World Journal of Psychiatry

Submit a Manuscript: https://www.f6publishing.com

World J Psychiatry 2024 January 19; 14(1): 44-52

DOI: 10.5498/wjp.v14.i1.44

ISSN 2220-3206 (online)

ORIGINAL ARTICLE

Retrospective Study

Improvement of the nutritional support management system for patients in intensive care units

Yuan-Yuan Zhang, Chun-Yi Wang, Dong-Xian Guo, Hai-Nu Gao, Xian-Shan Jin, Yan-Li Wu, Lu-Han Chen, Zhi-Xian Feng

Specialty type: Psychiatry

Provenance and peer review: Unsolicited article; Externally peer reviewed.

Peer-review model: Single blind

Peer-review report's scientific quality classification

Grade A (Excellent): 0
Grade B (Very good): B
Grade C (Good): C
Grade D (Fair): 0
Grade E (Poor): 0

P-Reviewer: Ebrahimi OV, Norway; Vidal-Almela S, Canada

Received: October 23, 2023
Peer-review started: October 23, 2023
First decision: November 8, 2023
Revised: November 27, 2023
Accepted: December 25, 2023
Article in press: December 25, 2023
Published online: January 19, 2024

Yuan-Yuan Zhang, Chun-Yi Wang, Dong-Xian Guo, Hai-Nu Gao, Department of Critical Care Medicine, Shulan (Hangzhou) Hospital, Zhejiang Shuren University Shulan International Medical College, Hangzhou 310022, Zhejiang Province, China

Xian-Shan Jin, Department of Information, Shulan (Hangzhou) Hospital, Zhejiang Shuren University Shulan International Medical College, Hangzhou 310022, Zhejiang Province, China

Yan-Li Wu, Department of Pharmacy, Shulan (Hangzhou) Hospital, Zhejiang Shuren University Shulan International Medical College, Hangzhou 310022, Zhejiang Province, China

Lu-Han Chen, Department of Nutrition, Shulan (Hangzhou) Hospital, Zhejiang Shuren University Shulan International Medical College, Hangzhou 310022, Zhejiang Province, China

Zhi-Xian Feng, Administrative Office, Shulan (Hangzhou) Hospital, Zhejiang Shuren University Shulan International Medical College, Hangzhou 310022, Zhejiang Province, China

Corresponding author: Zhi-Xian Feng, MS, Professor, Administrative Office, Shulan (Hangzhou) Hospital, Zhejiang Shuren University Shulan International Medical College, No. 848 Dongxin Road, Gongshu District, Hangzhou 310022, Zhejiang Province, China.
zhixian.feng@shulan.com

Abstract

BACKGROUND

Nutritional support for patients hospitalized in the intensive care unit (ICU) is an important part of clinical treatment and care, but there are significant implementation difficulties.

AIM

To introduce a modified nutritional support management system for ICU patients based on closed-loop information management and psychological counseling.

METHODS

The division of functions, personnel training, system construction, development of an intelligent decision-making software system, quality control, and improvement of the whole process were carried out to systematically manage nutritional support for ICU patients.

RESULTS

Following the implementation of the whole process management system, the scores of ICU medical staff's knowledge, attitudes/beliefs, and practices regarding nutritional support were comprehensively enhanced. The proportion of hospital bed-days of total enteral nutrition (EN) in ICU patients increased from 5.58% to 11.46%, and the proportion of EN plus parenteral nutrition increased from 42.71% to 47.07%. The rate of EN initiation within 48 h of ICU admission increased from 37.50% to 48.28%, and the EN compliance rate within 72 h elevated from 20.59% to 31.72%. After the implementation of the project, the Self-rating Anxiety Scale score decreased from 61.07 ± 9.91 points to 52.03 ± 9.02 points, the Self-rating Depression Scale score reduced from 62.47 ± 10.50 points to 56.34 ± 9.83 points, and the ICU stay decreased from 5.76 ± 2.77 d to 5.10 ± 2.12 d.

CONCLUSION

The nutritional support management system based on closed-loop information management and psychological counseling achieved remarkable results in clinical applications in ICU patients.

