ORIGINAL ARTICLE

Establishment of a nutritional rehabilitation evaluation index system for patients with severe spinal deformities based on analytic hierarchy process

Chunyi Liu, Shinan He

Abstract

Objective: To construct the evaluation index system of nutritional rehabilitation nursing quality for patients with severe spinal deformity, and to provide reference for improving the quality of nutritional rehabilitation nursing.

Method: The study was conducted from January 1 to June 30, 2022, in in Henan, Hebei and Shandong provinces of China, and comprised experts in the field of spine orthopaedics, including doctors, nurses and managers from 10 tertiary grade A general hospitals. Data was collected through a predesigned questionnaire. Through literature search, combined with the "structure process result" theoretical model, guided by relevant standards and guidelines, the data was analysed to generate the quality evaluation index system of nutritional rehabilitation nursing for patients with severe spinal deformity using analytic hierarchy process. Statistical analyses was done using SPSS 20.

Results: Of the 20 experts, 15(75%) were females and 5(25%) were males. The overall mean age was 38.77±6.65 years (range: 34-55 years). There were 13(65%) head nurses, 5(25%) nursing directors, and 2(10%) attending physicians. Educational levels included undergraduate degrees 11(55%)) and master's degrees or higher 9(45%). The mean clinical experience was 13.55±7.21 years (range: 11-35 years), and mean nursing management experience was 10.11±3.12 years (range: 12-18 years). There were 13(65%) subjects with intermediate-level professional titles, 5(25%) deputy seniors, and 2(10%) with senior titles. The evaluation index system of nutritional rehabilitation nursing quality for patients with severe spinal deformity was divided into three levels, including three first-level indicators, seven second-level indicators and 34 third-level indicators.

Conclusion: The evaluation index system of nutritional rehabilitation nursing quality for patients with severe spinal deformity was found to have high reliability, and could be used as an evaluation tool to provide objective and quantifiable indicators.

Keywords: Spinal deformity, Nutritional rehabilitation, Analytic hierarchy process, Evaluation index system.

(JPMA 75: S-3 [Suppl. 02]; 2025) **DOI: https://doi.org/10.47391/JPMA.SRPH-02**

Introduction

The establishment of scientific nursing quality evaluation indicators can provide an objective basis for clinical nursing quality evaluation. In the future, the evaluation of nursing quality will gradually change to a more scientific, more sensitive and more reflective index of nursing essence. The scientificity of the evaluation index plays an important guiding role in improving the quality of nursing.[1,2] Research indicates that nursing quality evaluation indicators can effectively assess various aspects of nursing care, including structure, process and outcomes, particularly in specialised fields like emergency nursing, where 85 indicators have been identified, albeit with limited validation.[3-5]

Severe spinal deformity refers to scoliosis with Cobb angle ≥90° on the coronal plane, which is usually combined with severe kyphosis, thoracic deformity and obvious spinal rotation.[6-8] At present, effective surgical methods for the treatment of severe spinal deformities are difficult and risky, and are prone to produce a series of complications.[9-11] Some complications have a serious impact on the prognosis of patients . Therefore, nutritional rehabilitation nursing of patients has also become an important factor affecting the surgical effect of patients with severe spinal deformities.[12,13] Research indicates that undernutrition significantly increases perioperative morbidity and mortality, making its prevention vital in surgical prehabilitation and rehabilitation programmes.[14-16] Malnutrition, prevalent among hospitalised surgical patients, adversely affects clinical performance and quality of life, necessitating ongoing nursing interventions, such as enteral or parenteral nutrition, to mitigate complications.[17-19] In the context of spinal surgery, effective nutritional management can enhance recovery by improving muscle strength and functionality that are critical in postoperative rehabilitation.[20,21] However, there is no unified understanding of the evaluation index system of nutritional rehabilitation nursing quality for patients with severe spinal deformities.[22-24] Most nursing work is carried out only through medical orders and personal experience.[25-27] Therefore, the establishment of a quality evaluation index system for nutritional rehabilitation nursing of patients with severe spinal deformity can improve the quality of nursing work, and also improve the

Department of Orthopaedics, Nanjing Drum Tower Hospital, The Affiliated Hospital of Nanjing University Medical School, Nanjing, Jiangsu, China.

