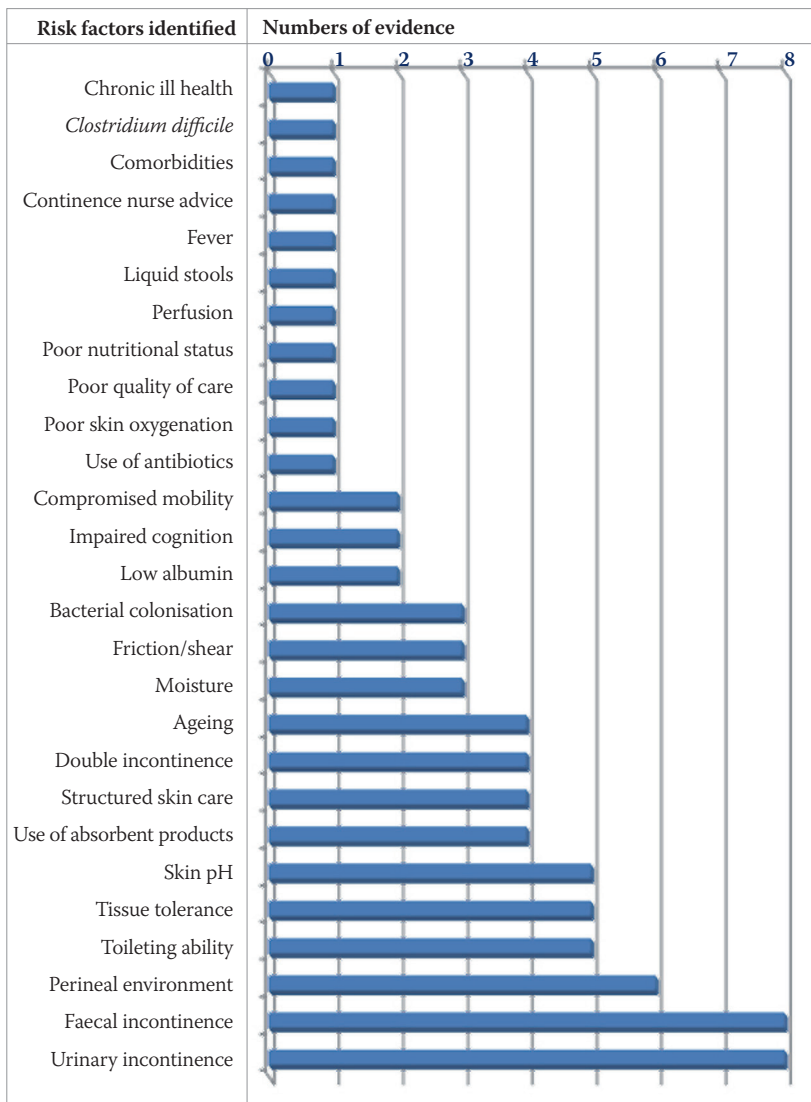
it could be concluded that they are the author's own observations, thus limiting the review by a lack of quality appraisal. Risk factors identified were: urinary incontinence; faecal incontinence, ageing, friction and shear, impaired cognition and poor quality care.

Junkin and Selekof (2008) carried out a review outlining the prevalence, incidence and risk assessment methods for IAD. They suggested that structured skin care reduces the incidence of IAD, and they present several IAD risk assessment tools. However, the review is neither replicable nor systematic. Risk factors identified were: tissue tolerance; perineal environment; low albumin; the presence of *Clostridium difficile*; antibiotic use; toileting ability; urinary incontinence; and faecal incontinence.

A review by Gray (2010) examined the optimal management of IAD in the elderly. Gray (2010) identifies faecal incontinence as a risk factor for IAD and suggests that liquid faeces may increase this risk further. Urinary incontinence is also identified as a risk factor.

Nix and Haugen (2010) presented a concise and informative review of IAD prevention and management. They present a range of lower level evidence on a number of clinical issues, including; cleansing and moisturising skin, incontinence devices and skin barriers. The authors made several assertions about risk factors for IAD development, suggesting that bacteria within faeces may increase risk. Urinary incontinence, faecal incontinence, moisture, skin pH and bacterial colonisation were identified.

Figure 2: Number of times in the evidence risk factors are identified in the literature.



5c: Expert opinion-based narrative review

In a review of IAD, Gray (2007) presented a range of evidence not reported elsewhere, however, no search strategy is described therefore the inclusion and exclusion criteria used for the review are unknown. Gray (2007) made several evidence-based recommendations for preventing and managing IAD, and outlined urinary incontinence as a risk factor.