Key Words: Closed-loop information; Psychological counseling; Intensive care unit patients; Nutritional support; Management system

Core Tip: Nutritional support for patients hospitalized in the intensive care unit is an indispensable part of clinical treatment and care, but there are problems in achieving nutritional support goals. This study has launched a nutrition support management system based on closed-loop information management and psychological counseling to try to address this issue and has made some progress.

Citation: Zhang YY, Wang CY, Guo DX, Gao HN, Jin XS, Wu YL, Chen LH, Feng ZX. Improvement of the nutritional support management system for patients in intensive care units. *World J Psychiatry* 2024; 14(1): 44-52
URL: https://www.wjgnet.com/2220-3206/full/v14/i1/44.htm
DOI: https://dx.doi.org/10.5498/wjp.v14.i1.44

INTRODUCTION

Nutritional support for critically ill patients has become an indispensable part of clinical treatment, especially for intensive care patients[1]. However, in clinical practice, it is difficult to achieve the goal of nutritional support for patients hospitalized in intensive care units (ICUs), mainly due to the poor standardization and compliance of nutritional support for medical staff[2,3]. Domestic and foreign studies have shown that the establishment and implementation of a standardized nutrition management system can improve the rate of achieving nutrition goals for inpatients and reduce the incidence of nutrition-related complications[4-7]. In addition, providing psychological support to ICU patients is conducive to reducing their mental anxiety and negative emotions induced by continuous treatment and pain, and helps to improve their treatment compliance and quality of life. Based on further modifications to the nutritional support management system, standardized training of medical staff, and great attention given to psychological counseling intervention measures, our hospital used information technology to form a closed loop of the information required and data obtained during the nutritional support of ICU patients. In this way, the diagnosis and treatment procedures, nutrient solution configuration and transmission, nutrition-related physiological indicator acquisition, whole-process quality index monitoring of medical staff related to clinical nutritional support can be integrated and supplemented by psychological intervention to build a nutritional support management system for ICU patients based on closed-loop information and psychological counseling. The improvement process and effects are reported below. In addition, this study aims to improve the medical experience of ICU patients by constructing a nutritional support management system based on closed-loop information and psychological counseling combined with psychological interventions.

MATERIALS AND METHODS

General information

A retrospective cohort study design was adopted. The inclusion criteria of the subjects are as follows: (1) Length of ICU stay ≥ 3 d; (2) No enteral or parenteral nutrition (PN) contraindications, and (3) Age > 16. The following are exclusion criteria: Patients with a ventilator-dependent ICU stay > 14 d due to a specific etiology, as well as unconscious or uncooperative patients. Patients admitted to ICUs between July and August 2021 were classified as the control group, and those admitted between March 2022 and April 2022 were classified as the improvement group. All enrolled patients met the inclusion criteria described above.

The SoJump online survey platform was used to investigate the knowledge, attitudes/beliefs, and practices regarding nutritional support among all medical staff in the Department of Critical Care Medicine before and after project implementation. In the survey, there were 10 questions on nutrition knowledge, with 10 points for each correct answer and 0 for a wrong answer and a score range of 0-100; the score was proportional to nutrition knowledge. In terms of nutritional attitudes/beliefs, 10 questions were answered on a 5-point Likert scale as follows: 1 = completely disagree, 2 = somewhat disagree, 3 = not sure, 4 = somewhat agree, and 5 = completely agree; the total score ranged from 10 to 50, with higher scores suggesting more active and positive nutritional beliefs and attitudes. The nutritional practice subscale consisted of 10 questions answered on a 5-point Likert scale, with 1, 2, 3, 4, and 5 points indicating never, rarely, sometimes, often, and always, respectively; on a 10-50-point scale, a higher score represented more active nutritional support practices. There were 4 questions in the psychological knowledge questionnaire answered on a 4-point Likert scale (0 = I do not know, 1 = I have heard of it, 2 = I know it generally, 3 = I know it fairly well, 4 = I know it very well), with the total score ranging from 0 to 16; better psychological knowledge was indicated by a higher score. The psychological nursing attitudes/beliefs subscale consisted of 11 questions that were scored using a 4-point Likert-scale, with 0, 1, 2, 3, and 4 indicating strongly disagree, disagree, somewhat agree, agree, and completely agree, respectively; on a 44-point scale, higher scores were associated with more active and positive psychological nursing attitudes and beliefs. A total of three questions were asked about psychological nursing practices, using a 4-point Likert scale with scores of 0, 1, 2, 3, and 4 indicating none, seldom, sometimes, frequently, and persistently, respectively; the total score ranged from 0 to 12 points, and higher scores suggested more active psychological nursing practices. This questionnaire was conducted anonymously using Sojump. All medical staff in the Department of Critical Care Medicine were instructed to complete the questionnaire following the instructions and submit it on their personal mobile phones.

