

# Critical Care Nurses' and Physicians' Perception about Re-feeding Syndrome

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**Abstract Introduction:** Re-feeding syndrome is a fetal syndrome which results from fatal shifts in fluids and electrolytes that may occur in malnourished patients receiving artificial re-feeding. Therefore, nurses and physicians working in ICUs should be aware of this fetal complication and consequences of its occurrence in acutely ill. **The aim of the work** is to examine the perception of nurses and physicians about re-feeding syndrome in critically ill. **Methods: The study design** was a descriptive and cross sectional design. **Setting,** This study was implemented in general and trauma intensive care units (ICUs) at Assiut university Hospital in Assiut-Egypt. **Subjects,** 30 critical care nurses and 25 intensive care physicians were drawn from the previously mentioned ICUs. **Tools:** A questionnaire tool was adopted from the articles to be used in data collection to assess the focus group perception regarding re-feeding syndrome. The data was collected from May 2018 to August 2018. **Results:** The findings of the current study show that nurses and physicians have poor knowledge regarding re-feeding syndrome. **Conclusion:** The present study shows strong evidence that the level of knowledge of nurses' and physicians about re-feeding syndrome, was not adequate and low. This may be contributed as the participants didn't receive any previous educative sections about re-feeding syndrome. **Recommendation:** Nurses and physicians need training to give them advanced level of knowledge about re-feeding syndrome to be able to deal with the physiological changes that occur in critically ill.

**Keywords:** re-feeding syndrome, critically ill, Critical care nurses

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## 1. Introduction

Nutritional support in patients with acute disease is a complex issue. Many recent studies have led to dramatic changes in the awareness of the metabolic response to serious diseases and various aspects of the management of the nutrition, including monitoring of metabolic response and determining the requirements for calories, proteins and micronutrients [1].

People who are underweight, acute malnutrition or hunger during nutritional repetition are risky for many serious conditions as re-feeding syndrome (RS). RS involves considerable imbalance in electrolytes, fluids, and vitamin that can lead to an obvious morbidity and mortality rates. All health team practitioners especially nurses and physicians must be aware of RS, identify patients at risk of developing RS, and most need take steps to prevent this serious issue. It is a great caution for patients who develop RS signs and symptoms to re-start strong electrolytic supplements, vitamin supplements, and supportive care [2,3,4].

Re-feeding syndrome has been defined as a severe shift of fluids and electrolytes in patients who are malnourished during oral or enteral or parenteral re-feeding, and may lead to severe metabolic dysfunction and can lead to morbidity and mortality [5,6,7]. The earlier published reports of the prisoners of war reported that starvation is a key risk factor for the syndrome [8]. Certain population as hunger strikers, persons with anorexia nervosa, chronic alcoholics, elderly patients with concurrent chronic diseases, and chronic signs of malnutrition such as cystic fibrosis, severe inflammatory bowel disease or with short bowel syndrome or morbidly obese patients with rapid weight loss were confirmed in re-feeding syndrome. The recent definition of re-feeding syndrome is a life-threatening decrease in electrolyte concentrations, fluid and electrolyte imbalance, and organ dysfunction caused by fast or unbalanced nutrition support. However, this definition is inaccurate and lacks of specific threshold values for electrolyte to reliably diagnose re-feeding syndrome [9,10].

The absence of a universally accepted definition of this issue means that the real prevalence of re-feeding syndrome is largely unknown [2]. Nurses and physicians confidence with regard to the identification of re-feeding

syndrome makes it more difficult to obtain real incidence and epidemiological data [11]. In patients with critical conditions, a hypophosphatemia level of 34-52% was reported. The mortality and morbidity of RFS is not studied efficiently during a very serious illness due to variable definitions [12,13,14].

Since it has recently been discovered as a disease, both diagnosis and treatment still seem limited. The team of nutrition can direct and educate other health professionals in managing the re-feeding syndrome. However, further research is needed to provide detailed information on this syndrome, particularly with regard to preventive protocols. [15].