Correspondence: Shinan He. e-mail: 17798930529@163.com

ORICID:0009-0005-4405-1947

surgical effect of patients, and provide quality evaluation reference for nursing management.[28,29]

The current study wsa planned to construct the evaluation index system of nutritional rehabilitation nursing quality for patients with severe spinal deformity, and to provide reference for improving the quality of nutritional rehabilitation nursing.

Materials and Methods

The study was conducted from January 1 to June 30, 2022, in Henan, Hebei and Shandong provinces of China, and comprised experts in the field of spine orthopaedics, including doctors, nurses and managers from 10 tertiary grade A general hospitals.

Those included were professionals having at least a bachelor's degree, holding at least an intermediate-level professional title, having at least 10 years of clinical experience, and currently working in the field of spine orthopaedics. All the participants provided informed consent, and those not willing to participate were excluded. The study questionnaire was distributed personally or through emails, as appropriate, to the experts.

In addition, the relevant literature[30-33] and guidelines[32] were analysed based on the "structure process result" theoretical model.

Data from the experts was gathered using a questionnaire.

The screening criteria for indicators comprised mean value of importance assignment (MJ) >3.50, index full score rate (kJ) >20%, and coefficient of variation (CV) <0.20.[34] A total of 9 indicators with CV >0.20 were deleted, including 3 environmental equipment, 3 clinical services, 2 institutional processes, and 1 risk management. On the basis of suggestions of three experts, the secondary indicator "satisfaction" was deleted, and the secondary indicator "adverse events" was modified to "risk management". In the second round, the experts' opinions were highly concentrated, and their differences were small, so they were not deleted. In the second round, the experts' opinions on all indicators were highly concentrated, and in the third round, the experts' opinions on indicators were the same as those in the second round.[35]

The hierarchical structure was established to lay a good foundation for the performance of the subsequent hierarchical analysis. Level creation was related to the grouping of factors, and the factors were included in different levels to achieve the effective sequencing of each group of factors. Through index comparison and research, the system influencing factors in the hierarchy were established, which transformed into simple problems, and the correlation among the problems was analysed.

In research, empowerment refers to giving the experts a relative value of power. The level of decision-making power depends on the experts' social popularity, social influence, the size of the research field, decision-making ability and other aspects.

Suppose the weight of the p-th expert is η_p, $\sum_{p=1}^{n} \eta_p = 1$.

In the creation stage of the multi-level evaluation model, it is necessary to clarify the relevance of each level and establish a judgment matrix. If there are target layer, indicator layer and criterion layer in the model analysis stage, the relationship between target layer and criterion layer is determined by both. The indicators are compared in the criterion layer to obtain the importance and influence of each indicator (Table 1).

Table-1: The scale and its processing.

Scale	Meaning
1	Two factors are of equal importance
3	Compare the two factors, one factor is slightly more important than the other
5	Compared with the two factors, one factor is significantly more important than the other
7	Compare the two factors, one factor is more strongly important than the other
9	Compared with the two factors, one factor is more important than the other
2, 4, 6, 8	The intermediate value of the two adjacent judgments
Count backwards	a_{ij} The judgments comparing factor i and j are reciprocal to the judgment values comparing factor j and i a_{ij}

After comparing the two factors, a judgment matrix is established based on the results, which is replaced by A, equivalent to(a_{ij})nxn.

$$a_{ij}>0;\quad a_{ij}=1/a_{ij};\quad a_{ii}=1$$

The A matrix can be transformed into a positive and negative matrix. In the above properties, a_{ij} represents the proportional scale that is more important for the upper element X and element A_i than element A_j.[36]

