

## **Application of NRS 2002 in nutritional screening of patients underwent thoracic surgery and study on nutritional nursing intervention.**

Hui-Juan Wang<sup>1</sup>, Sheng-Qin Li<sup>2\*</sup>

<sup>1</sup>Department of Thoracic Surgery, Eastern Medical District of Linyi People's Hospital, Linyi City, Shandong Province 276034, PR China

<sup>2</sup>The Third Ward of Internal Medicine, Eastern Medical District of Linyi People's Hospital, Linyi City, Shandong Province 276034, PR China

### **Abstract**

**Objective:** To explore application of Nutritional Risk Screening 2002 (NRS2002) scale in nutritional screening for thoracic surgery, and to analyze the nutritional nursing methods.

**Methods:** Totally 98 patients with thoracic surgery in our hospital from March 2013 to March 2017 were randomly divided into control group and observation group, 49 cases in each group. The control group received routine nutrition nursing, the observation group evaluated by NRS 2002 scale were given specific nutritional nursing by regulating diets according to different nutritional status, until two groups were discharged from hospital. The conditions of nutritional risk were analyzed after 2 weeks of intervention, the changes of transferrin (TRF) and hemoglobin (Hb), prealbumin (PA), albumin (ALB) level and physical status were compared, the incidences of complications were compared.

**Results:** The incidence of nutritional risk in the observation group was significantly lower than that of the control group (6.12% vs. 20.41%;  $\chi^2=4.346$ ,  $P<0.05$ ); there were significant differences in the ALB, PA, Hb, TRF of the observation group before and after intervention ( $P<0.05$ ); the ALB, PA and TRF of the observation group after intervention were significantly higher than those of the control group ( $P<0.05$ ); the upper arm muscle circumference, upper arm circumference and triceps skinfold thickness of two groups were higher than those before intervention, and the observation group after intervention were significantly higher than those of the control group ( $P<0.05$ ); the hypoxemia and pulmonary infection in the observation group were significantly lower than those in the control group (4.08%, 2.04% vs. 16.33%, 12.24%;  $\chi^2=4.009$ , 4.405,  $P<0.05$ ).

**Conclusion:** NRS 2002 scale can identify the nutritional status of patients with open chest surgery and give targeted nursing guidance, it is worthy of clinical promotion.

**Keywords:** Nutritional screening, Open chest surgery, Nutritional nursing, Nutritional risk screening 2002.

*Accepted on December 06, 2017*

### **Introduction**

Thoracic surgery is the important procedure to treat injured cardiac artery, esophagus rupture, hemothorax and intrathoracic active bleeding, but the particular surgical sites cause great damage to patients physically, which lead to the higher risk of occurring postoperative complications, mainly in pulmonary infection [1,2]. The symptoms of partial complications are latent and not detected in time, once the patients have the significant seizure, the life of patients will be seriously threatened or even die. It is reported in Flaris et al. that the occurrence of complications after thoracic surgery may be in correlation with status of physical nutrition, the results showed there was the greater possibility of having related pulmonary complications in patients with nutritional risk, which was unfavorable to improve prognosis [3]. Therefore, during the perioperation, status of physical nutritional in

patients should be identified in hospital, and given with objective nutritional support for reducing complications, so it is crucial significance of postoperative recovery in patients. Nutritional Risk Screening 2002 (NRS2002) scale refers to evaluate the status of nutritional risk in patients, this professional scale also was recommended and applied in hospitalized patients by The European Society for Clinical Nutrition and Metabolism (ESPEN) [4-6], currently, this scale has been induced in the department of oncology, internal medicine or intensive care unit (ICU) etc. for nutritional assessment, however, the promotion is needed to strengthen [7].

In consideration of that, a total number of 98 patients with thoracic surgery in this study were collected as research objective, to investigate the effects of nutritional screening of

NRS 2002 in the patients, as well as the guidance value of nutritional nursing, now the report is as follows.

## Materials and Methods

### General data

In our hospital, a total of 98 cases with thoracic surgery from March 2013 to March 2017 were collected. Inclusion criteria: patients aged over 18 years old; patients had obvious indications of surgical, and tolerance to thoracic surgery; hospital stays were over 36h; patients were conscious with great ability to understand; patients were not abnormal in mentality; patients without limbs dysfunction could be measured their weight and height; patients were informed and

agreed in this study, which was approved by Ethical Committee (approval no. 201203012). Exclusion criteria: patients occurred pulmonary infection before surgery; patients had previous heart and lung surgeries; patients accompanied with adverse injured organs such kidney, liver; patients were diagnosed as malignant tumors; patients previously had psychosis and thoracic surgery; patients accompanied with blood coagulation dysfunction; patients were not willing to be included in this study. All patients were randomly divided into the observation group and the control group, each group of 49 cases. The control group had 32 males and 17 females, they aged from 30 to 71 years, the observation group had 30 males and 19 males, they aged from 29 to 73 years. The differences of general materials in two groups were not statistically significant ( $P > 0.05$ , Table 1).

