

# Application of 4R Crisis Management Theory in the Management of Incontinence-Associated Dermatitis in ICU Patients with Fecal Incontinence

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**Abstract:** *Objective:* To analyze the preventive and management effects of the 4R crisis management theory on incontinence-associated dermatitis (IAD) in ICU patients with fecal incontinence. *Methods:* A hundred patients with fecal incontinence who were admitted to the ICU for treatment between January 2024 and December 2024 were selected and randomly divided into two groups using a random number table. The observation group received 4R crisis management theory, while the control group received routine management. The IAD risk score, incidence of IAD, severity of IAD, and formation and healing time of IAD were compared between the two groups. *Results:* After management, the IAD risk score of the observation group was lower than that of the control group ( $P < 0.05$ ). The incidence of IAD in the observation group was lower than that in the control group, the proportion of mild IAD was higher than that in the control group, the formation time of IAD was later than that in the control group, and the healing time was shorter than that in the control group ( $P < 0.05$ ). *Conclusion:* Adopting the 4R crisis management theory for ICU patients with fecal incontinence can reduce the risk of IAD occurrence, effectively prevent IAD, reduce its severity, delay its formation time, and promote good healing.

**Keywords:** 4R crisis management theory; ICU fecal incontinence; Incontinence-associated dermatitis; Management

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## 1. Introduction

Incontinence-associated dermatitis (IAD) is a common complication of fecal incontinence, with an incidence rate of approximately 30% in ICU patients<sup>[1]</sup>. This disease continuously reduces patients' immunity, leading to adverse events such as secondary infections, and affects the tolerance of skin cells to external pressure, increasing the probability of pressure injuries. To effectively prevent IAD in ICU patients with fecal incontinence and ensure

patient safety during treatment, comprehensive nursing management services are needed. Routine management can comprehensively evaluate patients' IAD risks and provide systematic care. However, its management system lacks scientific rigor and is difficult to maximize IAD prevention [2]. The 4R crisis management theory is subdivided into four stages, which interact and influence each other, optimizing the management system, fully identifying risk issues, and implementing targeted and comprehensive management. Therefore, this study selected 100 patients with fecal incontinence admitted to the ICU to evaluate the intervention effect of the 4R crisis management theory.

## **2. Materials and methods**

### **2.1. General information**

A hundred patients with fecal incontinence who were admitted to the ICU for treatment between January 2024 and December 2024 are selected and randomly divided into two groups using a random number table. The observation group consisted of 50 patients, including 27 males and 23 females, with an age range of 40–75 years and a mean age of  $(53.25 \pm 4.18)$  years. The frequency of incontinence was  $\leq 7$  times per day in 31 cases and  $\geq 8$  times per day in 19 cases. The control group consisted of 50 patients, including 29 males and 21 females, with an age range of 37–76 years and a mean age of  $(53.37 \pm 4.23)$  years. The frequency of incontinence was  $\leq 7$  times per day in 32 cases and  $\geq 8$  times per day in 18 cases. There was no statistically significant difference in basic information between the two groups ( $P > 0.05$ ). Inclusion criteria are: Adult patients; Admitted to the ICU department for  $\geq 24$  hours; incontinence frequency of  $\geq 3$  times per day; Presence of loose or watery stools; Complete basic information. Meanwhile, the exclusion criteria include: Presence of IAD upon admission to the ICU; Pressure injury in the sacrococcygeal region; Infectious diseases or skin diseases in IAD high-risk areas; Concomitant urinary incontinence; Withdrawal from the study.

### **2.2. Methods**

The control group received routine management: nursing staff strictly washed their hands, wore masks, verified patients' identity information, evaluated the causes of fecal incontinence, assessed the basic information such as perineal skin condition, and understood the patients' current self-care abilities. They prepared gloves, cotton swabs, warm water, and feces collectors, explained the purpose and process of nursing management for fecal incontinence to the patients to obtain their cooperation. The patients are kept in a supine position, with soft cloth covering their private areas, and warm nursing care is provided. The local skin is moderately cleaned to ensure that no feces or urine remained in the skin folds, and the skin was patted dry with a paper towel. Targeted treatment is applied to skin defects. A moderate amount of emollient and skin protectant is applied, and the patients are returned to a supine position. Education on fecal incontinence and IAD knowledge is provided to enable patients to acquire basic nursing skills.

