

Review Article

The effect of comprehensive nursing on the postoperative recovery and quality of life of patients undergoing hepatectomy

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Received February 10, 2020; Accepted May 11, 2020; Epub July 15, 2020; Published July 30, 2020

Abstract: Objective: This study aimed to explore the effect of comprehensive nursing on the postoperative recovery and quality of life of patients undergoing hepatectomy. Methods: We randomly assigned 80 patients undergoing hepatectomy in Hanzhong Central Hospital from January 2016 to March 2017 to receive comprehensive nursing (the CN group) or routine nursing (the RN group) during the perioperative period in a 1:1 ratio. Results: Complications were more common in the RN group than in the CN group ($P < 0.05$). As compared with the patients from the RN group, the patients from the CN group had markedly lower postoperative 1 h visual analogue scale (VAS) scores (2.57 ± 0.75 vs. 3.15 ± 1.28 , $P < 0.05$), markedly lower postoperative 3 d VAS scores (1.02 ± 0.45 vs. 2.98 ± 0.89), markedly shorter time intervals from being activity-incapable to being activity-capable (1.46 ± 0.57 vs. 3.21 ± 1.53 , $P < 0.001$), markedly shorter hospitalization times (8.85 ± 3.42 vs. 13.25 ± 4.18 , $P < 0.001$), and markedly higher scores on the MOS 36-item short-form health survey (SF-36) (72.64 ± 10.58 vs. 60.78 ± 11.63 , $P < 0.001$). The CN group was not significantly different from the RN group in the Pittsburgh sleep quality index (PSQI) scores on the day of admission (11.55 ± 2.42 vs. 11.38 ± 2.65 , $P > 0.05$), but the CN group had markedly lower PSQI scores than the RN group one day before the surgery (7.54 ± 4.12 vs. 10.25 ± 4.55 , $P < 0.05$). The CN group was not significantly different from the RN group in the number of cases with marked satisfaction or moderate satisfaction ($P > 0.05$), but the CN group had a notably higher total nursing satisfaction rate than the RN group ($P < 0.05$). The CN group was not significantly different from the RN group in the overall survival rate (85% vs. 70%, $P > 0.05$). Conclusion: Comprehensive nursing can accelerate the postoperative recovery of patients undergoing hepatectomy and improve patients' quality of life.

Keywords: Comprehensive nursing, hepatectomy, recovery, quality of life

Introduction

Hepatocellular carcinoma (HCC) is the most prevalent primary malignant tumor of the liver [1], causing the fastest death from cancer in the US and which is difficult to control [2]. HCC, one of the cancers with the highest mortality worldwide [3], is facing a rising trend in its mortality in recent years, making it the third leading cause of global human death [4]. From 1990 to 2015, the number of newly diagnosed HCC cases increased by 75% [5], which imposes a heavy economic and health burden on health care institutions around the world.

According to data from the American Adult-to-adult Living Donor Liver Transplantation Data-

base, since 2004, the number of patients with nonalcoholic steatohepatitis waiting for liver transplantation has almost tripled, further reducing the possibility of available liver transplantation [6]. Hepatectomy is the preferred choice in the treatment of various primary and secondary liver tumors. However, hepatectomy may result in four potentially destructive complications, including postoperative bleeding, venous thromboembolism, bile leakage, and postoperative liver failure [7]. In addition, severe depression is a common surgical complication and may lead to an increase in disease morbidity and mortality [8]. Therefore, the clinical care of patients after surgery is particularly important. Development in the economy and people's living standards stimulates people's

demands for better medical care, medical treatment, and medical services, making routine nursing intervention no longer qualified to meet the needs of most patients [9]. Therefore, the comprehensive nursing model came into being. It is a human-centered nursing model guided by the modern nursing concept and based on scientific nursing procedures, focusing on the patient's living environment, psychological state, and other physical factors that affect the patient's recovery to perform nursing interventions [10]. There are abundant studies on the clinical application of comprehensive care and its superior effect. For example, comprehensive care for patients with diabetes effectively improved the nursing quality, promoted patients' self-management, and reduced the risk of cardiovascular disease [11]. In a previous study, patients receiving comprehensive care showed higher nursing satisfaction levels and better recovery than patients receiving routine nursing [12].

