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# Application and Observation of Inulin in the Treatment of Constipation for Critically Ill Patients in the ICU

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**Abstract:** *Objective*: To explore the application method and clinical effect of inulin in the treatment of constipation for patients in the ICU. *Methods*: Sixty ICU patients with constipation were randomly divided into an experimental group and a control group, with 30 patients in each group. The control group received nasal feeding with a regular diet. The experimental group received nasal feeding with a regular diet plus inulin. The defecation status of the patients was observed and compared on the 3rd, 5th, and 7th days. *Results*: Among the 30 patients in the experimental group and 30 patients in the control group, there was a statistically significant difference in treatment effect between the two groups ($P < 0.05$). The treatment duration was (3.91 ± 1.09) days in the experimental group and (5.78 ± 1.52) days in the control group. *Conclusion*: Inulin has a significant effect in the treatment of constipation for critically ill patients in the ICU and is worthy of clinical promotion and application.

**Keywords:** ICU; Constipation; Inulin; Treatment effect

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## 1. Introduction

Patients in the intensive care unit (ICU) often require the use of a large number of antibiotics and higher-level antibiotics due to their critical and complex conditions [1]. The use of these antibiotics can easily kill healthy intestinal flora. Additionally, the presence of multidrug-resistant bacteria in the ICU, which can colonize the intestine and cause significant impact on patients, further complicates the situation. Diarrhea, abdominal pain, intestinal distension, and constipation are clear signs of intestinal flora imbalance. Other factors contributing to constipation include decreased intestinal motility caused by illness, slowed intestinal peristalsis, the need for nasogastric feeding due to the inability to eat orally, and the lack of dietary fiber. Constipation can lead to increased toxin absorption, discomfort, and increased heart rate, which can adversely affect subsequent treatment [2]. Therefore, since January 2023, the hospital's department has been adding inulin to the patients' homogenized diet

to prevent constipation in ICU patients, achieving good results. The details are reported below.

## 2. Materials and methods

### 2.1. General information

The study is conducted between January 2023 and June 2025 and included 60 critically ill patients. The basic information for the groups is compared below:

**Table 1.** Comparison of basic information between the two groups [n/%, ±s]

| Group | Gender | | Age (years) | Disease type | | | |
|---|---|---|---|---|---|---|---|
| | Male | Female | | Severe craniocerebral injury | Cerebral hemorrhage | Cerebral infarction | Chronic obstructive pulmonary disease |
| Observation | 20 | 10 | 30–90, 58.65 ± 4.15 | 7 | 8 | 4 | 7 |
| Control | 18 | 12 | 32–91, 58.41 ± 4.95 | 4 | 7 | 4 | 6 |
| *P* | > 0.05 | | > 0.05 | > 0.05† | | | |

| Group | Gender | | Age (years) | Disease type | | |
|---|---|---|---|---|---|---|
| | Male | Female | | Septic shock | Post- cardio pulmonary resuscitation | Others |
| Observation | 20 | 10 | 30–90, 58.65 ± 4.15 | 7 | 2 | 1 |
| Control | 18 | 12 | 32–91, 58.41 ± 4.95 | 6 | 3 | 4 |
| *P* | > 0.05 | | > 0.05 | | | |

### 2.2. Diagnostic criteria

Functional constipation is diagnosed according to the relevant criteria of Rome IV, which is characterized by difficult defecation or incomplete defecation, difficulty in spontaneous defecation, requiring manual assistance for defecation, and fewer than 3 bowel movements per week.