**Table 1.** Comparison of baseline data in two groups.

Group	N	Gender male)	(female/ Age (years)	BMI (kg/m <sup>2</sup> )	Types of diseases			
					Intrathoracic active bleeding	Diaphragmatic rupture	Injured cardiac artery	Pneumothorax
Observation group	49	19/30	49.86 ± 8.37	22.31 ± 2.48	8 (16.33)	11 (22.49)	18 (36.73)	12 (24.49)
Control group	49	17/32	48.73 ± 9.59	21.96 ± 2.52	9 (18.37)	12 (24.49)	17 (34.69)	11 (22.49)
$\chi^2/t$		0.176	0.621	0.693	0.174			
P		0.675	0.536	0.490	0.982			

### Methods

The control group were given routine nutritional nursing, enteral nutrition intervention was conducted at 24 h after surgery, including fruit juice, millet gruel, red dates soup etc., the initial amount was 200 mL/d. Then, dietary reference intake (DRI) gradually was adjusted based on specific conditions of physical rehabilitation according to "revised DRI of Chinese residents in 2013" [8], the highest amount was at 2500 mL/d. The early vegetarian diets gradually turned into collocation of vegetable and meat. After recovering, semiliquid diets convert to general diets.

The observation group adopted NRS 2002 scale for nutrition screening and received specific nutritional nursing.

1) **Nutrition evaluation:** NRS 2002 scale [9] was used to evaluate the nutritional status of patients after surgery, including nutrition damage, age, and severity of disease. Nutrition damage: total score was 0-3 points, normal nutrition was 0 score; rate of weight loss over 5% in 90 d was 1 score; rate of weight loss over 5% in 60 d was 2 scores; rate of weight loss over 5% in 30 d was 3 scores. Severity of disease: total score was 0-3 points, basic self-care in life was 0 score; activity of daily living with poor health was 1 score; patients being unable to ambulate was 2 scores; patients in ICU was 3 scores. Age: total score was 0-1 points, patients aged below 70 years was 0 score, over 70 years was 1 score. The critical value was 3 scores,  $\geq 3$  scores were the patients with nutritional risk,  $< 3$  scores was the patients without nutritional risk.

2) **Nutritional nursing:** for NRS 2002 of patients being  $\geq 3$  scores, if retention volume in gastric fluid was below 150 mL, patients will be pumped at 0.9 kcal/mL of whole protein enteral nutrition by gastric tube, which contained 56 g/L protein, 6.3 KJ of calories. The dose of 500 mL was transfused at 25 mL/h for the first day; 1000 mL was transfused at 45 mL/h for the second day; 1000 mL was transfused at 60 mL/h for the third day; 1000 mL was transfused at 80 mL/h until the seventh day. The nutritional status of patients was observed for making nutrition intake scheme. For NRS 2002 of patients being  $< 3$  scores, nursing methods were similar with the control group.

**Table 2.** Comparison of the incidence of nutritional risk in two group [n(%)].

Group	n	Nutritional risk	Non-nutritional risk
Observation group	49	3 (6.12)	46 (93.88)
Control group	49	10 (20.41)	39 (79.59)
$\chi^2$		4.346	
P		0.037	

### Observation indicators

1) **Nutritional risk:** the incidence of nutritional risk at 2 weeks after surgery was analyzed in two group, which referred to NRS 2002 scale for evaluation.

*Application of NRS 2002 in nutritional screening of patients underwent thoracic surgery and study on nutritional nursing intervention*

2) **Nutritional indexes:** before intervention and at 2 weeks after intervention, nutritional indexes were evaluated. Fasting peripheral venous blood was collected to be centrifuged at string of 1500 rpm for 15 min for the separation of serum, transferrin (TRF) and hemoglobin (Hb), prealbumin (PA), albumin (ALB) level in serum were determined by automatic chemistry analyser.

3) **Physical status:** before intervention and at 2 weeks after intervention, upper arm muscle circumference and upper arm circumference were measured by tape; patients stood vertically, the skinfold were clamped to measure triceps skinfold thickness by using skinfold caliper.