Beeckman et al (2011) carried out a review of literature of varying quality. Although the authors made several recommendations for the prevention of IAD (including using structured skin care), they suggested that the evidence concerning the management of IAD remains complex and unclear. Beeckman et al (2011) outlined urinary incontinence and a lack of structured skin care as risk factors.

Langemo et al (2011) presented a comprehensive review of IAD in acute and long term care in North America. Tissue tolerance, the perineal environment, toileting ability, moisture, friction/shear and bacterial colonisation are identified as risk factors for IAD.

DISCUSSION

Based on all the evidence reviewed, a total of 27 risk factors for IAD were identified by recording the number of papers that referred to a risk factor (Figure 2 and Table 6).

Although the levels of evidence identified in this review are insufficient to make strong recommendations, nine risk factors were proposed as priorities (Table 7). Overall urinary and faecal incontinence were the most common risk factors identified.

Table 6: Summary of results.			
Risk factor identified	Number of times identified	Author, date	Evidence level
Chronic ill health	1	Gray et al (2007b)	5a
<i>Clostridium difficile</i>	1	Junkin and Selekof (2008)	5b
Comorbidities	1	Gray et al (2007b)	5a
Continence nurse advice	1	Palese and Carniel (2011)	4
Fever	1	Gray et al (2007b)	5a
Liquid stools	1	Bliss et al (2011)	3c
Perfusion	1	Bliss et al (2011)	3c
Poor nutritional status	1	Junkin and Selekof (2007)	3c
Poor quality of care	1	Nazarko (2007)	5b
Poor skin oxygenation	1	Gray et al (2007b)	5a
Use of antibiotics	1	Junkin and Selekof (2008)	5b
Compromised mobility	2	Gray et al (2007b) Junkin and Selekof (2007)	5a 3c
Impaired cognition	2	Bliss et al (2011) Nazarko (2007)	3c 5b
Low albumin	2	Junkin and Selekof (2007) Junkin and Selekof (2008)	3c 5b
Bacterial colonisation	3	Farage et al (2007) Nix and Haugen (2010) Langemo et al (2011)	5b 5b 5c
Friction/shear	3	Junkin and Selekof (2007) Nazarko (2007) Langemo et al (2011)	3c 5b 5c
Moisture	3	Farage et al (2007) Nix and Haugen (2010) Langemo et al (2011)	5b 5b 5c
Ageing	4	Gray et al (2007b) Junkin and Selekof (2007) Nazarko (2007) Langemo et al (2011)	5a 3c 5b 5b
Double incontinence	4	Farage et al (2007) Gray et al (2007b) Gray (2010) Black et al (2011)	5b 5a 5b 5a
Absence of structured skin care	4	Gray et al (2007b) Beeckman et al (2009) Beeckman et al (2011) Palese and Carniel (2011)	5a 1 5c 4
Use of absorbent products	4	Farage et al (2007) Gray et al (2007b) Denat and Khorshid (2011) Palese and Carniel (2011)	5b 5a 2 4
Skin pH	5	Farage et al (2007) Gray et al (2007b) Gray (2007) Nix and Haugen (2010) Langemo et al (2011)	5b 5a 5c 5b 5c

Table 6: continued.

Tissue tolerance	5	Junkin and Selekof (2008) Toth et al (2008) Borchert et al (2010) Black et al (2011) Langemo et al (2011)	5b 3a 3b 5a 5c
Toileting ability	5	Junkin and Selekof (2008) Toth et al (2008) Borchert et al (2010) Black et al (2011) Langemo et al (2011)	5b 3a 3b 5a 5c
Perineal environment	6	Junkin and Selekof (2008) Toth et al (2008) Beeckman et al (2009) Borchert et al (2010) Black et al (2011) Langemo et al (2011)	5b 3a 1 3b 5a 5c
Faecal incontinence	8	Gray et al (2007b) Junkin and Selekof (2007) Nazarko (2007) Junkin and Selekof (2008) Gray (2010) Nix and Haugen (2010) Black et al (2011) Bliss et al (2011)	5a 3c 5b 5b 5b 5b 5a 3c
Urinary incontinence	8	Gray (2007) Gray et al (2007b) Nazarko (2007) Junkin and Selekof (2008) Gray (2010) Nix and Haugen (2010) Beeckman et al (2011) Black et al (2011)	5c 5a 5b 5b 5b 5b 5c 5a

This article has presented an evaluation of the literature referring to the most commonly reported risk factors for IAD development. In comparison to other wound aetiologies, such as pressure ulcers, this review was only able to identify a small body of literature around IAD. Using an EBR study design ensured that this review was undertaken systematically and in a robust manner. However, searching for literature on IAD was complex due to the multitude of terms in use for this condition (*Table 2*), and this also made the comparison of evidence problematic. A recommendation of this review would be that a UK-wide consensus on a term to describe IAD is needed.