The observation group adopted the 4R crisis management theory: 16 experts, including dermatologists and wound care nurses, with a familiarity of 0.74 and an authority level of 0.82, are consulted. Based on the results of the first round of consultation, the experts conducted literature reviews, consulted frontline medical staff, and developed a consultation form after multiple discussions. This included the "Basic Information Form for Experts" and the "Accuracy Expert Consultation Form for IAD Crisis Management Plan Items for Critically Ill Patients in the ICU", etc. The results of the first round of consultation are revised to form professional nursing management content, specifically:

(1) Reduction stage

The goal is to eliminate hidden factors of IAD and skin damage, effectively prevent the disease, and reduce its harm. Specific measures include conducting a detailed examination of the patient's skin condition within 2 hours of entering the ICU department. The Perineal Assessment Tool (PAT) is used to comprehensively evaluate the patient's risk of IAD, understand the patient's stool characteristics (liquid or formed stool), skin manifestations in the perineal area, duration of skin exposure to the external environment, and diarrhea-related factors such as hypoproteinemia or *Clostridium* infection. With 7 points as the standard value, those scoring below 7 are classified as low-risk, while those scoring 7 or above are classified as high-risk. The first PAT assessment is performed within 2 hours of the patient's admission to the department. For high-risk patients, immediate assessment is required after each bowel movement, while low-risk patients are strictly assessed during shift changes. Timely re-evaluation is needed for new risk factors.

(2) Readiness stage

The goal is to improve the ability of ICU medical staff to identify and respond to IAD, enhancing their readiness. Specific measures include establishing a management team led by an experienced chief nursing officer and consisting of senior nursing staff. The team leader conducts knowledge training once a week, explaining IAD high-risk factors, severity classification methods, assessment frequency, daily assessment opportunities, and other knowledge through workshops, on-site demonstrations, or theoretical courses. At the same time, they provide information on the selection and usage precautions of skin care products, and outline structured measures for skin care management. After the training, assessments are conducted through theoretical exams and practical operations to ensure that each team member has risk prevention and control abilities and professional nursing skills. Team members are responsible for regularly checking patients' disease conditions, summarizing skin problems, providing IAD warnings, and implementing corresponding nursing management processes.

(3) Response stage

After a patient is diagnosed with IAD, their severity is assessed, and systematic nursing management is implemented. A skin cleanser that is rinse-free, gentle, and slightly acidic is selected. A stool collector is reasonably chosen based on the patient's stool characteristics and volume. If the patient belongs to a difficult case, a stoma specialist is invited to participate in the department consultation to provide efficient nursing management methods.

(4) Recovery stage

After a patient develops IAD, it is necessary to evaluate the psychological changes of the nursing staff, prohibit the use of accusatory language, and promptly carry out remedial plans in collaboration with the nursing staff to effectively control the patient's condition. A group meeting is held once a week to summarize the incidence and causes of IAD, deeply analyze management deficiencies, and list improvement suggestions.

## 2.3. Observation indicators

- (1) IAD risk score: The PAT assessment method is selected, which includes duration of irritants, related influencing factors, intensity of irritants, and perineal skin condition, each with a score of 1–3, totaling 4–12 points. The risk level is positively correlated with the score.

- (2) IAD incidence rate: Observe the proportion of IAD cases in each group.
- (3) Severity of IAD: The IAD Severity Assessment Scale is selected, which includes dimensions such as rash, skin color, and defects, with a total of 13 areas evaluated. Among them, mild refers to pink skin, no blisters, intact and dry, blurred boundaries, elevated skin temperature on palpation, accompanied by stinging or burning sensation; moderate refers to bright red skin, local exudation or damage, accompanied by pain; severe refers to skin defects and redness, accompanied by bleeding and exudation.
- (4) Formation and healing time of IAD: Observe the time from fecal incontinence to the appearance of IAD; the time from the appearance of IAD to healing.

## 2.4. Statistical analysis

Data processing software is SPSS 28.0. Measurement data is expressed as  $[\pm s]$ , and t-value comparison and testing are performed. Count data is expressed as  $[n/\%]$ , and  $\chi^2$  value comparison and testing are performed. Statistical significance is indicated by  $P < 0.05$ .

## 3. Results

### 3.1. Comparison of IAD risk scores between the two groups

Before management, there was no difference in IAD risk scores between the two groups ( $P > 0.05$ ). After management, the IAD risk score of the observation group was lower than that of the control group ( $P < 0.05$ ). The results are shown in **Table 1**.