As carbohydrates are reintroduced, the clinical manifestations of the syndrome of re-feeding are prevailing. A sudden shift from fat and protein to carbohydrate metabolism leads to a catastrophic increase in insulin production. This increase in insulin secretion leads to intracellular glucose shifts with mandatory cell privileges for phosphates, magnesium and potassium [3,16]. Furthermore, this sudden supplementation of carbohydrate can reduce water and sodium excretion, resulting in the expansion of the extracellular fluid compartment and fluid overload, pulmonary edema, and/or cardiac arrest. Other clinical features that may also be observed during this time include hypophosphatemia, hypopotassemia, hypomagnesemia, hyperglycemia, and thiamin deficiency. Hypophosphatemia can cause cardiac arrhythmia, respiratory failure, rhabdomyolysis, and confusion [14,17,18].

The early identification of risky individuals, controlled hypocaloric nutritional treatment and electrolytes supplementation are recommended by the guidelines for the prevention and treatment of re-feeding syndrome. However, not all individuals with risk factors for re-feeding syndrome show symptoms during nutritional repletion. One possible consequence of joining these untested guidelines is the insufficient nutrition of undernourished people [19]. However, further research is needed to provide detailed information on this syndrome, particularly with regard to preventive protocols and remedial measures [8,11,20,21].

## 2. Methodology

### 2.1. Research Design

This descriptive research (cross sectional survey) of the critical care nurses & physicians was conducted from May 2018 to August 2018.

#### The research question:

“What is the perception of nurses & physicians in critical care units regarding re-feeding syndrome?”

#### Aim of the study:

To examine the perception of nurses & physicians in critical care units regarding re-feeding syndrome.

### 2.2. The Study Site

The study site included two different intensive care units (Trauma ICU and general ICU) at Assuit University Hospitals.

### 2.3. The Focus Group

- 30 nurses and 25 doctors from the previous settings and meet the eligibility criteria were included in the study. **Inclusion criteria:** Nurses & physicians who were responsible for providing care to critically ill patients in direct and continuous manner and have at least one year experience to able to respond about question.

### 2.4. Ethical Consideration

A research proposal was presented to the Ethical Committee at the Faculty of Nursing Assiut University. Each ICU coordinator was informed about the study and provided their oral support and written consent to the study. Participants were given information about the study to help them make an informed decision about participation.

### 2.5. Tools

The following tool was utilized to collect data pertinent to the study:

The data collection tool included the author-made questionnaire composed of 2 parts: the first part included questions about the demographic characters of the nurses, the second part included questions regarding nurses and physician perception of re-feeding syndrome. The study comprised four three phases, including (i) development of a questionnaire of nurses and physician perception of re-feeding syndrome (one month); (ii) pilot testing of questionnaire (one month); (iii) implementation of the questionnaire (two months).

#### 2.5.1. Development of the Questionnaire

The questionnaire was a tool for collecting self-reporting data where participants present their views and knowledge about re-feeding syndrome. The questionnaire was developed from published research and publications describing best practices relating to all relevant aspects of nutrition of critically ill patients [22,23,24]. It was easy to administer, not time consuming, enabling access to larger samples. This questionnaire was closed ended question.

#### Parts of the questionnaire:

- Questions related to demographic data (open questions)
- Questions related to nurses & physician knowledge about re-feeding syndrome which are so important as it provides an insight into the current knowledge (multiple choice questions with only one possible answer per question). The questions were discussed with critical care nurses and doctors experienced in critical care education.
- The questionnaire was designed in English because all nurses and physician are bachelor and master degree (their study was in English when they were studying in their faculty) and hospital documents are in English. Moreover, the participants were able to communicate in the English

#### 2.5.2. Piloting the Questionnaire

The pilot questionnaire was tested once the approval of the ethical committee was received. The pilot study was

conducted on 3 nurses and 3 physicians who were asked about re-feeding syndrome. The reason for selecting these nurses & physicians was to test the tool with a set that reflects the expected appearance of the target population and identify any confusing and irrelevant questions. Any comments from nurses & doctors about the questionnaire were provided.

### 2.5.3. The Final Questionnaire

The last edition of the questionnaire contained twenty questions. The questionnaire included: (four questions) related to personal data (Age, unit, level of experience, and educational level. (sixteen questions) of nurses & physician knowledge about re-feeding syndrome.

### 2.5.4. Validity & Reliability

The researcher gave the questionnaire to 6 experts in critical care nursing & medicine to review and examine the document and their recommendations were used to improve the quality of the questionnaire. The reliability and validity of the instruments gives an attribute of the study and reduce the bias level. Included test retest reliability and internal validity was measured by correlation coefficient (Cronbach alpha was 0.85).