Methods

Team establishment: Standardized and effective management of the whole nutritional support for critically ill patients requires overall resource allocation and relies on the hospital's various functional departments as the operational link. Therefore, this project team was an interdisciplinary team represented by clinical medicine, nursing, pharmacy, nutrition and information technology (including 1 chief physician, 1 attending physician, 1 chief nurse, 1 deputy chief nurse, 3 nurses, 1 intermediate nutritionist, 1 pharmacist in charge, and 1 senior medical information software engineer). Among them, the clinical medical staff were mainly responsible for project process sorting, process re-engineering, project implementation and effect inspection; the clinical functional departments were primarily responsible for evidence retrieval and quality control during the system process transformation; and the information department was responsible for the implementation of the software system.

Personnel training: Given that the participants of the whole nutritional support process for ICU patients were mainly medical staff in the Department of Critical Care Medicine, the knowledge, attitudes/beliefs, and practices of medical care personnel regarding nutritional support directly affected the nutritional support for ICU patients[8]. In addition, psychological support diagnosis and treatment activities can also affect the treatment compliance of ICU patients to a certain extent. Therefore, the project team organized experienced professionals in the hospital and invited well-known experts in the industry to train all ICU medical staff in the Department of Critical Care Medicine on nutritional support and diagnosis activities in the form of special lectures, academic meetings and workshops, spanning two months with a total of 17 class hours, covering the key points, difficulties and new progress of nutritional support for critically ill patients. The medical staff were assessed after the training. Long-term regular standardized nutrition training courses were developed.

System improvement: All nutritional support procedures, such as nutrition screening, evaluation, planning, prescription, prescription review, implementation, and monitoring, were defined; the management key points and responsibilities of various departments, such as the ICU, medicine, nutrition, and information technology, were detailed; and the key points of inspection during the implementation and the indicators in the quality management process were monitored. The team members summarized the nutrition-related work systems and processes at the hospital and department levels, conducted detailed discussions, consulted a large number of references, and learned from the existing systems of benchmarking hospitals to form norms and standards through intragroup discussions. Experts were then invited to review and further modify the system before it was submitted to the Quality Management Section for review and the Dean's Office for approval. Finally, an in-hospital management system applicable to the actual situation of nutritional support diagnosis and treatment in our hospital was formed, which was used and promoted in clinical practice. In addition, the medical, nursing and nutrition departments conducted regular clinical inspections to track the effects and provide feedback.

System research and development and application: The core component of the nutritional support management system construction was the establishment of a standardized, intelligent and efficient information system to provide decision support functions for nutritional support, thus facilitating high-quality and more comprehensive development of nutritional support diagnosis and treatment. Through participating in the nutrition management courses, referring to and learning the major advanced nutrition measurement systems, and taking into account the current situation of nutrition management of ICU patients in our hospital, the group members designed a framework of nutrition monitoring system for critically ill patients that met the national conditions and clinical applications of the hospital after several rounds of expert discussions and checked the system design through a professional novelty-checking institution to determine its innovativeness. With the support of the hospital, the system was developed after obtaining a docking permission with the hospital's clinical application system related to nutrition management.

To ensure the consistency, timeliness, and accuracy of the data applied in the process of nutrition diagnosis and treatment to enable in-depth and effective use of the data and reduce the workload of medical staff and dietitians in clinical departments, the design adopted database access, FTP file acquisition and Web service for data exchange and application integration. The nutrition management system was expected to work in tandem with the databases of the clinical information system, with the nutritional support as the main line of the whole-process business management, focusing on the work required for nutritional diagnosis and treatment of patients after admission.