4) The incidences of postoperative complications in two groups were recorded.

**Statistical analysis**

SPSS20.0 software was used to analyze the data. Measurement data expressed as mean ± standard deviation, the comparisons of groups adopted t-test; enumeration data expressed as percentage, the comparisons adopted chi-square test. P<0.05 referred difference was statistically significant.

**Results**

**The incidence of nutritional risk in two groups**

At 2 weeks after intervention, there were 3 cases of nutritional risk in observation group, which accounted for 6.12% (3/49);

there were 10 cases of nutritional risk in the control group, which account for 20.41% (10/49). The incidence of nutritional risk of the observation group was lower than that of the control group, the difference was statistically significantly (P<0.05, Table 2).

**The changes of nutritional indexes before and after intervention in two groups**

Before intervention, the ALB, PA, Hb, TRF levels of two groups had no significant differences (P>0.05), after intervention, the above indexes in the observation group were increasing, but there were significant differences in the observation group before and after intervention (P<0.05); ALB, PA, TRF after intervention of the observation group were significantly higher than those of th control group (P<0.05, Table 3).

**The changes of upper arm muscle circumference, upper arm circumference and triceps skinfold thickness before and after intervention in two groups**

Differences were not significant in the upper arm muscle circumference, upper arm circumference and triceps skinfold thickness of two group (P>0.05). After intervention, the above indicators of two groups were higher than those before intervention, and the observation group were higher than the control group, the differences were statistically significant (P<0.05, Table 4).

**Table 3.** Comparisons of nutritional indexes before and after intervention in two groups.

Group	Time	ALB (g/L)	PA (mg/L)	Hb (g/L)	TRF (g/L)
Observation group (n=49)	Before intervention	32.68 ± 4.76	101.64 ± 21.15	104.93 ± 12.75	1.59 ± 0.32
	After intervention	37.94 ± 3.89	129.53 ± 22.09	110.38 ± 11.05	2.09 ± 0.35
t		5.990	6.384	2.261	7.380
P		0.000	0.000	0.026	0.000
Control group (n=49)	Before intervention	32.35 ± 4.32	102.83 ± 20.65	104.82 ± 11.93	1.58 ± 0.29
	After intervention	35.21 ± 4.10*	114.37 ± 21.55*	109.64 ± 10.87*	1.77 ± 0.17*
t		3.361	2.706	2.091	3.957
P		0.001	0.008	0.039	0.000

Note: \* Compared with the observation group after intervention, P<0.05.

**Table 4.** Comparison of upper arm muscle circumference, upper arm circumference and triceps skinfold thickness in two groups.

Group	Time	Upper arm muscle circumference (cm)	Upper arm circumference (cm)	Triceps skinfold thickness (mm)
Observation group (n=49)	Before intervention	21.48 ± 2.42	26.07 ± 3.25	14.27 ± 3.21
	After intervention	23.62 ± 2.87	28.04 ± 3.18	16.48 ± 3.47
t		4.177	3.023	3.273

P		0.000	0.003	0.002
Control group (n=49)	Before intervention	21.47 ± 2.36	26.03 ± 3.15	14.04 ± 3.16
	After intervention	22.51 ± 2.29*	27.09 ± 0.34*	15.12 ± 1.13*
t		2.214	8.705	2.253
P		0.029	0.000	0.027

Note: \*Compared with the observation group after intervention, P<0.05.

**Table 5.** Comparison of postoperative complications in two groups [n(%)].

Group	n	Hypoxemia	Pulmonary infection	Arrhythmia	Atelectasis	Incision infection	Angina pectoris	Rising pressure	blood
Observation group	49	2 (4.08)	1 (2.04)	0 (0.00)	0 (0.00)	1 (2.04)	0 (0.00)	1 (2.04)	
Control group	49	8 (16.33)	6 (12.24)	1 (2.04)	1 (2.04)	0 (0.00)	1 (2.04)	0 (0.00)	
$\chi^2$		4.009	4.405*	0.000*	0.000*	0.000*	0.000*	0.000*	
P		0.045	0.036	1.000	1.000	1.000	1.000	1.000	

Note: \*adopted continuity correction chi-square test.

### **The incidence of postoperative complications in two groups**

The incidences of hypoxemia and pulmonary infection in the observation group were 4.08% (2/49) and 2.04% (1/49) respectively, which were lower than those of 16.33% (8/49) and 12.24% (6/49) in the control group, differences were significant (P<0.05). The incidences of other complications in two groups had no significant differences (P>0.05, Table 5). All of postoperative complications were mild symptoms, the patients with hypoxemia or/and pulmonary infection were treated with antibacterial agents particularly.