The quality of nursing can affect patients' recovery and prognosis. So far, the application of comprehensive nursing in patients undergoing hepatectomies has been rarely studied. Here we performed comprehensive nursing interventions for patients undergoing hepatectomies and assessed its application value, aiming to provide a better nursing model for patients during the hepatectomy perioperative period.

Materials and methods

Basic data

We randomly assigned 80 liver tumor patients undergoing hepatectomy in Hanzhong Central Hospital from January 2016 to March 2017 to receive comprehensive nursing (the CN group) or routine nursing (the RN group) during the perioperative period in a 1:1 ratio. The basic clinical data were all recorded. The study was approved by the medical ethics committee of Hanzhong Central Hospital.

Inclusion and exclusion criteria

Inclusion criteria: Patients diagnosed with a liver tumor through imaging and pathology according to the diagnostic criteria issued by the EASL-EORTC clinical practice guidelines in 2012 [13] (the tumor diameter was less than 5 cm, without distant metastasis); patients with no history of anti-tumor treatments; patients

with complete clinical data and willing to cooperate with the treatment and the follow-up. All the patients signed a written informed consent.

Exclusion criteria: Patients with diffuse hepatocellular carcinoma; patients with comorbid or other malignancies; patients with severe liver and kidney dysfunction; patients with cognitive dysfunction; patients unwilling to cooperate with the medical staff; patients with surgical contraindications; patients with drug allergies or severe infections.

Nursing methods

The RN group: Patients received routine nursing during the perioperative period. Before surgery: We managed their diets and informed the patients of the related knowledge and precautions of the disease and surgery. After surgery: 1. We strictly monitored the changes in their vital signs to maintain a water-electrolyte balance in patients. 2. We taught the patients about the use of the related drugs. 3. The patients were ordered to take oral analgesics when needed. 4. We recommended a balanced diet for nutritional considerations. 5. We popularized health education on related diseases. 6. We shared the phone number of the Hanzhong Central Hospital and gave the patients reminders for the follow-up visits.

The CN group: The patients received comprehensive nursing during the perioperative period. Before the surgery: We managed their diets and gave the patients a 250 mL 10% glucose injection 2 hours before the surgery (Sichuan Kelun Pharmaceutical Co., Ltd., China Food and Drug Administration (CFDA) approval No. H51020633). In addition, we explained in detail the relevant knowledge and precautions of the disease and surgery and conducted psychological guidance for patients to relieve their anxiety. After surgery: 1. We strictly monitored the changes in their vital signs to maintain a water-electrolyte balance in the patients. 2. Pain care: The patients were administered oral paracetamol (Sinopharm Group Guangdong Medi-World Pharmaceutical Co., Ltd., CFDA approval No. H44023356, 6 h/time, 0.5 g/time) and tramadol hydrochloride (Shenzhen Neptunus Pharmaceutical Co., Ltd., CFDA Approval No. H20033331, 3 h/time, 50 mg/time). 3. Prevention of lung infections: Aerosol inhalation was required if necessary to keep the air-

way open. 4. Recovery training: We designed a personalized recovery training plan for each patient and ordered them to do the training 3 times a day. 5. Psychological care: We paid close attention to the patients' psychological changes and gave them timely guidance. Also, we cited successful recovery cases to improve the patients' confidence and communicated with their family members to enlighten the patients with a joint effort. 6. Education of disease knowledge: We introduced the cause, treatment method, efficacy, and prognosis of the disease to the patients and informed them about the treatment regimen and guidance. 7. Diet intervention: We suggested a scientific and balanced diet mainly composed of light and digestible foods that meet the energy demand.

Follow-up

A 2-year follow-up was performed through outpatient review and telephone calls at the 1st, 6th, 12th, and 24th months after the surgery to record patient survival. The follow-up started at the time the hepatectomies finished and ended at the scheduled follow-up time or at the patient's death.