The major procedures were as follows: (1) Nutritional screening after patient admission and transfer to another department: For nutritional risk-positive patients, the system automatically carried out risk warnings with special characters and colors on the evaluation page, nursing bedside card, patient homepage, doctor's preview page, pharmacy preview page, and nutrition department system; (2) The system automatically prompted the doctor when a nutrition consultation was needed; (3) The system calculated the nutritional requirements of patients and notified clinicians and nurses automatically; (4) When the clinician performed a prescription operation, the system calculated the liquid and energy of the prescription synchronously; (5) The system supported the pharmacy department in conducting intelligent prescription reviews, with the results automatically fed back to the doctor; (6) During nursing, the patient's homepage in the nursing system allowed for visual monitoring of the proportion of energy infusion components and the display of the corresponding relationship between energy and liquid on the day of implementation; (7) The daily target energy compliance rate was displayed by way of a line chart on the homepage of nursing medical records; (8) On the patient 360-degree holographic display of the doctor's medical record, the system visually displayed all relevant holographic data of the patient's nutritional support over time; (9) On the homepage of nursing cases and patients, the note and follow functions of nutrition indices could be customized, and the changing trend of the index could be obtained by clicking; (10) All nutrition-related indicators could be retrieved with one click in the test system, which was convenient for clinicians and nurses to extract nutrition evaluation data in clusters; (11) Nutritionists could collect information across the hospital on nutritionally at risk patients, and proactively review the status of nutritional support for patients to inform doctors whether nutrition-related medical orders were the most appropriate scheme; (12) The system could intelligently prompt a 7-d nutrition review; and (13) The system automatically summarized the quality control data of nutritional support and ultimately formed a closed loop of nutritional support management.

After the completion of system development, the information department technicians trained the members of the project team and the key personnel of the Department of Critical Care Medicine, focusing on explaining the system's operating methods and precautions. The system was trialed on a small scale in ICUs. During the application, patients' energy and nutrient proportions were counted by using both the system intelligent calculation method and the manual calculation method for comparative analysis, so as to find problems and correct them. After the system was stabilized, all members of the ICU, pharmacy, and nutrition departments were given one week of on-site training to explain the standardized operation of the system in detail. The system was gradually applied in clinical practice. During implementation, IT technicians were on standby 24 h a day to provide technical support and solve difficult problems.

Psychological counseling: The medical staff provided timely and effective negative emotion counseling for patients. Although ICU inpatients have passed the high-risk period of illness, the pain and fear of death caused by the disease during the high-risk period can negatively affect their emotions. Therefore, the medical staff specifically told the patients that the disease had passed the critical stage and would not cause their death and gave timely medication and physical relief when there was heart pain. In addition, the nursing staff kept a close eye on the patients' negative emotions caused by other potential reasons and provided appropriate psychological counseling. Furthermore, the causes of the disease, treatment, surgery, nursing methods, and postoperative prevention and treatment methods were detailed to the patients, and targeted prognostic analysis was carried out according to their specific conditions so that they could rebuild confidence in the future and feel the care and love of medical staff, thus establishing a sense of trust and improving compliance. Moreover, the hospital provided patients with a good ward environment that was clean, tidy, and well ventilated with suitable temperature and humidity so that they could maintain psychological and physical comfort during residential nursing. Appropriate music and relaxing TV and movie programs were also played for patients to distract them. If necessary, painkillers or antianxiety drugs and antidepressants were given.

Effect analysis

Evaluation indicators: (1) The proportions of hospital bed-days of patients receiving different nutritional support methods, such as total PN, PN + enteral nutrition (EN), and total EN, were calculated; (2) The scores of ICU nurses' knowledge, attitudes/beliefs, and practices regarding nutritional support were assessed; (3) The survey scores of ICU nurses' knowledge, attitudes/beliefs, and practices regarding psychological support were analyzed; (4) The rate of EN initiation within 48 h of admission to the ICU (number of patients initiating EN within 48 h during the same period/number of ICU patients included in the survey during the statistical period) was counted; (5) The EN compliance rate within 72 h of ICU admission (the number of patients who achieved the EN standards within 72 h during the same period/the number of ICU patients included in the survey during the statistical period) was counted; (6) Patients' anxiety and depression before and after project implementation were assessed by the Self-rating Anxiety Scale (SAS) and Self-rating Depression Scale (SDS), respectively, and (7) The length of ICU stay was recorded. Notes: (1) The day of admission to the ICU was recorded as day 0; (2) The standard for achieving EN standards for patients within 72 h of ICU admission was the total energy intake of EN consumed by patients on the third day of ICU admission ≥ 20 kcal/kg.