### 2.5.5. Implementing the Questionnaire

Upon completion of the questionnaire it was copied according to the number of participants. The questionnaires were distributed by the research in the selected units on nurses and doctors at the time of their rest to assure that patient care is not affected. The researcher met each participant individually to clarify any question. After completion of the questionnaire the researcher collect it

#### The scoring system of the questionnaire:

- The second part was evaluated as each correct answer was scored one degree and zero for wrong answer.
- The total score of knowledge was scored as 75% or more of correct answer is considered good level of knowledge, 60% to less than 75% is considered faire level, but less than 60% was considered poor level.

## 2.6. Data Analysis

SPSS for Windows version 16.00 (SPSS Inc., Chicago, IL, USA) was used for statistical analysis. Descriptive statistics are presented by numbers (n), percentages (%) and as mean (standard deviation). Normality of data distribution was evaluated with the Kolmogorov-Smirnov test. Data were analyzed primarily descriptively, but inferential analysis ( $Z/\chi^2$ /Fisher's exact test) was used to determine whether nurses' and physicians' experience, educational status or ICU type. A p-value <0.05 was accepted as the indicator of statistical significance.

## 2.7. Strength and Limitations

The strength of our study is that it is the first study that aimed to identify the perception of critical care nurses and physician about re-feeding syndrome. As our study was focused at a single institution, it is possible that the results reflect local culture limiting generalizability and the low

response rate by providers limits generalizability of the results. Moreover, the time constraints and workload of the participants who work in a critical care environment.

## 3. Results

The mean & SD of age in physicians was  $27.16 \pm 4.24$  versus  $24.36 \pm 4.39$  in nurses. The highly percent of the participating nurses (46.6%) and physicians (68%) have less than 2 years' experience. A large number of nurses (66.7%) and physicians (68%) were bachelor degree. As regard to the intensive care unit, sixty percent of nurses were in the general ICU versus 56% of physician. The rest of the groups were in the trauma unit (Table 1).

Regarding to the type of nutrition that is associated with re-feeding syndrome, the highly percentages of nurses 11(36.6%) and physicians 8(32%) answered correctly the oral nutrition, nasogastric tube nutrition and parenteral nutrition. The rest of the sample selected different answers without statistically significant difference (P value >0.05). In concern to the hall-mark laboratory abnormality, 6(20%) of nurses versus 10(40%) of physicians answered correctly and stated hypophosphatemia without statistically significant difference (P value >0.05). Regarding to the cause of electrolyte disturbance in re-feeding syndrome, most nurses 26(76.7%) and physicians 25(100%) stated correctly electrolyte shift from the extracellular to the intracellular compartment respectively with statistically significant difference (P value < 0.05). In relation to the most common vitamin deficiency in re-feeding syndrome 70% of nurses correctly stated Vitamin B 1 (thiamine) versus 88% of physicians stated this correct answer without significant difference (P value > 0.05). In concern to the type of magnesium, 53.3% of nurses' answers were correct versus the high percentage of physicians (100%) who answered the same question correctly and selected intracellular cation with significant difference (P value <0.05) (Table 2).

Related to the risk factors of RFS, 80% of nurses versus 44% of physicians stated malignancy, alcoholism and intestinal mal-absorption with significant difference (P value <0.05). Regarding to the operation that increases risk for RFS, all physicians versus half of nurses correctly answered duodenal-switch operations. In concern to the risky weight loss for RFS, little number of nurses 6(20%) and physicians 3(12%) correctly stated greater than 10% over a couple of months. In the other hand, the rest of the sample of the two groups selected incorrect answers. For the cause of increased risk to RFS in patients undergoing chemotherapy, only 26.7% of nurses versus 28% of physician correctly answered anorexia nervosa. Regarding to the cause of increased risk to RFS in patients with stroke 23.3% of nurses stated correctly dysphagia. While all physicians, stated wrong answers with significant difference (P value <0.05) (Table 3).