The weight information of each indicator is determined based on the research information of each comparison matrix, and the importance of different indicators in the indicator system is obtained by combining with the calculation formula, and finally the weight information of indicators in the same level is obtained. The detailed process is as follows:

After pairwise comparison of factors, a judgment matrix A is established based on the numerical value. The judgment is as follows:

(1) $A=a_{ij}$ Assuming an n-order square, normalisation the A column vector can further obtain the matrix, $B=b_{ij}$ (Eq. 1)

$$b_{ij} = a_{ij} / \sum_{i=1}^{n} a_{ij}, \quad (i, \ j = 1, \ 2, \ \ldots\ldots, \ n) \quad \text{Eq. 1}$$

(2) Sum B=b_{ij} by rows",C=（C1，C2，……，Cn)T (Eq. 2)

$$C_i = \sum_{1}^{n} b_{ij} \quad (i, \ j=1, \ 2, \ \ldots, \ n) \quad \text{Eq. 2}$$

(3) C is normalised, W=（W_1, W_2,…, Wn) T, W is the approximate feature vector (Eq. 3).

$$W_i = C_i / \sum_{1}^{n} C_i, \quad (i=1, \ 2, \ \ldots, \ n) \quad \text{Eq. 3}$$

(4) Calculate the maximum feature root (λ_{max}) (Eq. 4).

$$\lambda_{max} = \frac{1}{n} \sum_{1}^{n} \frac{(AW)_i}{W_i} \quad \text{Eq. 4}$$

In this formula, AW represents the ith component of the Adjusted Weight.[37]

(5) Consistency testing is performed to assess the logical consistency of the calculations and determine its relationship with the acceptable range. If the consistency ratio (CR) is outside the acceptable range, it is necessary to adjust the relative importance of the indicators until the consistency test is satisfied, after which the process can proceed to the next step (Eq. 5).

The CR is calculated using Eq. 5:

$$CR = \frac{CI}{RI} \quad \text{Eq. 5}$$

where:

CI: Consistency Index, a measure of the deviation from consistency, calculated using Eq. 6.

RI: Random Index, a benchmark value for consistency that depends on the size of the matrix.

λ_{max}: The maximum eigenvalue of the judgment matrix, representing the most significant factor in determining consistency.

The CI is determined by Eq. 6:

$$CI = \frac{(\lambda_{max} - n)}{(n-1)} \quad \text{Eq. 6}$$

The order of the judged matrix corresponds to 'n'. If the CR is <0.1, the weight set by the matrix is in the allowed range. If the value is opposite, the weight set by the matrix is no longer allowed range, which should be adjusted, and its consistency should be verified. It can be applied only in accordance with the requirements. When CI is 0, A is consistent; with larger CI, A is inconsistent.[38] CR expresses the authority coefficient of experts, and is calculated using the formula (Ca+Cs) / 2, where CA is the expert's judgment coefficient, and Cr is the expert's familiarity coefficient with the research content.[39]

The specific values of the random consistency index (RI) were noted (Table 2).

After completing the step-by-step design, the weight of each factor was designed and calculated.

Data was noted in the Excel programme and was analysed using SPSS 20.

Table-2: The specific values of the random consistency index (RI).

Order	1	2	3	4	5	6	7	8	9
RI	0	0	0.52	0.89	1.12	1.26	1.36	1.41	1.46

Table-3: Hierarchy and weight of nutritional rehabilitation evaluation index system for patients with severe spinal deformity.[40-42]