Outcome measures

Primary outcome measures: The visual analogue scale (VAS) was used to evaluate the patients' pain intensity at 1 h and 3 d after the surgeries. The total score of VAS ranges from 0 to 10 points: 0 points indicates the absence of pain; 1-3 points indicates slight pain that is bearable; 4-6 points indicates moderate pain that affects the sleep quality but is barely bearable; 7-10 points indicates unbearable severe pain that affects the patients' appetite and sleep quality. The MOS 36-item short-form health survey (SF-36), a 10-point scale, was used to assess the patients' quality of life from 8 aspects, including physiological functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional, and mental health. A higher SF-36 score indicates a better quality of life. The Pittsburgh sleep quality index (PSQI) was used to assess the patients' sleep quality. The PSQI scores range from 0 to 21 points: 0-5 points indicates an excellent sleep quality; 6-10 points indicates a good sleep quality; 11-15 points indicates a fair sleep quality; 16-21 points indicates a poor sleep quality. The hospitalization time and the time interval from being activity-incapable to

being activity-capable were compared between the two groups.

Secondary outcome measures: The two groups were compared in the incidence of complications, survival, and nursing satisfaction. The nursing satisfaction assessment was based on a nursing satisfaction questionnaire made by Hanzhong Central Hospital (total satisfaction rate = rate of marked satisfaction + rate of moderate satisfaction).

Statistical analysis

SPSS 19.0 was utilized for the statistical analysis (SPSS Inc., Chicago) and GraphPad Prism 7 for the data visualization (GraphPad Software Inc., San Diego). The count data were expressed as the rate (%) and compared using chi-squared tests (denoted by χ^2). The measurement data were expressed as the mean $\pm$ standard deviation (mean $\pm$ SD). All the measurement data were under a normal distribution and were compared between the two groups using independent sample t-tests (denoted by t). A difference was statistically significant when $P < 0.05$.

Results

Comparison of the basic clinical data

The two groups of patients were comparable since they were not statistically different in terms of age, sex ratio, body mass index (BMI), smoking, drinking, place of residence, tumor type, or TNM stage ($P > 0.05$). More details are shown in **Table 1**.

Comparison of the perioperative complications

The CN group had 1 case of pulmonary infection, 1 case of incision infection, and 1 case of pleural effusion, and the RN group had 1 case of pulmonary infection, 4 cases of incision infections, and 5 cases of pleural effusion. The case number of complications was higher in the RN group than in the CN group. More details are shown in **Table 2**.

Comparison of the VAS scores

The VAS scores were used to assess the pain intensity at 1 hour and 3 days after the surgery. The CN group had lower one hour postoperative VAS scores than the RN group (2.57 ± 0.75 vs. 3.15 ± 1.28 , $P < 0.05$) and lower three day post-

Table 1. Comparison of the basic clinical data

Factors	CN group (n=40)	RN group (n=40)	t/ χ^2	P
Age	45.37±8.25	47.28±7.86	1.06	0.292
Sex				
Male	27 (67.50)	25 (62.50)	0.220	0.639
Female	13 (32.50)	15 (37.50)		
BMI (kg/m ²)	22.12±1.85	21.79±2.07	0.752	0.454
Smoking				
Yes	29 (72.50)	27 (67.50)	0.238	0.626
No	11 (27.50)	13 (32.50)		
Drinking				
Yes	19 (47.50)	22 (55.00)	0.450	0.502
No	21 (52.50)	18 (45.00)		
Place of residence				
Urban area	16 (40.00)	18 (45.00)	0.205	0.651
Rural area	24 (60.00)	22 (55.00)		
Tumor type				
Hepatocellular carcinoma	31 (77.50)	29 (72.50)	0.267	0.606
Cavernous hemangioma of liver	9 (22.50)	11 (27.50)		
TNM stage				
Stage I	14 (35.00)	15 (37.50)	0.054	0.816
Stage II	26 (65.00)	25 (62.50)		

Table 2. Comparison of the perioperative complications

Group	Pulmonary infection	Incision infection	Pleural effusion	Total case number
CN group (n=40)	1 (2.50)	1 (2.50)	1 (2.50)	3 (7.50)
RN group (n=40)	2 (5.00)	4 (10.00)	5 (12.50)	11 (27.5)
χ^2				5.541
P				0.019

Table 3. Comparison of the VAS scores

Group	1 hour after surgery	3 days after surgery
CN group (n=40)	2.57±0.75	1.02±0.45
RN group (n=40)	3.15±1.28	2.98±0.89
t	2.473	12.43
P	0.016	<0.001

operative VAS scores (1.02±0.45 vs. 2.98±0.89, $P<0.001$). More details are shown in **Table 3**.

