https://www.doi.org/10.53964/jmnpr.2023003

https://www.innovationforever.com

Journal of
Modern Nursing Practice and Research

ISSN 2708-2202 (Online)

Open Access

Research Article

Predictive Nursing Versus Routine Nursing on Health Status, Cancer-related Fatigue and Psychological State of Patients with Pancreatic Cancer Undergoing Chemotherapy

Hang Zhang[1*], Fujun Liu[1]

[1]Department of Obstetrics and Gynecology, The Fifth Affiliated Hospital of Southern Medical University, Guangzhou, Guangdong Province, China

[*]**Correspondence to: Hang Zhang**, Bachelor, Attending Physician, Department of Obstetrics and Gynecology, The Fifth Affiliated Hospital of Southern Medical University, No. 566, Congcheng Avenue, Guangzhou 510900, China; Email: zh8208fate@163.com

Received: December 1, 2022 **Accepted:** January 31, 2023 **Published:** February 15, 2023

Abstract

Objective: To investigate the implications of predictive nursing on the health status, cancer-related fatigue and psychological state of patients with pancreatic cancer after chemotherapy.

Methods: This was a randomized controlled experiment that included 68 patients with pancreatic cancer who received chemotherapy in our hospital from July 2019 to February 2022, and the participants were assigned 1:1 either into the routine (*routine nursing mode*) or the prediction (predictive nursing mode) group. The outcome measures included health status, cancer-related fatigue, anxiety, depression, quality of life (QoL) and adverse reactions.

Results: In this study, there were no cases of treatment intolerance to the point of shedding, and no cases of additional supplemental treatment. The predictive nursing intervention resulted in superior health status (P<0.05), yet less cancer-related fatigue versus the routine nursing (P<0.05). The predictive nursing intervention was associated with lower self-rating anxiety scale and self-rating depression scale scores (P<0.05), but higher QoL score versus the routine nursing (P<0.05). The predictive nursing intervention led to lower incidence of adverse reactions versus the routine nursing (P<0.05).

Conclusion: The predictive nursing is a viable mode for patients with pancreatic cancer undergoing chemotherapy is remarkable. It produces remarkable benefits in terms of boosting the health status and QoL of patients, mitigating cancer-related fatigue, and minimizing the probability of adverse reactions, and therefore merits clinical application.

Keywords: predictive nursing, pancreatic cancer, postoperative chemotherapy, health level, cancer-related fatigue, psychological state

Citation: Zhang H, Liu F. Predictive Nursing Versus Routine Nursing on Health Status, Cancer-related Fatigue and Psychological State of Patients with Pancreatic Cancer Undergoing Chemotherapy. *J Mod Nurs Pract Res*, 2023; 3(1): 3. DOI: 10.53964/jmnpr.2023003.

https://www.doi.org/10.53964/jmnpr.2023003

1 INTRODUCTION

Pancreatic cancer is a highly malignant tumor of the digestive tract with dismal prognosis[1]. Recent years witness a rising incidence of pancreatic cancer as a result of the changes in people's living and diet habits in China. Clinical statistics reveal that the pancreatic cancer-related mortality is at an alarming rate, with a notoriously low survival of less than 1%[2]. At present, pancreatic cancer patients is predominantly managed by surgery, but the cancerous tissue cannot be completely removed using simple surgical dissection. Consequently, postoperative chemotherapy is encouraged as an adjuvant therapy[3]. Albeit effective, it is associated with discomfort, giving rise to anxiety and fear and even abandonment of treatment[4]. A wealth of evidence suggest that quality nursing care is conducive to the recovery of cancer patients following surgery. Both comprehensive and meticulous treatment and postoperative care are essential to improve the patient's prognosis. Some patients' lack of understanding of their condition may lead to excessive mental stress, which is detrimental to recovery. Therefore, postoperative care measures for pancreatic cancer patients are crucial for patients.

Patients receiving chemotherapy after surgery need trust, encouragement and care, and these psychological supports act as a morale booster for treatment[5]. Pancreatic cancer is a complex disease with poor prognosis, which complicates postoperative nursing care. Doctors and nurses have different focus in clinical work, doctors focus more on disease diagnosis and nurses focus more on clinical thinking, but due to the wide range of nursing work and complex patient problems, nurses' clinical experience alone may not yield the best nursing results.