Level 1 indicator	Level 2 indicator	Level 3 indicators
Structure (0.192)	Environmental unit (0.455)	Traction bed ratio (0.452) Compliance status of first aid articles and instruments (0.548)
	Human resources (0.545)	Theory and operation training rate of spinal orthopaedic specialty (0.255) Qualified rate of Standardized Nursing Training and Continuing Education (0.265) The ratio of orthopaedic nurses to total nursing staff (0.205) Bed care ratio (0.275)
Proces (0.473)	Clinical services (0.616)	Position care execution rate (0.082) Correct execution rate of axis turning over (0.075) Correct circulation assessment of affected limb (0.082) Accuracy of sensory and motor assessment (0.093) Accuracy of muscle strength assessment (0.085) Caprini Assessment of conformance rate (0.096) Accuracy of urine and feces / anal sphincter assessment (0.088) Qualification rate of orthopaedic specialty technical operation (0.075) Intervention accuracy of specialized complications (0.071) Qualified rate of basic nursing quality (0.082) Timely rate of condition observation and nursing disposal (0.075) Patient health education awareness rate (0.096)
	System process (0.384)	Implementation rate of routine and operating practices (0.245) Qualified rate of narcotic drugs (0.265) Qualified rate of nursing document writing (0.260) Implementation rate of pipeline management system (0.230)
Bear fruit (0.335)	Risk management (0.340)	Incidence of ineffective traction, needle eye infection (0.159) Incidence of total peroneal nerve injury after lower extremity surgery (0.195) Prevalence of respiratory obstruction in patients after cervical injury surgery (0.150) Prevalence of iatrogenic skin injury (0.168) Incidence and reporting rate of pressure ulcers in hospitalized patients (0.159) Incidence of patient falls and falls (0.169)
	Hospital infection (0.305)	Implementation rate of Infection Control System and Measures (0.491) Qualification rate of medical waste disinfection treatment (0.509)
	Service results（0.355)	Patient Satisfaction with Orthopaedic Care Job (0.254) Patient satisfaction with hospital job level (0.264) Mean length of hospital stay (0.273) Patient Clinical Outcomes (0.209)

Results

Of the 20 experts, 15(75%) were females and 5(25%) were males. The overall mean age was 38.77±6.65 years (range: 34-55 years). There were 13(65%) head nurses, 5(25%) nursing directors, and 2(10%) attending physicians. Educational levels included undergraduate degrees 11(55%)) and master's degrees or higher 9(45%). The mean clinical experience was 13.55±7.21 years (range: 11-35 years), and mean nursing management experience was 10.11±3.12 years (range: 12-18 years). There were 13(65%) subjects with intermediate-level professional titles, 5(25%) deputy seniors, and 2(10%) with senior titles.

The experts in the first round had CA 0.91, CS 0.88 and Cr 0.91. The corresponding values in the second round were 0.88, 0.88 and 0.88.

The hierarchical structure of the evaluation index system of nutritional rehabilitation nursing for patients with severe spinal deformity included 3 first-level indicators, 7 second-level indicators and 34 third-level indicators (Table 3).[40-42]

The consistency coefficient and test coefficient of all judgment matrices were <0.1, and the judgment matrix passed the consistency test.

Discussion

The current findings highlight the importance of comprehensive nursing interventions for patients undergoing surgical correction of severe spinal deformities. Previous studies have emphasised the significance of targetted psychological counseling to alleviate patients' anxiety about postoperative complications, such as disability, pain and paralysis.[43,44] Consistent with these findings, the current study demonstrated that providing detailed explanations to patients and their families improved preoperative understanding and postoperative cooperation, thus optimising recovery outcomes.

A significant contribution of the current study is its focus on respiratory rehabilitation prior to surgery. As noted by Lanini et al.,[45] respiratory exercises can significantly reduce the risk of pulmonary complications in patients with spinal deformities. The current results align with these findings.

The nursing care framework outlined in the current study also underscores the critical role of postoperative monitoring. Similar to the findings of Burgess et al.,[46] the study identified the immediate postoperative period as crucial for minimising complications. Experts have consistently recommended close monitoring of physiological indicators, including heart rate, respiratory rate and oxygen saturation, during this period.

Pain management remains a cornerstone of postoperative care. Prior studies[47] have highlighted the effectiveness of analgesic pumps for managing severe postoperative pain. The current findings are in agreement.