Comparison of the hospitalization times and the time intervals from being activity-incapable to being activity-capable

The CN group had shorter time intervals from being activity-incapable to being activity-capable

than the RN group (1.46±0.57 vs. 3.21±1.53, $P<0.001$) and shorter hospitalization times (8.85±3.42 vs. 13.25±4.18, $P<0.001$). More details are shown in **Table 4**.

Comparison of the postoperative quality of life

The SF-36 scores were used to assess the patients' postoperative quality of life. The CN group had higher SF-36 scores than the RN group (72.64±10.58 vs. 60.78±11.63, $P<0.001$). More details are shown in **Figure 1**.

Comparison of the sleep quality

The PSQI scores were used to assess the patients' sleep quality. The CN group was not significantly different from the RN group in the PSQI scores on the day of admission (11.55±2.42 vs. 11.38±2.65, $P>0.05$), but the CN group had markedly lower PSQI scores than the CN group one day before the surgery (7.54±

4.12 vs. 10.25±4.55, $P<0.05$). More details are shown in **Table 5**.

Comparison of the nursing satisfaction

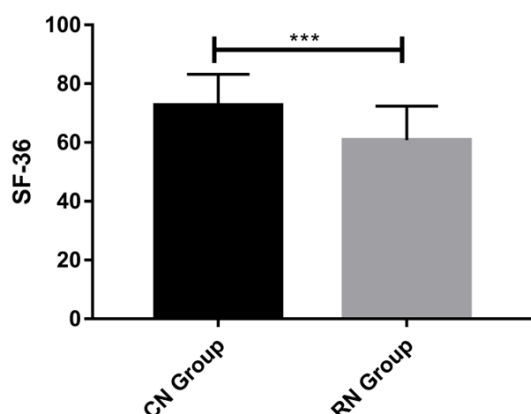
The CN group was not significantly different from the RN group in the case numbers of marked satisfaction or moderate satisfaction ($P>0.05$), but the CN group had a notably higher total nursing satisfaction rate than the RN group ($P<0.05$). More details are shown in **Table 6**.

Comparison of patient survival

All 80 patients were successfully followed up to record the overall survival. The CN group was not significantly different from the RN group in the overall survival rate (85% vs. 70%, $P>0.05$). More details are shown in **Figure 2**.

Table 4. Comparison of the hospitalization times and the time intervals from being activity-incapable to being activity-capable

Group	Time interval from being activity-incapable to being activity-capable	Hospitalization time
CN group (n=40)	1.46±0.57	8.85±3.42
RN group (n=40)	3.21±1.53	13.25±4.18
t	6.779	5.153
P	<0.001	<0.001

**Figure 1.** Comparison of the SF-36 scores. The SF-36 scores in the CN group (72.64±10.58) were higher than those in the RN group (60.78±11.63). *** indicates $P < 0.001$.**Table 5.** Comparison of the PSQI scores

Group	The day of admission	1 day before surgery
CN group (n=40)	11.55±2.42	7.54±4.12
RN group (n=40)	11.38±2.65	10.25±4.55
t	0.300	2.792
P	0.765	0.007

Discussion

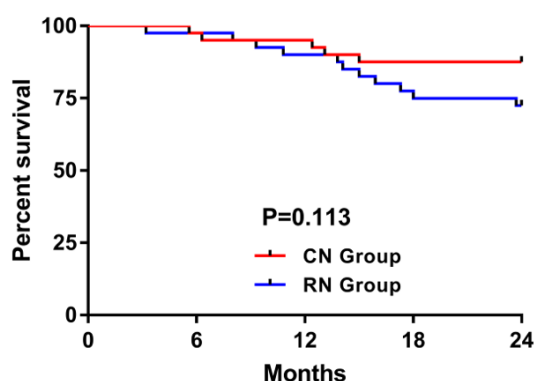
Hepatectomy is the first choice for the treatment of various benign and malignant liver diseases. It is widely used in treating hepatocellular carcinoma and advanced liver diseases. The clinical safety and effectiveness of hepatectomy have been confirmed in many patients, but its postoperative morbidity and mortality are still high [14-16]. The surgery is accompanied by many complications, such as pain, gastrointestinal reactions, infections, and thromboembolism that seriously affect the patient's recovery and quality of life. Therefore, high-quality