Predictive nursing is a new clinical care model in which nurses systematically assess possible pathological and physiological reactions or complications during treatment with reference to previous experience, and then develop targeted interventions to inhibit disease deterioration or complications, reduce treatment risks, and promote recovery of patients' conditions. It not only predicts the possible emergencies of patients, but also provides people-oriented and realistic psychological care, making the whole care process more efficient and humane[6]. Accordingly, this study was undertaken to explore the effect of predictive nursing on the health status, cancer-related fatigue and psychological state of patients with pancreatic cancer undergoing chemotherapy.

2 MATERIALS AND METHODS

2.1 Patients

This is a randomised controlled trial that included 68 patients with pancreatic cancer undergoing chemotherapy in our hospital from July 2019 to February 2022, and the participants were assigned into the routine group (n=34) and the prediction group (n=34). Randomisation was undertaken online using a web-based randomisation tool, with full concealment (www.sealedenvelope.co.uk).

2.1.1 Sample Size Estimation

For sample size calculation, the sample size was determined according to the hospital sample survey case-control study method, with an estimated prevalence of 5%, a relative error of 20% for sampling set at 1.5, a confidence interval of 95%, Za=1.96, and a data incompleteness rate of 10%, with a final calculated sample size between 30 and 50.

2.1.2 Ethical Considerations

The trial was conducted according to Good Clinical Practice guidelines developed by the International Council for Harmonisation and in compliance with the trial protocol. The protocol was approved by the institutional review boards or independent ethics committees. All patients provided written informed consent as per Declaration of Helsinki principles.

2.1.3 Inclusion and Exclusion Criteria

Participants were eligible if they satisfied the following inclusion criteria: (1) Pancreatic cancer patients who have undergone surgery and chemotherapy in our hospital; (2) Patients and their families were informed about this study and voluntarily participated in this study.

Whereas participants had (1) Other serious organ diseases; (2) Psychiatric diseases or accompanying communication disorders; (3) Poor compliance were excluded from the study.

2.2 Methods

(1) The routine nursing mode was used for patients in the routine group, including basic symptomatic nursing, basic chemotherapy nursing, drug guidance and vital sign monitoring.

(2) The patients in the prediction group adopted the predictive nursing model. The first step is to clarify the patient's personal information and knowledge of the disease, then to develop a specific care plan through discussion, and finally to provide care according to the developed care plan. The specific measures of predictive nursing interventions are as follows. (1) Health education: Nursing staff should use videos, brochures and a combination of pictures and texts to explain the patient's subsequent treatment process, and urge the patient to actively cooperate with various treatment and nursing measures[7]. (2) Psychological nursing: Nursing staff should evaluate the patient's psychological status, grasp the patient's psychological dynamics in real time, and patiently listen to the patient's complaints. Nursing

staff should also regularly invite patients in remission back to the hospital for face-to-face communication and guidance to provide psychological support for the patient, thereby enhancing the patient's confidence in treatment. Nursing staff should timely feedback the results of treatment and examination, which can help patients eliminate anxiety, fear, etc., promote patients to establish good self-confidence in treatment, and improve patients' treatment enthusiasm and compliance[8]. (3) Discomfort nursing: Nursing staff should choose corresponding intervention measures based on the patient's preferences to assist patients in diverting their attention, which can effectively relieve the patient's discomfort after chemotherapy; if the patient feels intense discomfort, nursing staff should follow the doctor's advice and give the patient relevant drug intervention when necessary[9]. (4) Environmental care: Nursing staff should arrange the ward environment reasonably according to the patient's preferences or habits, and strive to create a warm and life-filled ward environment, which can make the patient feel comfortable and warm, and further is conducive to the treatment adherence and facilitates the recovery process of the patient[10]. (5) Nutritional care: According to the recovery of the patient, the nurses should encourage the patient to get out of bed to do moderate physical activities. Also, some intake should be light and easily digestible to prevent the disturbance of water, electrolyte and acid-base levels in the body[11]. (6) Nursing of adverse reactions: Nursing personnel should monitor and document the amount, color, and type of the patient's drainage fluid on a regular basis. In case of an irregularity, it should be reported to the doctor as soon as possible, and appropriate intervention steps should be implemented. Anti-infection, fluid replenishment, nutritional support, and other treatments should be administered to the patient as soon as possible. During the chemotherapy process, the nursing staff should encourage the patient to drink more water and give the patient an appropriate amount of diuretics per the doctor's instructions, which can effectively avoid the strong stimulation of the patient's gastrointestinal tract by chemotherapy and speed up the removal of toxins from the patient's body. In addition, nursing staff should also instruct patients to perform oral cleaning on time to avoid oral inflammation in patients[12]. (7) Post-chemotherapy care: After the chemotherapy, the nurses should observe the patient's physical condition, and take the corresponding nursing plan according to the different physiques of different patients to ensure the pertinence of clinical intervention. The nursing after chemotherapy are supposed to be focus on the recovery of the patient's body, the nursing staff should perform some appropriate massage and rehabilitation training for the patient[13].