Statistical methods

Relevant data were imported into SPSS 19.0 for statistical analysis. The scores of medical staff's knowledge, attitudes/beliefs, and practices regarding nutritional support were analyzed by one-way analysis of variance (ANOVA). After

Table 1 Comparison of general data between the two groups

Groups	Proportion of males (%)	Proportion of females (%)	Age (yr)	APACHE II score (points)	NRS 2002 score (points)
Improvement group (n = 145)	64.14	35.86	63.68 ± 13.71	26.02 ± 10.23	4.57 ± 1.21
Control group (n = 136)	64.71	35.29	64.99 ± 13.45	25.85 ± 10.71	4.57 ± 1.30
P value	> 0.1	> 0.1	> 0.1	> 0.1	> 0.1

APACHE: Acute Physiology and Chronic Health Evaluation; NRS: Numeric Rating Scale.

Table 2 Comparative analysis of knowledge, attitudes/beliefs, and practices regarding nutritional support among medical staff in the Department of Critical Care Medicine before and after project implementation

Groups	Number of cases (n)	Knowledge	Attitudes/beliefs	Practices
Before project implementation	88.00	54.09 ± 19.45	45.37 ± 5.25	39.27 ± 7.60
After project implementation	83.00	94.57 ± 7.86	47.23 ± 4.07	44.45 ± 5.77
P value		< 0.01	< 0.05	< 0.01

testing for normality, the measurement data (represented by mean ± SD) were analyzed by the independent sample t test. The count data, described as frequencies (rates), were analyzed by the χ^2 test. In all tests, a significance level of 5% (P < 0.05) was adopted.

RESULTS

One hundred and forty-five cases were enrolled in the improvement group with a valid hospital stay of 733 d. The control group included 136 cases with 789 d of effective hospitalization. No significant difference was identified between the two groups in age, sex, Acute Physiology and Chronic Health Evaluation II score, or Numeric Rating Scale 2002 score on the day of ICU admission (P > 0.1), as shown in Table 1.

Knowledge, attitudes/beliefs, and practices regarding nutritional and psychological support were investigated among medical staff in the Department of Critical Care Medicine. Ninety questionnaires were distributed before and after project implementation, with 88 and 83 valid questionnaires recovered, respectively. Through comparison before and after project implementation, the knowledge, attitudes/beliefs, and practices scores regarding nutritional support treatment in the critical medicine department improved significantly. The survey also revealed significantly enhanced psychological support of the medical staff in the Department of Critical Care Medicine in terms of knowledge, attitudes/beliefs, and practices (see Tables 2 and 3 for details).

The proportions of hospital bed-days of total PN support, total EN support and EN + PN support in ICU patients were statistically analyzed. After project implementation, the proportions of hospital bed-days of total EN support and EN + PN support in ICU patients increased significantly (P < 0.05), while total PN support did not alter markedly (P > 0.05) (Table 4).

The EN initiation rate among ICU patients within 48 h of admission increased from 37.50% to 48.28%; the EN compliance rate within 72 h of ICU admission elevated from 20.59% to 31.72%; the differences were statistically significant, as shown in Table 5. After improvement, a lower SAS score (52.03 ± 9.02 *vs* 61.07 ± 9.91) and a lower SDS score (56.34 ± 9.83 *vs* 62.47 ± 10.50) were observed in the improvement group compared with the control group (P < 0.01; Table 6). After project implementation, the total length of ICU stay of patients in the improvement group was 5.10 ± 2.12 d, lower than the 5.76 ± 2.77 d in the control group (P < 0.01), as shown in Table 7.