Regarding to the cause of impaired respiratory muscle function sometimes resulting in respiratory failure or ventilator dependency occur in patients with RFS, 23.3% of nurses versus 16% of physicians stated correctly hypophosphatemia. In matter of the cause of ocular disturbance, confusion, ataxia, and coma occur in patients with RFS, 33.3% of nurses versus 40 % of physicians

stated correctly Thiamine (vitamin B1) deficiency. Regarding to the cause of cardiac arrhythmias, hypotension, and cardiac arrest occur in patients with RFS, 33.3% of nurses versus 84% of physicians stated correctly hypokalaemia with significant difference (P value <0.05). As regard to the cause of abdominal discomfort and anorexia have been described in patients with RFS, only 30 % of nurses versus 72% of physicians stated correctly hypomagnesaemia with significant difference (P value <0.05). For the management of re-feeding syndrome, the

calorie repletion should be slow at approximately 5 kcal/kg per day, this was correctly stated by 36.7% of nurses versus 8% of physicians with significant difference (P value <0.05). The important nursing care for patients with RFS, 43.3% of nurses versus 36% of physicians stated correctly: connect patients to cardiac monitor; vitamins supplementation and monitor electrolyte daily (Table 4). Regarding to the total mean score of both nurses and physicians was poor level and less than 60% (37.29 and 51.5) respectively. (Table 5)

**Table 1. Frequency distribution of Critical care nurses' & physicians socio-demographic criteria**

| items              |               | Nurses (30)  | Physician (25) | P value |
|--------------------|---------------|--------------|----------------|---------|
| Age                | Mean &SD      | 24.36 ± 4.39 | 27.16 ± 4.24   | 0.021   |
| Year of experience | 0 - < 2 years | 14(46.66%)   | 17(68%)        | 0.04    |
|                    | 2-<5          | 10(33.33%)   | 8(32%)         |         |
|                    | 5-10          | 6(20%)       | 0(0)           |         |
| education          | bachelor      | 20(66.7%)    | 17(68%)        | 0.237   |
|                    | master        | 10(33.3%)    | 8(32%)         |         |
| units              | trauma        | 12(40%)      | 14(56%)        |         |
|                    | general       | 18(60%)      | 11(44%)        |         |

**Table 2. The frequency distribution of the perception of the participant about the concept of re-feeding syndrome and its hallmarks**

| items   |  | Nurses     | physician | P value |
|---|--|------------|-----------|---------|
| 1-Re-feeding syndrome comprises a constellation of metabolic disturbance that occur with: | a. Parenteral nutrition  | 7(23.33%)  | 5(20%)    | 0.20    |
|   | b. Nasogastric tube nutrition  | 9(30%)     | 4(16%)    |         |
|   | c. Oral nutrition  | 3(10%)     | 8(32%)    |         |
|   | d. All of the above  | 11(36.66%) | 8(32%)    |         |
| 2- The hall-mark laboratory abnormality in RFS is:  | a. hypophosphatemia  | 6(20%)     | 10(40%)   | 0.36    |
|   | b. hyperkalemia  | 10(33.3%)  | 8(32%)    |         |
|   | c. hypermagnesemia   | 7(23.3%)   | 3(12%)    |         |
|   | d. high erythrocyte sedimentation rate                                       | 7(23.3%)   | 4(16%)    |         |
| 3-electrolyte disturbance in re-feeding syndrome occur mainly due to:                     | a. electrolyte shift from the extracellular to the intracellular compartment | 23(76.7%)  | 25(100%)  | 0.035*  |
|   | b. electrolyte shift from the intracellular to the extracellular compartment | 4(13.3%)   | 0         |         |
|   | c. decrease electrolyte supplementations                                     | 3(10%)     | 0         |         |
|   | d. hypervolemia  | 0          | 0         |         |
| 4-the most common vitamin deficiency in re-feeding syndrome is:                           | a. Vitamin B I (thiamine)  | 21(70%)    | 22(88%)   | 0.26    |
|   | b. Vitamin D.  | 5(16.7%)   | 2(8%)     |         |
|   | c. Vitamin A   | 4(13.3%)   | 1(4%)     |         |
|   | d. Vitamin C   | 0          | 0         |         |
| 5-Magnesium is an important   | a. intracellular ion   | 8(26.7%)   | 0         | 0.001*  |
|   | b. intracellular cation  | 16(53.3%)  | 25(100%)  |         |
|   | c. extracellular ion   | 6(17.6%)   | 0         |         |
|   | d. extracellular cation  | 1(3.3%)    | 0         |         |