### **Discussion**

Thoracic surgery belongs to be greatly traumatogenic surgical technology, the risk of pulmonary infection after surgery is much higher, additionally, because this complication was discovered too late to have an influence on surgical efficacy, resulting in increasing the rate of disability and mortality [10,11]. Wang et al. [12] reported, malnutrition might be the one of risk factors to increase the risk of postoperative complications, particularly patients with thoracic surgery occurred malnutrition easily owing to difficult feed, causing greater effects on status of physical nutrition, thereby the possibility of a series of complications such as descent immunologic function indirectly and increasing infection etc. was introduced. To identify the status of nutritional risk in patients with thoracic is to provide the related evidence with nutritional nursing intervention. This study prepared to adopt NRS 2002 scale to assess nutritional risk in patients. This scale is well-operated with high reliability and sensibility, low false positive rate [13,14]. At present, NRS 2002 is acknowledged as preferred scale in screening nutritional risk, so that it is convenient to understand the status of nutritional risk, for providing references with nutritional support [15,16].

In the report of Wu [17], the results of NRS 2002 scale on nutritional status assessment in maintenance hemodialysis patients showed, before and after dialysis, the proportion of patients with nutritional risk had significant difference, and the proportion after dialysis was higher than that before dialysis, which indicated hemodialysis therapy had effect on status of nutritional risk in patients. Li et al. [18] found, after application of NRS 2002 screening colorectal cancer patients in the process of chemotherapy, the nutritional indicators of non-nutritional group were better than those of nutritional group, and reported the specificity, accuracy and sensitivity of this scale were 95.2%, 56.2% and 89.0% respectively in screening results, while the specificity and accuracy were ideal. In this study, after the observation group received nutritional nursing guidance according to the screening results of NRS 2002 scale, the incidence of postoperative nutritional risk in the observation group was significantly lower than that in the control group, the improvement of ALB, PA, TRF was better than that in the control group, it expressed that application of NRS 2002 in nutritional nursing intervention can improve the status of nutritional risk and nutritional indexes, which is in agreement with the study of Ding et al. [19]. NRS 2002 scale can identify the status of nutritional risk in patients. Establishing specific nutritional scheme is to distinguish different types of patients. The patients with nutritional risk should be given with enteral nutrition in time for adjusting their body and improving the status of nutrition. The traditional nutritional nursing was lack of pertinence; Therefore, improvement was not significant [20,21]. Hb level of two groups had no significant difference after intervention, which lied in the shorter observation time after surgery, unobvious improvement of Hb.

Through observing upper arm muscle circumference, upper arm circumference, triceps skinfold thickness, after the

observation group accepted the nutritional risk screening of NRS 2002 and objective nursing, the above indexes increased and were higher than that of the control group. It pointed out the screen of NRS 2002 scale and its objective nursing could further improve the status of physical health, the reason was the observation group was divided in to nutritional risk group and non-nutritional risk group according to the results of NRS 2002, the nutritional risk group aimed to supplement nutritional treatment to reach the purpose of correcting status of nutritional risk, strengthening immune response, the conclusion is similar with Han et al. [22]. Regarding to the incidence of complications, the observation group was lower in hypoxemia and pulmonary infection than that in the control group, it indicated NRS 2002 nursing intervention can better status of nutrition, thereby lower the risk of complications.

It is concluded that NRS 2002 scale plays a vital role in screening nutritional risk after thoracic surgery, which is able to identify status of nutritional risk in patients, improve status of physical health, reduce the incidence of postoperative complications, and provide references with formulation of postoperative nutritional nursing scheme, it is worthy of promotion widely.