There are a number of gaps in the current understanding of IAD, and further research is needed into the risk factors for IAD development as these would help to develop a risk assessment strategy to inform prevention. Also, further research is needed to explore whether incontinence is a true risk factor

for pressure ulcer development and whether IAD increases the risk of pressure ulcer development.

The first step may be to undertake a retrospective analysis of hospitalised patients who have IAD, to validate the risk factors identified in this review.

National IAD incidence and prevalence data would also help to understand the extent of the problem. There is a requirement for accurate incidence and prevalence surveys to be undertaken to establish the true extent of IAD both locally and nationally. Indeed, preliminary data collected at the authors' Trust suggest there may be some confusion about differentiating IAD and pressure ulcers, therefore, the prevalence of IAD may be higher than previously thought.

All the evidence identified is nursing focused, suggesting that IAD is primarily of interest to nurses. IAD generally falls within the realms of the two specialties of tissue viability and continence nursing. In the UK, these services are usually separate, whereas in North America these roles are often combined. This may explain why more of the research in this review is from North America.

Prioritising risk factors

A large number of risk factors for IAD are identified, but there are clearly some that should be prioritised because the quality of the evidence for them is of higher quality (*Table 7*).

It is hoped that this review sets in motion further initiatives to improve the overall quality of care for patients at risk of IAD, and to support the efficiency savings outlined by the Department of Health (DH, 2010a; 2011). This could benefit patients, organisations and the health service as a whole (Department of Health, 2010b; Gray, 2011).

Further research into patient-reported outcomes of their experience of IAD may help strengthen the body of evidence for IAD.

Following this review, the Royal United Hospital in Bath has added risk factors for IAD into its tissue viability training programme. Although yet to be formally evaluated, indications are that care around the prevention of IAD has improved as a result.

CONCLUSION

This review aimed to identify and assess existing evidence on the risk factors for developing IAD to inform prevention strategies.

The evidence found was generally of a low quality, with most of the evidence retrieved at the narrative review level. The highest quality evidence retrieved was a systematic review.

This review article identified 27 risk factors for the development of IAD from the international literature.

If IAD were better researched and understood, then perhaps health providers could prioritise IAD accordingly. Until more insights are gained, preventing, managing and treating IAD remains challenging. **WUK**

REFERENCES

Beeckman D, Schoonhoven L, Verhaeghe S et al (2009) Prevention and treatment of incontinence-associated dermatitis: literature review. *J Adv Nurs* 65 (5): 1141–54

Beeckman D, Schoonhoven L, Fletcher J et al (2010) Pressure ulcers and incontinence associated dermatitis: effectiveness of the Pressure Ulcer Classification Education Tool on classification by nurses. *Qual Safety Healthcare* 19 (5): 3–5

Beeckman D, Woodward S, Gray ME (2011) Incontinence-associated dermatitis: step-by-step prevention and treatment. *Br J Community Nurs* 16 (8): 382–9

Beeckman D, Van Lancker A, Van Hecke A, Verhaeghe S (2014) A systematic review and meta-analysis of incontinence-associated dermatitis, incontinence, and moisture as risk factors for pressure ulcer development. *Res Nurs Health* 37 (3): 204–18

Bianchi J (2012) Causes and strategies for moisture lesions. *Nursing Times* 108 (5): 20–2

Black J, Gray M, Bliss DZ et al (2011) MASD part 2: incontinence-associated dermatitis and intertrigous dermatitis: a consensus. *J Wound Ostomy Continence Nurs* 38 (4): 359–70

Bliss DZ, Savik K, Thorson M et al (2011) Incontinence-associated dermatitis in critically ill adults: a consensus. *J Wound Ostomy Continence Nurs* 38 (4): 433–45

Borchert K, Bliss DZ, Savik K, Radosevich DM (2010) The incontinence associated dermatitis and its severity instrument: development and validation. *J Wound Ostomy Continence Nurs* 37 (5): 527–35

Consolidated Standards of Reporting Trials (2010) Consort 2010 checklist [online]. Available from: www.consort-statement.org. (accessed 30.09.2014)