DISCUSSION

Patients hospitalized in ICUs are critically ill with symptoms such as high energy metabolism, increased calorie demands, and negative nitrogen balance. Their emotions are also easily affected by illness and bodily function, resulting in negative emotions such as anxiety and depression that adversely affect treatment effectiveness. Previous studies have confirmed that early, reasonable, and standardized nutritional support can reduce patient mortality, shorten the length of ICU stay, and reduce medical expenses[9,10]. However, for various reasons, many studies still show a high incidence of malnutrition among critically ill patients during hospitalization, and there are nonstandard diagnostic and treatment practices for EN and PN support[11]. The purpose of this project is to improve the compliance of medical staff in carrying

Table 3 Comparative analysis of knowledge, attitudes/beliefs, and practices regarding psychological support among medical staff in the Department of Critical Care Medicine before and after project implementation

Groups	Number of cases (*n*)	Knowledge	Attitudes/beliefs	Practices
Before project implementation	88.00	9.50 ± 3.22	29.49 ± 4.74	8.17 ± 1.51
After project implementation	83.00	13.05 ± 2.27	37.17 ± 4.71	9.76 ± 1.58
P value		< 0.01	< 0.01	< 0.01

Table 4 Comparison of each nutritional support mode as a percentage of total effective hospital stay between the two groups

Groups	Total parenteral nutrition	Parenteral nutrition + enteral nutrition	Total enteral nutrition
Improvement group (*n* = 733)	261 (35.61%)	345 (47.07%)	84 (11.46%)
Control group (*n* = 789)	293 (37.14%)	337 (42.71%)	44 (5.58%)
P value	> 0.05	< 0.05	< 0.01

Table 5 Comparison of the enteral nutrition initiation rate within 48 h and compliance rate within 72 h after admission to the intensive care unit between the two groups

Groups	Enteral nutrition initiation rate within 48 h after ICU admission	Enteral nutrition compliance rate within 72 h after ICU admission
Improvement group (*n* = 145)	48.28% (66)	31.72% (*n* = 46)
Control group (*n* = 136)	37.50% (47)	20.59% (*n* = 28)
P value	< 0.05	< 0.05

ICU: Intensive care unit.

Table 6 Comparison of Self-rating Anxiety Scale and Self-rating Depression Scale scores between the two groups

Indicators	Improvement group (*n* = 145)	Control group (*n* = 136)	*t* value	*P* value
SAS (points, mean ± SD)	52.03 ± 9.02	61.07 ± 9.91	8.004	< 0.01
SDS (points, mean ± SD)	56.34 ± 9.83	62.47 ± 10.50	5.055	< 0.01

SAS: Self-rating Anxiety Scale; SDS: Self-rating Depression Scale.

Table 7 Comparison of intensive care unit length of stay between the two groups of patients

Indicators	Improvement group (*n* = 145)	Control group (*n* = 136)	*t* value	*P* value
Length of ICU stay	5.10 ± 2.12	5.76 ± 2.77	2.28	< 0.05

ICU: Intensive care unit.

out nutritional support diagnosis and treatment according to the norms and to standardize nutritional support diagnosis and treatment practices. Moreover, nutritional support and psychological counseling were combined to validate the clinical application advantages of this system in ICU patients. After the implementation of the project, the knowledge, attitudes/beliefs, and practices of ICU medical staff regarding nutritional and psychological support were greatly improved. In addition, the improvement group focused more on the early development of EN in terms of nutritional and psychological support, using a more diverse and rationalized nutritional support structure. Therefore, the patients' nutritional compliance rate was also significantly improved, their SAS and SDS scores were significantly reduced, and their stay in the ICU was significantly shortened. The construction and implementation of a nutritional support management system based on closed-loop information and psychological counseling has further optimized the diagnosis

and treatment process of nutritional support, improved the nutritional compliance rate of patients, and relieved their psychological negative emotions, which is of great importance in improving patient outcomes.