### 2.3. Inclusion criteria

(1) Patients admitted to the ICU department for no less than 48 hours
(2) Patients under the age of 80
(3) Patients with stable disease conditions who can tolerate this study
(4) Patients with normal heart function
(5) Patients with normal skin condition on the waist and abdomen
(6) Patients with chronic diseases
(7) Patients with complete basic information

### 2.4. Exclusion criteria

(1) Patients with habitual constipation
(2) Patients with severe organic lesions in the intestine
(3) Patients with internal bleeding or gastrointestinal perforation, or acute infection

(4) Patients with heart disease
(5) Patients with malignant tumors
(6) Patients with abnormal communication skills
(7) Patients with dull response or local loss of sensation in the body
(8) Patients with damaged skin lesions on the abdomen; patients who have been in the ICU for 1 week
(9) Patients who voluntarily withdraw from the study

## 2.5. Treatment methods

Both groups received routine nursing care, health education, and a light and digestible homogenized diet that avoids greasy food and includes more dietary fiber.

### 2.5.1. Observation group

On the basis of routine nursing measures, inulin is added to the homogenized diet. The specific operation method is as follows: The patient's family members are instructed to prepare the homogenized diet, and 1 scoop of inulin (5 grams per scoop) is dissolved into the homogenized diet three times a day during each nasal feeding, with a daily maximum of 15 grams. For conscious patients who can eat, inulin is dissolved in warm water and consumed. Fluid management is performed to ensure a daily fluid intake of not less than 2500 ml.

## 2.6. Nursing methods

If the patient is in a sober state, it is necessary to inquire about their current feelings, predict their negative psychology based on characteristics such as changes in tone or facial expression, and then provide verbal counseling. Successful cases can be used as aids to detail the entire process of case treatment, allowing patients to enhance their confidence in treatment through care. It is important to emphasize that constipation has a high curability rate, and actively cooperating with treatment and nursing procedures can achieve an ideal prognosis and reduce patients' concerns. Strengthen care for bowel movements, keep the local skin clean and dry, assess the color or nature of stool irregularly, record the amount of stool, and report any abnormalities to the doctor. At the same time, collect a moderate amount of stool samples, send them for testing to determine the cause of the abnormality, and then provide individualized care. Additionally, it is important to strengthen nutrition, consume more dietary fiber rich in vitamins, increase intestinal motility, and increase stool volume to facilitate bowel movements.

## 2.7. Criteria for evaluating therapeutic effects

Markedly effective: Bowel movements occur within 48 hours or defecation is smooth, stool texture is soft, and there are no accompanying symptoms; Effective: Bowel movements occur smoothly within 72 hours, stool texture is initially dry and then softens, with mild accompanying symptoms; Ineffective: No bowel movements occur after 72 hours, indicating no improvement in constipation.

## 2.8. Statistical processing

Data are analyzed using SPSS 26.0 statistical software. Measurement data are compared using the t-test and expressed as mean ± standard deviation. Count data are compared using the chi-square test and expressed as percentages. $P < 0.05$ is considered statistically significant.

# 3. Results

## 3.1. Comparison of clinical effects on constipation between the two groups

After 10 days of intervention, the total effective rate for constipation in the control group was 70.00%, while the total effective rate in the experimental group was 93.33%. The difference in total effective rates between the two groups was statistically significant ($P < 0.05$), as shown in **Table 2**.

**Table 2.** Comparison of constipation improvement between the two groups after one week of intervention (n)

| Group | *n* | Markedly effective | Effective | Ineffective | Total effectiveness rate (%) |
|---|---|---|---|---|---|
| Observation group | 30 | 20 | 8 | 2 | 93.33 (28/30) |
| Control group | 30 | 14 | 7 | 9 | 70.00 (21/30) |
| $\chi^2$ | | | | | 5.455 |
| *P* | | | | | 0.020 |

## 3.2. Comparison of treatment days between the two groups

The treatment duration was (3.91 ± 1.09) days in the observation group and (5.78 ± 1.52) days in the control group, with a comparison of t = 5.476 and P = 0.000 between the two groups.

# 4. Discussion

The results of this study show that the effective rate of the observation group is significantly higher than that of the control group, indicating that inulin can effectively relieve constipation in ICU patients. Constipation is a common complication in the ICU, and active prevention and treatment of constipation have certain significance for improving the prognosis of severely ill patients.