**Table 3. Frequency distribution of the perception of the participant about the risk factors of re-feeding syndrome**

| items  |  | Nurses    | physician | P value |
|--|--|-----------|-----------|---------|
| 6-Risk factors of RFS are the following except:              | a. Malignancy                                | 6(20%)    | 6(24%)    | 0.01*   |
|  | b. alcoholism                                | 9(30%)    | 1(4%)     |         |
|  | c. intestinal mal-absorption                 | 9(30%)    | 4(16%)    |         |
|  | d. hypertension                              | 6(20%)    | 14(56%)   |         |
| 7-Which of the following operation increase risk for RFS:    | a. duodenal-switch operations                | 15(50%)   | 25(100%)  | 0.001*  |
|  | b. mastectomy                                | 6(20%)    | 0         |         |
|  | c. tonsillectomy                             | 3(10%)    | 0         |         |
|  | d. open heart surgery                        | 6(20%)    | 0         |         |
| 8-The risky weight loss for RFS:                             | a. Greater than 10% over a couple of months. | 6(20%)    | 3(12%)    | 0.04*   |
|  | b. Greater than 5% over a couple of months.  | 14(46.7%) | 20(80%)   |         |
|  | c. Less than 10% over a couple of months.    | 5(16.7%)  | 2(8%)     |         |
|  | d. Less than 5% over a couple of months.     | 5(16.7%)  | 0         |         |
| 9-Patients undergoing chemotherapy are risky for RFS due to: | a. Anorexia nervosa.                         | 7(26.7%)  | 8(28%)    | 0.15    |
|  | b. Metastasis.                               | 10(33.3%) | 4(16%)    |         |
|  | c. Bleeding.                                 | 3(10%)    | 8(32%)    |         |
|  | d. Stress                                    | 9(30%)    | 6(24%)    |         |
| 10-Patients with stroke are risky for RFS due to:            | a. Anorexia nervosa.                         | 1(3.3%)   | 0         | 0.04*   |
|  | b. Dysphagia.                                | 7(23.3)   | 0         |         |
|  | c. Bleeding.                                 | 6(26.7%)  | 6(32%)    |         |
|  | d. vomiting                                  | 14(46.7%) | 17(68%)   |         |

**Table 4. Frequency distribution of the perception of the participant about the complication and managements of re-feeding syndrome**

| items  |  | Nurses    | physician | P value |
|--|--|-----------|-----------|---------|
| 11-Impaired respiratory muscle function sometimes resulting in respiratory failure or ventilator dependency occur in patients with RFS due to: | a. Hypophosphatemia.   | 7(23.3%)  | 4(16%)    | 0.74    |
|  | b. Hypomagnesaemia.  | 8(26.7%)  | 10(40%)   |         |
|  | c. hypokalemia.  | 7(23.3%)  | 5(20%)    |         |
|  | d. Thiamine (vitamin B1) deficiency  | 8(26.7%)  | 6(24%)    |         |
| 12-Ocular disturbance, confusion, ataxia, and coma occur in patients with RFS due to:  | a. Hypophosphatemia.   | 10(33.3%) | 10(40%)   | 0.51    |
|  | b. Hypomagnesaemia.  | 6(20%)    | 2(8%)     |         |
|  | c. hypokalemia.  | 4(13.3%)  | 2(8%)     |         |
|  | d. Thiamine (vitamin B1) deficiency  | 10(33.3%) | 11(40%)   |         |
| 13- Cardiac arrhythmias, hypotension, and cardiac arrest occur in patients with RFS due to:  | a. Hypophosphatemia.   | 7(23.3%)  | 4(16%)    | 0.19    |
|  | b. Hypomagnesaemia.  | 5(16.7%)  | 10(40%)   |         |
|  | c. hypokalemia.  | 10(33.3%) | 4(16%)    |         |
|  | d. Thiamine (vitamin B1) deficiency  | 8(26.7%)  | 7(28%)    |         |
| 14- Abdominal discomfort and anorexia have been described in patients with RFS due to:   | a. Hypophosphatemia.   | 6(20%)    | 1(4%)     | 0.09    |
|  | b. Hypomagnesaemia.  | 9(30%)    | 4(16%)    |         |
|  | c. hypokalemia.  | 8(26.7%)  | 8(32)     |         |
|  | d. Thiamine (vitamin B1) deficiency  | 7(23.3%)  | 12(48%)   |         |
| 15- The calorie repletion should be slow at approximately:   | a. 5 kcal/kg per day.  | 11(36.7%) | 2(8%)     | 0.02    |
|  | b. 10 kcal/kg per day  | 6(20%)    | 4(16%)    |         |
|  | c. 15 kcal/kg per day.   | 8(26.7%)  | 7(28%)    |         |
|  | d. 20 kcal/kg per day  | 5(16.7%)  | 12(48%)   |         |
| 16-Which of the following is most important nursing care for patients with RFS?  | a. Connect patients to cardiac monitor, vitamins supplementation and monitor electrolyte daily | 13(43.3%) | 9(36)     | 0.13    |
|  | b. Connect patients to oxygen.   | 8(26.7%)  | 8(32%)    |         |
|  | c. Suctioning.   | 3(10%)    | 7(28%)    |         |
|  | d. Connect patient to urinary catheter.  | 6(20%)    | 1(4%)     |         |