In addition to clinical outcomes, the current study developed a novel three-level quality evaluation system for nutritional rehabilitation nursing. Unlike traditional quality assessments, which focus solely on patient outcomes, this system incorporates structure, process and result dimensions, making it more comprehensive. Experts participating in the study strongly supported this approach, as it aligns with previous studies[48] emphasising the importance of process-focussed evaluations in improving care quality.

The current study has limitations as the sample size was not calculated statistically, which may have influenced the power of the study, and the generalisability of the findings.

Conclusion

Indicators like "satisfaction", "rate", and "ratio" allowed for a comprehensive and objective evaluation of nursing quality, particularly in spine orthopedic care. Specific indicators considered unique aspects of spinal deformity care, such as posture nursing, professional operations, and complication management. An intuitive and quantifiable nursing quality evaluation system based on the analytic hierarchy process was established, which could enhance work efficiency and patients' quality of life. Further clinical testing across departments is required to refine the system's specificity and sensitivity, ensuring it accurately reflects the needs of nutritional rehabilitation nursing for spinal deformity patients.

Disclaimer: None.

Conflict of Interest: None.

Source of Funding: None.

References

1. Luo M, Cao Q, Wang D, Tan R, Shi Y, Chen J, et al. The impact of diabetes on postoperative outcomes following spine surgery: A meta-analysis of 40 cohort studies with 2.9 million participants. Int J Surg 2022;104:106789. doi: 10.1016/j.ijsu.2022.106789
2. Rotherham M, Moradi Y, Nahar T, Mosses D, Telling N, El Haj AJ. Magnetic activation of TREK1 triggers stress signalling and regulates neuronal branching in SH-SY5Y cells. Front Med Technol 2022;4:981421. doi: 10.3389/fmedt.2022.981421
3. Moradi Y, Atyabi SA, Ghiassadin A, Bakhshi H, Irani S, Atyabi SM, et al. Cold Atmosphere Plasma Modification on Beta-Carotene-Loaded Nanofibers to Enhance Osteogenic Differentiation. Fibers Polym 2022;23:18–27. doi: 10.1007/s12221-021-0033-y.
4. Tian S, Chen X, Wu W, Lin H, Qing X, Liu S, et al. Nucleus pulposus cells regulate macrophages in degenerated intervertebral discs via the integrated stress response-mediated CCL2/7-CCR2 signaling pathway. Exp Mol Med 2024;56:408-21. doi: 10.1038/s12276-024-01168-4