The construction of a nutritional support management system follows the medical development context of the strengthening of clinical nutritional support diagnosis and treatment, with the key cornerstone being the closed-loop information nutritional support intelligent management system, which is in line with the hospital's information development strategy. The software system covers the whole management of nutritional diagnosis and treatment practices, including nutritional risk screening, assessment, prescription, implementation, effect monitoring, and quality control. A large number of applications, such as dynamic data trends and 360-degree holographic display, are used, which highlights the awareness of dynamic monitoring in the implementation process of nutritional support, avoids the shortcomings of "fan out from a point to an area" in most target management models, and improves the clarity of medical staff's understanding of patients' nutritional support dynamic information, thus improving work efficiency and increasing work initiative. At the same time, most of the data in the system are displayed in visual charts, transforming complex dynamic monitoring data into visual images to provide medical staff with the most intuitive visual reflection, which is conducive to the assessment of the nutritional status of critically ill patients and facilitates timely adjustment of nutritional management programs to ensure that patients receive timely and effective nutritional support[12]. Dynamic displays and visual early warnings reflect more scientific, refined and humanized management, which is crucial to improve the safety and standardization of patient nutrition implementation.

CONCLUSION

The ICU patient nutritional support management system based on closed-loop information and psychological counseling uses informatization, modernization and process management methods to focus on solving the difficulties of clinical nutritional support management, providing medical staff with more accurate decision-making support based on personalized dynamic assessment of patients, and ensuring multidimensional protection of patient physical and mental health. However, after implementation, it was found that there is still room for further improvement in EN initiation for patients within 48 h of ICU admission, EN compliance within 72 h of admission, and alleviation of negative emotions, which warrants continuous modifications during future promotion of the homogenization and management of nutritional support for patients in the whole hospital.

ARTICLE HIGHLIGHTS

Research background

Due to the poor standardization and compliance of nutritional support for patients by medical staff, it is difficult to achieve the goal of nutritional support for intensive care unit (ICU) inpatients.

Research motivation

This study intends to optimize the clinical nutritional support of ICU patients by constructing a nutrition support management system based on closed-loop information and psychological counseling combined with psychological interventions.

Research objectives

To explore the value of the nutritional support management system based on closed-loop information management and psychological counseling in the clinical application of ICU patients.

Research methods

Through the division of functions, personnel training, system construction, development of an intelligent decision-making software system, quality control, and improvement of the whole process, the nutritional and psychological support of ICU patients are systematically managed. In addition, the valid number of hospital stays of patients with different nutritional support methods after the implementation of systematic management, the scores of ICU nurses' knowledge, attitudes/beliefs and practices of nutritional or psychological support, and the rate of total enteral nutrition (EN) initiated within 48 h or 72 h after admission to the ICU were counted. Moreover, the anxiety and depression of patients before and after the implementation of the project and the length of stay in the ICU were recorded.

Research results

After the implementation of the whole-process management system, the scores of nutritional or psychological support knowledge, attitudes/beliefs and practices of ICU medical staff were significantly enhanced, and the proportions of hospital bed-days of total EN and EN plus parenteral nutrition (PN) of ICU patients were significantly increased. The EN initiation rate also increased significantly within 48 h or 72 h after admission to the ICU. Moreover, markedly reduced Self-rating Anxiety Scale, Self-rating Depression Scale scores and ICU stays were observed in ICU patients after the implementation of the project.

Research conclusions

The nutritional support management system based on closed-loop information management and psychological counseling plus psychological interventions has significant advantages in the clinical application of ICU patients. It can not only improve the awareness and executive abilities of ICU medical staff, but also significantly increase the application of EN support and EN plus PN support for CU patients. Moreover, it is effective in relieving patients' negative emotions and shortening the length of ICU stay.

Research perspectives

The nutrition support management system for ICU patients based on closed-loop information and psychological counseling combined with psychological interventions can not only improve the clinical practice of medical staff, but also optimize the medical management of ICU patients. However, there is still room for improvement in aspects such as EN initiation within 48 h of admission to the ICU, EN compliance within 72 h of admission, and negative emotional relief, warranting continuous improvement.

FOOTNOTES

Author contributions: Zhang YY and Feng ZX designed the research and wrote the first manuscript, and conducted the analysis and provided guidance for the research; Zhang YY, Wang CY, Guo DX, Gao HN, Jin XS, Wu YL, Chen LH, and Feng ZX contributed to conceiving the research and analyzing data; and all authors reviewed and approved the final manuscript.

Supported by Research Project of Zhejiang Provincial Department of Education, No. Y202045115.

Institutional review board statement: This study was approved by the Ethic Committee of Shulan (Hangzhou) Hospital (Approval No. KY2021064).