The normal human intestine is home to 10 trillion bacteria, which can affect body weight, digestive ability, resistance to infection, and risk of autoimmune diseases, and can also control the body's response to cancer treatment drugs [3]. According to conservative estimates, there are about 1000 species of bacteria parasitizing in the intestinal tract, among which probiotics account for about 20%, harmful bacteria account for about 10%, and the remaining 70% are intermediate bacteria, which can turn into pathogenic bacteria when the host's resistance is weak. These flora inhabit and live in the intestinal tract, producing a large amount of metabolites, and 40% of the substances in the blood come from the intestinal flora. Most ICU patients are critically ill, with multiple diagnoses and complex treatment medications. They often use large amounts of high-grade antibiotics, which kill normal intestinal flora while eliminating pathogenic bacteria, disrupting the normal intestinal flora ecology.

Due to long-term bed rest and inability to move, patients' gastrointestinal function is weakened, leading to slowed intestinal motility and intestinal motility dysfunction, which can easily lead to constipation. Additionally, many patients are in a fasting or temporary fasting state due to illness, and there is no supply of food and dietary fiber. As a result, the normal intestinal flora loses the opportunity to obtain nutrition, leading to a significant reduction in the number of probiotics and intestinal dysfunction. These are the reasons why ICU patients are prone to constipation [4]. The reduction of intestinal probiotics hinders the synthesis of B vitamins (such as B1, B2, B6), various short-chain fatty acids, vitamin K, etc., which are needed by the human body. The intestinal mucosa of patients is damaged, permeability increases, pathogenic bacteria enter the bloodstream, and flora shifts, causing greater harm.

As a dietary modulator, inulin is a soluble dietary fiber that is not absorbed by the human body and only acts in the intestine. It is colorless and tasteless, with a good taste, and is relatively easy to accept. It has no side effects on the body, which is unmatched by any drug. Soluble dietary fiber generally includes pectin, inulin, and oligosaccharides [5]. Compared with other soluble dietary fibers, inulin is relatively easy to obtain and inexpensive. It generally exists in plants, especially chicory. It cannot be decomposed by enzymes in the stomach and small intestine but can be fermented by probiotics in the large intestine, becoming the favorite food of intestinal probiotics. It not only provides dietary fiber to maintain normal intestinal function but also allows intestinal probiotics to proliferate significantly. Around 15 grams of inulin per day is equivalent to the dietary fiber of 900 grams of apples, 2,100 grams of bananas, and 1,200 grams of celery. The refined inulin has higher dietary fiber content, no odor, and can be dissolved in water, milk, porridge, soy milk, and other foods, making it convenient to eat [6].

Due to the critical illness, ICU patients cannot eat, leading to reduced dietary fiber intake. Even if they can barely eat, they cannot consume a large amount of dietary fiber needed by the body due to taste and appetite issues, which is insufficient to meet the body's requirements. Therefore, they are prone to dry stool and constipation. Because stool is a substance with more toxins in the human body, constipation increases the absorption of toxins, which is not conducive to disease recovery [7]. In addition, inulin can also wrap around the stool to form a protective film, making the stool smoother and more comfortable to pass, improving bowel movements.

## 5. Conclusion

In summary, the main component of inulin is β-(2,1) fructose polymer, which is not absorbed after entering the small intestine tissue and can be fermented in the colon, thereby increasing the local blood concentration. Inulin can increase the proliferation of *Lactobacillus* and *Bifidobacterium*, exerting a prebiotic effect. Its treatment mechanism for constipation in ICU patients is to regulate the intestinal flora and enhance colonic motility; increase the secretion of mucus by colonic goblet cells, playing a role in lubricating the intestine and reducing defecation resistance; and regulate the neuroendocrine system, improving the existing activity of the enteric nervous system. In short, inulin can significantly improve the overall efficacy of ICU patients with constipation, shorten the treatment duration, and has better therapeutic advantages. It can be used as the preferred treatment method for ICU patients with constipation to achieve ideal disease prognosis.

## Disclosure statement

The author declares no conflict of interest.

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