5. Ju Q, Wu X, Li B, Peng H, Lippke S, Gan Y. Regulation of craving training to support healthy food choices under stress: A randomized control trial employing the hierarchical drift-diffusion model. Appl Psychol Health Well Being 2024;16:1159-77. doi: 10.1111/aphw.12522
6. Gerber LH, Deshpande R, Prabhakar S, Cai C, Garfinkel S, Morse L, et al. Narrative Review of Clinical Practice Guidelines for Rehabilitation of People With Spinal Cord Injury: 2010-2020. Am J Phys Med Rehabil 2021;100:501-12. doi: 10.1097/PHM.0000000000001637
7. Radmehr S, Dehghani F, Bai Y, Yang X, Li J. The impact of intermittent and continuous training on the levels of CIDE and Perilipin-1 proteins and their effect on the size of lipid droplets in the visceral adipose tissue of obese male rats. Eur J Hum Mov 2024;52:43-53. doi: 10.21134/eurjhm.2024.52.4.
8. Monemi M, Garrosi L, Mirzaei S, Farhadi B, Ataee Disfani R, Zabihi MR, et al. Identification of proteins' expression pathway and the effective miRNAs for the treatment of human papillomavirus-induced cervical cancer: in-silico analyses-experimental research. Ann Med Surg (Lond) 2024;86:5784-92. doi: 10.1097/MS9.0000000000002513
9. EskandariNasab M, Raeisi Z, Lashaki RA, Najafi H. A GRU-CNN model for auditory attention detection using microstate and recurrence quantification analysis. Sci Rep 2024;14:8861. doi: 10.1038/s41598-024-58886-y
10. Hamedi F, Ranjbar-Naeini OR, Layeghi A, Heidariazar A, Zibaii MI, Latifi H. Self-referred microcavity-based fused-fiber fabry-perot refractometer. Opt Fiber Technol 2022;68:102753. doi: 10.1016/j.yofte.2021.102753.
11. Rostami M, Farahani P, Esmaelian S, Bahman Z, Fadel Hussein A, A Alrikabi H, et al. The Role of Dental-derived Stem Cell-based Therapy and Their Derived Extracellular Vesicles in Post-COVID-19 Syndrome-induced Tissue Damage. Stem Cell Rev Rep 2024;20:2062-103. doi: 10.1007/s12015-024-10770-y
12. Forqani MA, Akbarian M, Amirahmadi S, Khorrami MB, Hosseini M, Forouzanfar F. Protective Effect of Carvacrol against Oxidative Damage in Aged Rats. Cent Nerv Syst Agents Med Chem 2024. doi: 10.2174/0118715249303906240729074821. [Ahead of print].
13. Rastegar-Moghaddam SH, Amirahmadi S, Akbarian M, Sharizina M, Beheshti F, Rajabian A, et al. Cardioprotective effect of cedrol in an inflammation systemic model induced by lipopolysaccharide: Biochemical and histological verification. J Cardiovasc Thorac Res 2024;16:120-8. doi: 10.34172/jcvtr.33112
14. Guinhut M, Guezennec S, Raynard B. Nutritional management of patients during surgical prehabilitation and rehabilitation programs. Soins 2024;69:38-41.
15. Hamedi F, Huang C, Akbari F, Liu X, Mohtasebi M, Yeo C, et al. An affordable miniaturized speckle contrast diffuse correlation tomography (scDCT) device for 2D mapping of cerebral blood flow. In: Proceedings Multiscale Imaging and Spectroscopy. California, United States: SPIE BiOS; 2024.
16. Nouri S, Navari M, Zarei F, Rostami M, Mahmoudi T, Rezamand G, et al. NAMPT gene rs2058539 variant is a risk factor for nonalcoholic fatty liver disease. Rev Assoc Med Bras (1992) 2024;70:e20230188. doi: 10.1590/1806-9282.20230188
17. Zdankiewicz A, Konaszczuk W, Pawłowski P, Kościołek A. Prehabilitation and nutritional interventions-an interdisciplinary perspective. J Educ Health Sport 2023;13:116-23. doi: 10.12775/JEHS.2023.13.02.016.
18. Navari M, Zarei F, Sayedsalehi S, Mahmoudi T, Rostami M, Mahban A, et al. The Arg/Arg genotype of leptin receptor gene Gln223Arg polymorphism may be an independent risk factor for nonalcoholic fatty liver disease. Lab Med 2024;55:590-4. doi: 10.1093/labmed/lmae016