nursing interventions should be performed during the treatment period to reduce the risk of complications and promote recovery. Here we provided patients undergoing hepatectomy with comprehensive nursing or routine nursing to explore the application value of comprehensive nursing for patients undergoing hepatectomy.

We recorded the incidence of adverse complications in the two groups and discovered a markedly lower incidence of complications in the CN group than we did in the RN group, indicating that comprehensive nursing can reduce the incidence of complications in patients undergoing hepatectomy. Tufts et al. [16] found that infections at the surgical site are the leading cause of increased morbidity, mortality and health care costs, suggesting that multiple scientific nursing interventions can reduce the incidence of surgical site infections, which is similar with our findings. Pain is the most common physical symptom among medical outpatients, and it is usually accompanied by depression, anxiety, and other negative emotions, leading to a marked decline in patients' quality of life [17]. Here the results of the pain interventions revealed that the VAS scores were notably lower in the patients undergoing comprehensive nursing intervention than in the patients undergoing routine nursing. Such results indicate that comprehensive nursing can reduce the postoperative pain intensity and relieve physical and psychological stress. We compared the two groups in terms of their hospitalization times and the time intervals between being activity-incapable to being activity-capable to evaluate the effect of comprehensive nursing on the postoperative recovery. The CN group had a markedly shorter time interval from being activity-incapable to being activity-capable than the RN group and shorter hospitalization times. The patients receiving comprehensive nursing had a better recovery than those receiving routine nursing. Appropriate recovery training promotes the recovery of mobility. The pain intervention and infection prevention we performed reduced the patients' hospitalization times. Joliat et al. [19] discovered that, compared with standard nursing, enhanced recovery nursing for patients undergoing liver surgery led to a significant decrease in the incidence of complications and the length of hospital stay. Early mobilization

Table 6. Comparison of the nursing satisfaction

Group	Marked satisfaction	Moderate satisfaction	Dissatisfaction	Total satisfaction rate
CN group (n=40)	16 (40.00)	21 (52.50)	3 (7.50)	37
RN group (n=40)	10 (25.00)	19 (47.50)	11 (27.50)	29
t	2.051	0.200	5.541	5.541
P	0.152	0.447	0.019	0.019

**Figure 2.** Comparison of the patient survival. The comparison of the overall survival rate between the CN group and the RN group showed no significant difference (P=0.113).

after hepatectomy is a safe and feasible way to ease the patients' pain and economic burdens, increase their comfort, reduce the workload of nursing, and boost patient recovery [20].

Jones et al. [21] demonstrated that enhanced recovery programs (ERP) can improve the quality of life and the short-term prognoses of patients after liver resection. This study used SF-36 scores to assess the patients' postoperative quality of life. The CN group had much higher SF-36 scores than the RN group. We performed dietary guidance, pain intervention, recovery training, and infection prevention on the patients receiving comprehensive nursing. The assessment of the quality of life favored comprehensive nursing over routine nursing. The PSQI scores were used to assess the sleep quality of the patients in this study. The CN group was not statistically different from the RN group in the PSQI scores on the day of admission, but the CN group had markedly lower PSQI scores than the CN group one day before the surgery. Such results suggest that comprehensive nursing can relieve postoperative discomforts and enhance sleep quality. The CN group had a notably higher total nursing satisfaction rate than the RN group. Multiple