## References

1. Blank RS, Colquhoun DA, Durieux ME. Management of one-lung ventilation: impact of tidal volume on complications after thoracic surgery. *Anesthesiology* 2016; 124: 1286-1295.
2. Fernandez-Bustamante A, Frenzl G, Sprung J. Postoperative pulmonary complications, early mortality, and hospital stay following noncardiothoracic surgery: a multicenter study by the perioperative research network investigators. *JAMA Surg* 2017; 152: 157-166.
3. Flaris AN, Simms ER, Prat N. Clamshell incision versus left anterolateral thoracotomy. which one is faster when performing a resuscitative thoracotomy? the tortoise and the hare revisited. *World J Surg* 2015; 39: 1306-1311.
4. Li SY, Yu JH, Diao ZF. Analysis on nutritional risk screening and influencing factors of hospitalized patients in central urban area. *J Huazhong Univ Sci Technolog Med Sci* 2017; 37: 628-634.
5. Leandro-Merhi VA, de Aquino JLB, Reis LO. Predictors of nutritional risk according to NRS-2002 and calf circumference in hospitalized older adults with neoplasms. *Nutr Cancer* 2017; 1: 1-8.
6. Poulia KA, Klek S, Doundoulakis I. The two most popular malnutrition screening tools in the light of the new ESPEN consensus definition of the diagnostic criteria for malnutrition. *Clin Nutr* 2017; 36: 1130-1135.
7. Giorgetti G M, Fabiocchi F, Brandimarte G. Nutritional Risk Screening (NRS2002) system in hospitalized patients with acute diverticular disease in a medicine department: implementation of a largescale. *J Clin Gastroenterol* 2016; 50: S112-S112.
8. Cheng YY. Revised dietary reference intake (DRI) of Chinese residents in 2013. *Acta Nutrimenta Sinica* 2014; 36: 313-317.
9. Rabito EI, Marcadenti A, da Silva Fink J. Nutritional Risk Screening 2002, short nutritional assessment questionnaire, malnutrition screening tool, and malnutrition universal screening tool are good predictors of nutrition risk in an emergency service. *Nutr Clin Pract* 2017; 32: 526-532.
10. Hetmann F, Kongsgaard U E, Sandvik L. Prevalence and predictors of persistent post-surgical pain 12 months after thoracotomy. *Acta Anaesthesiol Scand* 2015; 59: 740-748.
11. Fernandez-Bustamante A, Frenzl G, Sprung J. Postoperative pulmonary complications, early mortality, and hospital stay following noncardiothoracic surgery: a multicenter study by the perioperative research network investigators. *JAMA Surg* 2017; 152: 157-166.
12. Wang YP, Abulaiti R, Li X. Nutritional risk screening and application of nutritional support in hospitalized patients in tertiary hospitals of Urumqi. *J Xinjiang Med University* 2016; 39: 1178-1179.
13. Yan FQ, Zhu H, Duan XY. Application of Nutritional Risk Screening 2002, mini nutritional assessment, and clinical laboratory measurements in nutrition survey of hospitalized elderly patients. *Parenteral Enteral Nutri* 2016; 23: 369-372.
14. Sun ZY, Cao Z, Ye Q. Preoperative NRS 2002 assessment of nutritional risk of patients with esophagus cancer and postoperative results. *Chinese J Clin Thoracic Cardiovascul Surg* 2015; 4: 323-326.
15. Zhang Y, Li HL, Tong SP. Comparison of the application effect of malnutrition universal screening tool and nutritional risk screening 2002 in hospitalized patients with inflammatory bowel disease. *Nurs J Chinese PLA* 2015; 32: 29-32.
16. Ji LL, Hou DL, Song LN. Nutritional risk screening 2002, application and comparison of malnutrition universal screening tool and patient-generated subjective globe assessment in tumor inpatients. *Acta Nutrimenta Sinica* 2017; 39: 242-246.
17. Wu ZY. Effect of SGA and NRS 2002 scale on nutritional status assessment in maintenance hemodialysis patients. *Mod Med J* 2015; 9: 1140-1143.
18. Li Y, Liu YY, Feng LX. The observation of application effects on NRS 2002 nutritional risk screening in colorectal cancer patients during chemotherapy. *J Nurse Train* 2016; 31: 1488-1490.
19. Ding HL, Li Y. Analysis of evaluation results of NRS 2002 nutritional risk screening in 296 hospitalized patients with hepatitis. *Shandong Med J* 2016; 56: 80-83.
20. Xie HF. Research progress of nutritional risk screening 2002 and its consequence in nutritional support. *Chinese J Mod Nurs* 2017; 23: 1457-1460.
21. Liu Y, Yang DG, Zhu J. Comparison of different nutritional screening tools in the hospitalized patients. *J Guiyang Med College* 2015; 40: 486-489.

22. Han B, Xu QX, Ding YT. Nutritional Risk Screening 2002 used for preoperative nutritional assessment of patients with pancreatic cancer. *J Guiyang Med College* 2016; 22: 150-154.

**\*Correspondence to**

Sheng-Qin Li

The Third Ward of Internal Medicine

Eastern Medical District of Linyi People's Hospital

PR China