19. Akbarzadeh I, Poor AS, Khodarahmi M, Abdihaji M, Moammeri A, Jafari S, et al. Gingerol/letrozole-loaded mesoporous silica nanoparticles for breast cancer therapy: In-silico and in-vitro studies. Microporous Mesoporous Mater 2022;337:111919. doi: 10.1016/j.micromeso.2022.111919.
20. Sousa L, Raposo C, Guerra N, Faleiros F, Albuquerque G, Severino S. Rehabilitation Nursing Care for a patient undergoing corrective surgery for scoliosis: case report. Salud, Ciencia y Tecnología 2024;4:785. doi: 10.56294/saludcyt2024785.
21. Rostami N, Ghebleh A, Noei H, Rizi ZS, Moeinzadeh A, Nikzad A, et al. Peptide Functionalized Polymeric Nanoparticles for Delivery of Curcumin to Cancer Cells. J Drug Deliv Sci Technol 2024;102:106337. doi: 10.1016/j.jddst.2024.106337.
22. Parsa H, Samiee Rad F, Borzui B, Rahmani A. Severe iron deficiency anemia in a patient with cavernous hemangioma of small intestine, a case report. Compar Clin Pathol 2015;24:207–10.
23. Efati Z, hahangian SS, Darroudi M, Amiri H, Hashemy SI, Aghamaali MR. Green chemistry synthesized zinc oxide nanoparticles in Lepidium sativum L. seed extract and evaluation of their anticancer activity in human colorectal cancer cells. Ceram Int 2023;49:32568–76. doi: 10.1016/j.ceramint.2023.07.221.
24. Mehrnia M, Kholmovski E, Katsaggelos A, Kim D, Passman R, Elbaz MSM. Novel Self-Calibrated Threshold-Free Probabilistic Fibrosis Signature Technique for 3D Late Gadolinium Enhancement MRI. IEEE Trans Biomed Eng 2024;72:856-69. doi: 10.1109/TBME.2024.3476930
25. Letafati A, Bahari M, Salahi Ardekani O, Nayerain Jazi N, Nikzad A, Norouzi F, et al. HTLV-1 vaccination Landscape: Current developments and challenges. Vaccine X 2024;19:100525. doi: 10.1016/j.jvacx.2024.100525
26. Hajihosseinlou M, Maghsoudi A, Ghezelbash R. Regularization in machine learning models for MVT Pb‑Zn prospectivity mapping: applying lasso and elastic‑net algorithms. Earth Sci Inform 2024;17:4859–73. doi: 10.1007/s12145-024-01404-5
27. Fariman SK, Danesh K, Pourtalebiyan M, Fakhri Z, Motallebi A, Fozooni A. A robust optimization model for multi-objective blood supply chain network considering scenario analysis under uncertainty: a multi-objective approach. Sci Rep 2024;14:9452. doi: 10.1038/s41598-024-57521-0
28. Sarbaz P, Beigoli S, Payami B, Eshaghi Ghalibaf MH, Amirahmadi S, Hosseini M, et al. Curcuma longa impact on behavioral, brain oxidative stress, and systemic inflammation in rats exposed to inhaled paraquat. Toxicol Environ Health Sci 2024;16:287–98. doi: 10.1007/s13530-024-00225-9.
29. Saberi R, Mirazi N, Amirahmadi S, Darbandi ZK, Vafaee F, Rajabian A, et al. Ameliorative effects of thiamin on learning behavior and memory dysfunction in a rat model of hypothyroidism: implication of oxidative stress and acetylcholinesterase. Metab Brain Dis 2023;38:2603-1. doi: 10.1007/s11011-023-01317-0
30. Donabedian A. The quality of care. How can it be assessed? JAMA 1988;260:1743-8. doi: 10.1001/jama.260.12.1743.
31. Institute of Medicine (US) Committee on Quality of Health Care in America. Crossing the Quality Chasm: A New Health System for the 21st Century. Washington, DC: National Academies Press (US); 2001.
32. Institute of Medicine (US) Committee on Quality of Health Care in America. To Err is Human: Building a Safer Health System. In: Kohn LT, Corrigan JM, Donaldson MS, eds. Washington, DC: National Academies Press (US); 2000.
33. Cavalcante PS de, Rossaneis MA, Haddad MCL do, Gabriel CS. Healthcare quality indicators used in hospital nursing care management. Rev Enferm UERJ 2015;23:787-93. doi: 10.12957/reuerj.2015.7052.
34. Yan Z, Zhang Y, Zhu J, Pan D, Shen R. Construction of the evaluation index system for nursing quality in day operation center. Chin J Pract Nurs 2019;35:2509–13.
35. Gifford CS, McGahan BG, Miracle SD, Minnema AJ, Murphy CV,