interventions in terms of the physiology, psychology, daily diet, and postoperative recovery of patients can strengthen patients' compliance and postoperative recovery, improve their postoperative psychological well-being and quality of life, and improve the satisfaction level of the patients and their families [22, 23]. The results of this study also showed that comprehensive nursing is superior to routine nursing. All 80 patients were successfully followed up to record the overall survival. The CN group was not significantly different from the RN group in their overall survival rates. Complications may also affect the patients' prognoses. Complications after major surgery can reduce patient survival [24, 25]. In this study, the comparison of the survival curves of both nursing models showed no significant differences, but the survival rate results favored the patients receiving comprehensive nursing over the patients receiving routine nursing. Although comprehensive nursing cannot improve the prognosis, it can enhance the patients' survival rates, so it is worthy of clinical promotion and application. A study examining comprehensive nursing on patients with liver cirrhosis and liver cancer receiving interventional treatment showed that patients undergoing comprehensive nursing had higher nursing satisfaction, a better quality of life, a lower incidence of complications, and markedly higher 20-month survival than patients undergoing routine nursing [25], which is basically consistent with our results.

There are some shortcomings in this study. Firstly, we only performed nursing during the hospital stay, so the nursing intervention was not as flexible as home nursing. The advancement of the internet gives rise to the practice of remote nursing [27], but it is unclear whether these nursing methods will lead to different outcomes. Secondly, we only included diseased people as the research participants, but did not make a comparison between the diseased people and the normal population. We will work to address these deficiencies in the future.

In summary, comprehensive nursing intervention can accelerate the postoperative recovery of patients undergoing hepatectomy during the perioperative period and improve their quality of life, so it is worthy of clinical application.

Disclosure of conflict of interest

None.

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References

- [1] Rawla P, Sunkara T, Muralidharan P and Raj JP. Update in global trends and aetiology of hepatocellular carcinoma. *Contemp Oncol (Pozn)* 2018; 22: 141-150.
- [2] Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA and Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin* 2018; 68: 394-424.
- [3] Kew MC. Epidemiology of chronic hepatitis B virus infection, hepatocellular carcinoma, and hepatitis B virus-induced hepatocellular carcinoma. *Pathol Biol (Paris)* 2010; 58: 273-277.
- [4] Bertuccio P, Turati F, Carioli G, Rodriguez T, La Vecchia C, Malvezzi M and Negri E. Global trends and predictions in hepatocellular carcinoma mortality. *J Hepatol* 2017; 67: 302-309.
- [5] European Association for the Study of the Liver. Electronic address: easloffice@easloffice.eu; European Association for the Study of the Liver. EASL clinical practice guidelines: management of hepatocellular carcinoma. *J Hepatol* 2018; 69: 182-236.
- [6] Wong RJ, Aguilar M, Cheung R, Perumpail RB, Harrison SA, Younossi ZM and Ahmed A. Non-alcoholic steatohepatitis is the second leading etiology of liver disease among adults awaiting liver transplantation in the United States. *Gastroenterology* 2015; 148: 547-555.
- [7] Russell MC. Complications following hepatectomy. *Surg Oncol Clin N Am* 2015; 24: 73-96.
- [8] Ghoneim MM and O'Hara MW. Depression and postoperative complications: an overview. *BMC Surg* 2016; 16: 5.
- [9] Nilsson A, Rasmussen BH and Edvardsson D. A threat to our integrity—meanings of providing nursing care for older patients with cognitive impairment in acute care settings. *Scand J Caring Sci* 2016; 30: 48-56.
- [10] Gómez-Batiste X, Murray SA, Thomas K, Blay C, Boyd K, Moine S, Gignon M, Van den Eynden B, Leysen B, Wens J, Engels Y, Dees M and Costantini M. Comprehensive and integrated palliative care for people with advanced chronic conditions: an update from several european initiatives and recommendations for policy. *J Pain Symptom Manage* 2017; 53: 509-517.
- [11] American Diabetes Association. Standards of medical care in diabetes-2015 abridged for primary care providers. *Clin Diabetes* 2015; 33: 97-111.
- [12] Woo BFY, Lee JXY and Tam WWS. The impact of the advanced practice nursing role on quality of care, clinical outcomes, patient satisfaction, and cost in the emergency and critical care settings: a systematic review. *Hum Resour Health* 2017; 15: 63.
- [13] European Association for the Study of the Liver; European Organisation for Research and Treatment of Cancer. EASL-EORTC clinical practice guidelines: management of hepatocellular carcinoma. *J Hepatol* 2012; 56: 908-943.
- [14] Zhong JH, Ke Y, Wang YY and Li LQ. Liver resection for patients with hepatocellular carcinoma and macrovascular invasion, multiple tumours, or portal hypertension. *Gut* 2015; 64: 520-521.
- [15] Zhong JH, Rodríguez AC, Ke Y, Wang YY, Wang L and Li LQ. Hepatic resection as a safe and effective treatment for hepatocellular carcinoma involving a single large tumor, multiple tumors, or macrovascular invasion. *Medicine (Baltimore)* 2015; 94: e396.
- [16] Zhong JH, Ke Y, Gong WF, Xiang BD, Ma L, Ye XP, Peng T, Xie GS and Li LQ. Hepatic resection associated with good survival for selected patients with intermediate and advanced-stage hepatocellular carcinoma. *Ann Surg* 2014; 260: 329-340.
- [17] Tufts LS, Jarnagin ED, Flynn JR, Gonen M, Guillem JG, Paty PB, Nash GM, Smith JJ, Wei IH, Pappou E, D'Angelica MI, Allen PJ, Peter Kingham T, Balachandran VP, Drebin JA, Garcia-Aguilar J, Jarnagin WR and Weiser MR. A perioperative multidisciplinary care bundle reduces surgical site infections in patients undergoing synchronous colorectal and liver resection. *HPB (Oxford)* 2019; 21: 181-186.
- [18] Kroenke K, Evans E, Weitlauf S, McCalley S, Porter B, Williams T, Baye F, Lourens SG, Matthias MS and Bair MJ. Comprehensive vs. assisted management of mood and pain symptoms (CAMMPS) trial: study design and sample characteristics. *Contemp Clin Trials* 2018; 64: 179-187.
- [19] Joliat GR, Labgaa I, Hübner M, Blanc C, Griesser AC, Schäfer M and Demartines N. Cost-benefit analysis of the implementation of an en-