**Table 1.** Comparison of IAD risk scores between the two groups [ $\bar{x} \pm s$ , points]

Group	Number of cases	Irritant duration (min)		Related factors	
		Before intervention	After intervention	Before intervention	After intervention
Observation group	50	$2.07 \pm 0.31$	$1.41 \pm 0.29$	$2.04 \pm 0.38$	$1.71 \pm 0.30$
Control group	50	$2.09 \pm 0.33$	$1.82 \pm 0.34$	$2.06 \pm 0.40$	$1.98 \pm 0.35$
<i>t</i>	-	0.312	6.488	0.256	4.142
<i>P</i>	-	0.755	$< 0.001$	0.798	$< 0.001$

  

Group	Number of cases	Irritant intensity		Perineal skin status	
		Before intervention	After intervention	Before intervention	After intervention
Observation group	50	$1.84 \pm 0.33$	$1.90 \pm 0.28$	$1.90 \pm 0.28$	$1.40 \pm 0.28$
Control group	50	$1.86 \pm 0.32$	$1.91 \pm 0.24$	$1.91 \pm 0.24$	$1.68 \pm 0.27$
<i>t</i>	-	0.308	0.192	0.192	5.090
<i>P</i>	-	0.759	0.848	0.848	$< 0.001$

### 3.2. Comparison of IAD incidence between two groups

The incidence of IAD in the observation group was 18.00% (9/50), while the incidence in the control group was 36.00% (18/50) ( $\chi^2 = 4.110$ ,  $P = 0.043$ ).



### 3.3. Comparison of IAD severity between two groups

Based on **Table 2**, the proportion of mild IAD in the observation group was higher than that in the control group ( $P < 0.05$ ).

**Table 2.** Comparison of IAD severity between two groups [n/%]

Group	Number of cases	Mild n (%)	Moderate n (%)	Moderate n (%)
Observation group	9	7(77.78)	2(22.22)	0
Control group	18	6(33.33)	11(61.11)	1(5.56)
$\chi^2$	-	4.747	3.635	0.519
$P$	-	0.029	0.057	0.471

### 3.4. Comparison of IAD formation and healing time between two groups

The formation time of IAD in the observation group was later than that in the control group, and the healing time was shorter than that in the control group ( $P < 0.05$ ), as shown in **Table 3**.

**Table 3.** Comparison of IAD formation and healing time between two groups [ $\bar{x} \pm s$ , d]

Group	Number of cases	IAD onset time (days)	IAD healing time (days)
Observation group	9	$3.58 \pm 0.41$	$7.42 \pm 1.76$
Control group	18	$2.91 \pm 0.38$	$9.20 \pm 1.83$
$t$	-	4.210	2.412
$P$	-	$< 0.001$	0.024

## 4. Discussion

IAD mainly occurs in ICU patients with fecal incontinence. Its predisposing factors include the negative impact of enteral nutrition on the intestinal tract, decreased gastrointestinal barrier function, and abuse of antibacterial drugs. Excessive relaxation of the anal sphincter muscle in patients can increase bowel frequency<sup>[3]</sup>. The persistence of this disease can increase the incidence of stress injuries and lead to complications such as urinary tract infections, thereby increasing the patient's disease burden and treatment costs. Clinical medicine believes that regularly assessing patients' fecal incontinence and IAD risk can effectively prevent the disease. However, the current evaluation system is not perfect, and prevention and control management content is limited, making it difficult to significantly reduce the incidence of IAD<sup>[4]</sup>.

The 4R crisis management theory is a relatively new theory that can develop a continuous and sustainable management system based on the current status of IAD nursing management ( $P < 0.05$ ). It emphasizes risk process management, values prior control, allows for targeted management during events, and enables the development of post-event management content, thereby improving nursing management quality<sup>[5]</sup>. This theory covers four stages, which are independent and closely related to each other. It enables dynamic, comprehensive, and systematic circular management of patients, implemented throughout the entire management process, to prevent crisis events<sup>[6]</sup>.

The results showed that after management, the IAD risk score of the observation group was significantly

lower than that of the control group ( $P < 0.05$ ). The incidence of IAD in the observation group was 18.00%, while that in the control group was 36.00%. The proportion of mild IAD in the observation group was 77.78%, while that in the control group was 33.33%. The comparison between the two sets of data yielded  $P < 0.05$ . The reason for this is that the 4R crisis management theory considers skin care as the core of management. It enables timely screening and evaluation of skin problems, allowing for the development of standardized and individualized skin care content to prevent IAD<sup>[7, 8]</sup>. This theory facilitates circular nursing for existing nursing management problems, making the management process dynamic and minimizing disease progression, thereby reducing its severity<sup>[9]</sup>. The formation time of IAD in the observation group was later than that in the control group, and the healing time was shorter than that in the control group ( $P < 0.05$ ). The reason is that this theory cultivates nursing staff's risk awareness, improves their ability to manage IAD, allows them to take proactive measures, actively screens patients for risk factors, and follows a scientific management process, thereby delaying IAD formation and promoting faster healing<sup>[10]</sup>.

## 5. Conclusion

In summary, adopting the 4R crisis management theory for ICU patients with fecal incontinence can prevent IAD, reduce its severity, and accelerate the healing of dermatitis, demonstrating significant management advantages.

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## Disclosure statement

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