Vazquez DE, et al. Design and feasibility of a double-blind, randomized trial of peri-operative methylnaltrexone for postoperative ileus prevention after adult spinal arthrodesis. Contemp Clin Trials 2022;112:106623. doi: 10.1016/j.cct.2021.106623

36. Veillard D, Le Page E, Epstein J, Wiertlewski S, Gallien P, Hamonic S, et al. Evaluation of the quality of the care pathway for patients with multiple sclerosis in France: Results of an original study of a cohort of 700 patients. Rev Neurol (Paris) 2022;178:580-9. doi: 10.1016/j.neurol.2021.09.008
37. Zhang D, Wang F, Si L. Composite hashing with multiple information sources. In: Proceedings of the 34th international ACM SIGIR conference on Research and development in Information Retrieval. Beijing, China: The ACM Digital Library; 2011. doi: 10.1145/2009916.2009950.
38. itey E, Afolayan J, Shah N, Stringfellow T, Shafafy R, Gibson A. 1316 An Evaluation of The Consent Process in One of The Largest Spinal Surgery Units in Europe. Br J Surg 2021;108(Suppl 6):znab259. doi: 10.1093/bjs/znab259.143.
39. Yang X, Li L, Liu Y, Wu L, Lu C, Wang W, et al. Establishing quality evaluation system of nursing management in fever clinics: A Delphi method. J Nurs Manag 2021;29:2542-56. doi: 10.1111/jonm.13408
40. Joaquim AF, Cheng I, Patel AA. Postoperative spinal deformity after treatment of intracanal spine lesions. Spine J 2012;12:1067-74. doi: 10.1016/j.spinee.2012.09.054
41. Wright AK, La Selva D, Nkrumah L, Yanamadala V, Leveque JC, Sethi RK. Postoperative Ileus: Old and New Observations on Prevention and Treatment in Adult Spinal Deformity Surgery. World Neurosurg 2019;132:e618-22. doi: 10.1016/j.wneu.2019.08.062
42. Ashworth I, Wilson A, Aquilina S, Parascandalo R, Mercieca V, Gerada J, et al. Reversal of Intestinal Failure in Children With Tufting Enteropathy Supported With Parenteral Nutrition at Home. J Pediatr Gastroenterol Nutr 2018;66:967-71. doi: 10.1097/MPG.0000000000001894
43. Smith MA, Thompson A, Hall LJ, Allen SF, Wetherell MA. The physical and psychological health benefits of positive emotional writing: Investigating the moderating role of Type D (distressed) personality. Br J Health Psychol 2018;23:857-71. doi: 10.1111/bjhp.12320
44. Schwartz CE, Borowiec K, Aman S, Rapkin BD, Finkelstein JA. Mental health after lumbar spine surgery: cognitive appraisal processes and outcome in a longitudinal cohort study. Spine J 2024;24:1170-82. doi: 10.1016/j.spinee.2024.03.001
45. Lanini I, Amass T, Calabrisotto CS, Fabbri S, Falsini S, Adembri C, et al. The influence of psychological interventions on surgical outcomes: a systematic review. J Anesth Analg Crit Care 2022;2:31. doi: 10.1186/s44158-022-00057-4
46. Burgess LC, Arundel J, Wainwright TW. The Effect of Preoperative Education on Psychological, Clinical and Economic Outcomes in Elective Spinal Surgery: A Systematic Review. Healthcare (Basel) 2019;7:48. doi: 10.3390/healthcare7010048
47. Villa G, Lanini I, Amass T, Bocciero V, Scirè Calabrisotto C, Chelazzi C, et al. Effects of psychological interventions on anxiety and pain in patients undergoing major elective abdominal surgery: a systematic review. Perioper Med (Lond) 2020;9:38. doi: 10.1186/s13741-020-00169-x
48. Efthimiou P, Benetos IS, Evangelopoulos DS. Psychological support for the patient with spinal cord injury. Acta Orthop Trauma Hell 024;75:54-63.