- hanced recovery program in liver surgery. *World J Surg* 2016; 40: 2441-2450.
- [20] Ni CY, Wang ZH, Huang ZP, Zhou H, Fu LJ, Cai H, Huang XX, Yang Y, Li HF and Zhou WP. Early enforced mobilization after liver resection: a prospective randomized controlled trial. *Int J Surg* 2018; 54: 254-258.
- [21] Jones C, Kelliher L, Dickinson M, Riga A, Worthington T, Scott MJ, Vandrevalla T, Fry CH, Karanjia N and Quiney N. Randomized clinical trial on enhanced recovery versus standard care following open liver resection. *Br J Surg* 2013; 100: 1015-1024.
- [22] Arantes EC, Dessotte CAM, Dantas RAS, Rossi LA and Furuya RK. Educational program for coronary artery disease patients: results after one year. *Rev Bras Enferm* 2018; 71: 2938-2944.
- [23] Li M and Liu H. Implementation of a clinical nursing pathway for percutaneous coronary intervention: a prospective study. *Geriatr Nurs* 2018; 39: 593-596.
- [24] Farid SG, Aldouri A, Morris-Stiff G, Khan AZ, Toogood GJ, Lodge JP and Prasad KR. Correlation between postoperative infective complications and long-term outcomes after hepatic resection for colorectal liver metastasis. *Ann Surg* 2010; 251: 91-100.
- [25] Khuri SF, Henderson WG, DePalma RG, Mosca C, Healey NA and Kumbhani DJ. Determinants of long-term survival after major surgery and the adverse effect of postoperative complications. *Ann Surg* 2005; 242: 326-341; discussion 341-323.
- [26] Gou Y, Yi J, Jiang M and Cao C. Analysis on effects of comprehensive nursing care applied in interventional therapy for patients with liver cirrhosis and liver cancer. *Iran J Public Health* 2019; 48: 494-500.
- [27] Januszek R, Dziewierz A, Siudak Z, Rakowski T, Dudek D and Bartuś S. Chronic obstructive pulmonary disease and periprocedural complications in patients undergoing percutaneous coronary interventions. *PLoS One* 2018; 13: e0204257.