Informed consent statement: Patients were not required to give informed consent to the study because the analysis used anonymous clinical data that were obtained after each patient agreed to treatment by written consent.

Conflict-of-interest statement: All the authors report no relevant conflicts of interest for this article.

Data sharing statement: All data and materials are available from the corresponding author.

Country/Territory of origin: China

ORCID number: Yuan-Yuan Zhang 0009-0004-9639-5189; Zhi-Xian Feng 0000-0003-0885-4230.

S-Editor: Wang JJ
L-Editor: A
P-Editor: Yuan YY

REFERENCES

1 **Gostyńska A**, Stawny M, Dettlaff K, Jelińska A. Clinical Nutrition of Critically Ill Patients in the Context of the Latest ESPEN Guidelines. *Medicina (Kaunas)* 2019; **55** [PMID: 31810303 DOI: 10.3390/medicina55120770]
2 **Lin Z**, Xu Y, Ge WX, Li X, Gu Q. Survey and Analysis of Clinical Practice of Nutritional Support Guidelines for Critically Ill Patients by Some Doctors of Intensive Care Units in Jiangsu and. *Parenteral Enteral Nutrition* 2018; **25**: 342-345
3 **Yang L**. A preliminary study of the implementation of the main guidelines in the ICU and their influencing factors. Journal of Zhejiang University, 2015
4 **Bermejo de Las Heras S**, De la Calle de la Rosa L, Arias Díaz J, Giner M, Blesa Malpica AL. Tube feeding monitoring as a clinical quality indicator at intensive care units. *Nutr Hosp* 2018; **35**: 6-10 [PMID: 29565142 DOI: 10.20960/nh.1187]
5 **De la Calle de la Rosa L**, Bermejo de Las Heras S, Blesa A, Giner M, Arias Díaz J. Assessment of the clinical quality indicator "early enteral nutrition" in intensive care units. *Nutr Hosp* 2017; **34**: 1288-1291 [PMID: 29280641 DOI: 10.20960/nh.1171]
6 **Bahar M**. A Different Approach to the Nutritional Therapy in Intensive Care Units: Nutrition Software (ICNUS). *Turk J Anaesthesiol Reanim* 2017; **45**: 251-259 [PMID: 29114408 DOI: 10.5152/TJAR.2017.190901]
7 **Zhang Y**, Hou SK, Hou Y, Liu JP. Design and implementation of clinical nutrition treatment system. *Chinese Medical Equipment J* 2015; **36**: 71-73 [DOI: 10.7687/J.ISSN1003-8868.2015.07.071]
8 **Zeng W**, Guo YH, Wu GF, Fang Q. Investigation on the knowledge, attitude, practice and obstacles of enteral nutrition among nurses in Guizhou Province. *Guizhou Medical J* 2018; 383-384
9 **Sun RH**, Jiang RL, Huang M, Cai GL. Expert consensus on clinical practice of early enteral nutrition in critically ill patients. *Chinese Critical*

Care Medicine 2018; **30**: 715-721 [DOI: 10.3760/cma.j.issn.2095-4352.2018.08.001]

10 **Yao M**, Feng X, Guo Z, Huang X, Jin J. Early enteral nutrition dose selection in critically ill patients: a meta analysis. *Chinese J Emergency Medicine* 2018; **27**: 866-871 [DOI: 10.3760/cma.j.issn.1671-0282.2018.08.010]

11 **Leite HP**, de Lima LF, de Oliveira Iglesias SB, Pacheco JC, de Carvalho WB. Malnutrition may worsen the prognosis of critically ill children with hyperglycemia and hypoglycemia. *JPEN J Parenter Enteral Nutr* 2013; **37**: 335-341 [PMID: 22930337 DOI: 10.1177/0148607112458124]

12 **Luo H**, Wang P, Zhao HY. Visualization analysis and application based on medical big data. *China Medical Devices* 2020; **35**: 122-128

Published by **Baishideng Publishing Group Inc**
7041 Koll Center Parkway, Suite 160, Pleasanton, CA 94566, USA
Telephone: +1-925-3991568
E-mail: office@baishideng.com
Help Desk: https://www.f6publishing.com/helpdesk
https://www.wjgnet.com