Critical Appraisal Skills Programme (2014) Critical skills appraisal programme, making sense of evidence about clinical effectiveness [online]. Available from: <http://www.casp-uk.net/> (accessed 30.09.2014)

Denat Y, Khorshid L (2011) The effect of two different care products on incontinence-associated dermatitis in patients with faecal incontinence. *J Wound Ostomy Continence Nurs* 38 (2): 171–6

Department of Health (2010a) *The Operating Framework for the NHS in England 2011–2012*. The Stationery Office, London

Department of Health (2010b) *Equity and Excellence: Liberating the NHS*. The Stationery Office, London

Department of Health (2011) *QIPP*. Available at: <http://bit.ly/1zcXDOs> (accessed 12.06.2014)

Doughty D, Junkin J, Kurz P et al (2012) Incontinence associated dermatitis: consensus statements, evidence based guidelines for prevention and treatment and current challenges. *J Wound Ostomy Continence Nurs* 39 (3): 303–15

Driver DS (2007) Perineal dermatitis in critical care patients. *Critical Care Nurse* 27 (4): 42–6

Table 7: Risk factors based on current levels of evidence.

Risk factor
Urinary incontinence
Faecal incontinence
Double incontinence
Perineal environment
Toileting ability
Tissue tolerance
Skin pH
The use of absorbent products
Absence of structured skin care

Farace DJ, Schopfel J (2010) *Grey Literature in Library and Information Studies*. De Gruyter Saur, Berlin

Farage MA, Miller KW, Berardesca E et al (2007) Incontinence in the aged: contact dermatitis and other cutaneous consequences. *Contact Dermatitis* 57 (4): 211–7

Gray M (2007) Incontinence-related skin damage: essential knowledge. *Ostomy Wound Manage* 53 (12): 28–32

Gray M, Bohacek L, Weir D et al (2007a) Moisture vs pressure: making sense out of perineal wounds. *J Wound Ostomy Continence Nurs* 34: 134–42

Gray M, Bliss DZ, Doughty DB et al (2007b) Incontinence-associated dermatitis: a consensus. *J Wound Ostomy Continence Nurs* 34 (1): 45–54

Gray M (2010) Optimal management of incontinence-associated dermatitis in the elderly. *Am J Clin Dermatol* 11 (3): 201–10

Gray J (2011) *1000 Lives: Pursuing Quality in Healthcare*. Available at: <http://bit.ly/1qBfSUn> (accessed 29.08.2011)

Guyatt G, Sackett DL, Sinclair JC et al (1995) User's guide to the medical literature, 9: a method of grading health care recommendations. *JAMA* 274: 1800–4

Junkin J, Moore-Lisi G, Selekof JL et al (2005) *What we don't know can hurt us. Pilot prevalence survey of incontinence and related perineal skin injury in acute care* [Abstract]. Presented at: Wound, Ostomy and Continence Nursing National Conference. Las Vegas, US, June 2005

Junkin J, Selekof JL (2007) Prevalence of incontinence and associated skin injury in the acute care inpatient. *J Wound Ostomy Continence Nurs* 34 (3): 260–9

Junkin J, Selekof JL (2008) Beyond 'diaper rash': incontinence-associated dermatitis: Does it have you seeing RED? *Nursing* 38 (11 Suppl): 56

Langemo D, Hanson D, Hunter Setal (2011) Incontinence and incontinence associated dermatitis. *Adv Skin Wound Care* 24 (3): 126–40

Moher D (2009) Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Br Med J* 339: 25–35

Nazarko L (2007) Managing a common dermatological problem: Incontinence dermatitis. *Br J Community Nurs* 12 (8): 358–63

Nix D, Haugen V (2010) Prevention and management of incontinence-associated dermatitis. *Drugs Aging* 27 (6): 491–6

Palese A, Carniel G (2011) The effects of a multi-intervention incontinence care program on clinical, economic and environmental outcomes. *J Wound Ostomy Continence Nurs* 38 (2): 177–83

Preferred Reporting Items for Systematic Reviews and Meta-analyses (2014) The PRISMA statement [online]. Available from: <http://www.prisma-statement.org/statement.htm> (accessed 30.09.2014)

Schulz K, Altman DG, Moher D et al (2010) CONSORT statement: updated guidelines for reporting parallel group randomised trial. *Br Med J* 340: 332–6

Toth AM, Bliss D Z, Savik K, Wyman JF (2008) Validating MDS data about risk factors for perineal dermatitis by comparing with nursing home records. *J Gerontol Nurs* 34 (5): 12–8