**Table 5. Mean knowledge score of the perception of the participant about the re-feeding syndrome**

| test       | nurse              | physicians         |
|------------|--------------------|--------------------|
| Mean score | 37.29(poor level ) | 51.5 (poor level ) |
| Median     | 37.5               | 50                 |
| Mode       | 37.5               | 43.75              |
| Sum        | 1118.75            | 1287.5             |

## 4. Discussion

Re-feeding syndrome is known to be a widely unknown illness leading to preventable morbidity and mortality in high-risk groups. Many studies have been conducted on the distribution of questionnaire to health care professional to assess the attitudes of doctors and nurses to diagnosis and treatment of re-feeding syndrome. Both doctors and nurses declare that their knowledge of re-feeding syndrome and their ability to assess patients who are at a high risk of this condition is not satisfactory [11]. This report supports the result of the current study, as the level of knowledge of nurses' and physicians about re-feeding syndrome, was not adequate and low. This may be contributed as the participants didn't receive any previous educative sections about fluid creep. May be due to their involvement in patients care, they ignore the importance of the educative sections about re-feeding syndrome.

Re-feeding syndrome is a potentially fatal case that can be successfully managed and prevented if it is detected early, and if those at a high risk of this condition are appropriately identified in a prompt and efficient manner. Routine nutrition screening for all patients accessing health services in the community and in the hospital setting has been recommended by the European Society for Clinical Nutrition and Metabolism (ESPEN) and the European Union itself [25]. Growing education and

support of screening for malnutrition offers an opportunity to reinforce the importance of screening for risk of re-feeding syndrome among these patients at the healthcare interface [26].

The results of the study that conducted in the countries of Scandinavian on the healthcare professionals were replicated, but there were two groups of the participants of healthcare professionals. The first group was internal medicine and the second group was gastroenterology. The participants of the second group reported high confidence level than the first group with respect to the screening, diagnosis and management of the complications of malnutrition, but still declared that they believed their knowledge was less than the optimal level [27,28].

There are various institutions of healthcare emphasize and recommend the multidisciplinary management of nutritional needs of patients with high input from nutrition and dietetic services. Indeed, previous studies indicated the nutritional status of the patients was improved as a consequence of the development of nutrition teams within healthcare institutions with more successful implementation of screening and other nutritional guidelines. The awareness of the professionals in the healthcare institutions about the main groups of patients at risk for the re-feeding syndrome, its manifestations and its management should be increased. The Intersociety Professional Nutrition Education Consortium (IPNEC) established a working group aiming to drive nutrition education, and focusing on

complications of malnutrition such as re-feeding syndrome through improvements in clinician knowledge [11].

## 5. Conclusion

Adherence to the NICE guidelines for preventing and treating re-feeding syndrome should reduce the incidence and associated complications of the syndrome. Further research is needed to determine the true incidence of re-feeding syndrome and to ascertain the best management protocols. Patients at risk should receive nutrition by slow infusions and serum phosphorus, potassium, and magnesium levels should be monitored for appropriate replacement strategies.

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