2.3 Outcome Measures

2.3.1 Health Status

The health status was assessed by the European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire core 30 (EORTC QLQ-C30). The EORTC QLQ-C30 is a general QOL instrument for cancer patients. This questionnaire comprises 30 items, 24 of which are aggregated into five functional scales (physical, role, emotional, cognitive, and social), three symptom scales (fatigue, pain, and nausea/vomiting), and one global health status. The remaining six items assess additional symptoms (dyspnea, appetite loss, insomnia, constipation, and diarrhea) and financial impact.

All scales and single-item measures were transformed to scores in the range 0-100. A higher score on the global status scale and the functional scales denotes a high level of health and functioning, while a higher score on the symptomatic scale denotes a high level of symptom burden.

2.3.2 Cancer-related Fatigue

The revised fatigue scale (rFS) was used to evaluate the cancer-related fatigue of patients. The scale includes four dimensions of perception, emotion, behavior, and cognition. Each dimension was scored 0-10 points, the higher the patient's score, the more severe the cancer-related fatigue.

2.3.3 Self-rating Anxiety Scale (SAS) and Self-rating Depression Scale (SDS) Scores

These scales are used to quantify the anxiety and depression level of the subjects. Each scale has 20 items with a score of 1-4 (1 = never, 2 = often, 3 = sometimes, and 4 = always). According to the results of the healthy Chinese population, the cut-off value of SAS is 50 points, in which 50-59 is considered mild anxiety, 60-69 is considered moderate anxiety, and 69 or above is considered severe anxiety. The scale consists of 20 items, each of which corresponds to one symptom concerned, and is rated on a scale of 1-4. The raw score can be converted to an SDS index score by multiplying the raw score by 1.25. According to the results of the Chinese norm, the cut-off value of SDS standard score is 53 points, of which 53-62 is considered mild depression, 63-72 is considered moderate depression, and 73 or above is considered severe depression.

2.3.4 Adverse Reactions

The adverse reactions that may occur in patients during treatment include oral infection, bone marrow suppression, and gastrointestinal reactions.

2.4 Statistical Analysis

The transformed data were tested for normality using Shapiro-Wilk, and all log-transformed variables were normally distributed. The statistical analyses were performed using the SPSS software package, version

20.0 (SPSS Inc., Chicago, IL, the United State). All tests were two-sided, and the statistical significance was defined as $P<0.05$. The measurement data including SAS, SDS and QoL are expressed as (mean±SD), and were examined using the independent sample t test; the count data are expressed as the number of cases (rate), and were analyzed using Chi-square test.

3 RESULTS

3.1 Baseline Data

There were 21 males and 13 females in the routine group; the age ranged from 43 to 81 years, with an average age of (64.31±3.52) years. There were 24 males and 10 females in the prediction group; the age ranged from 42 to 79 years, with an average age of (64.28±3.47) years. The baseline data were balanced between the two groups of patients ($P>0.05$, Table 1).

3.2 Comparison of Health Status and Cancer-related Fatigue

The predictive nursing intervention resulted in superior health status and less cancer-related fatigue versus the routine nursing (both $P<0.05$, Table 2).

3.3 Comparison of SAS, SDS, and QoL

The predictive nursing intervention was associated with lower SAS and SDS scores and higher QoL score versus the routine nursing (both $P<0.05$, Table 3).

3.4 Comparison of Adverse Reactions

The predictive nursing intervention led to lower incidence of adverse reactions versus the routine nursing ($P<0.05$, Table 4).

4 DISCUSSION

Pancreatic cancer is one of the most common malignant tumors in clinical practice with high morbidity and mortality. Due to the insidious early symptoms of pancreatic cancer, most patients are diagnosed in the middle to late stages of cancer[14]. Chemotherapy for pancreatic cancer patients mainly uses drugs to interfere and block the proliferation and differentiation of tumor cells to effectively control the growth, spread and metastasis of tumors and prolong the survival of patients[15]. However, scholars have noted that despite the comparatively acceptable outcomes of chemotherapy regimens, its causative damages such as bone marrow suppression and gastrointestinal reactions, pose a serious threat on the patient's psychological and physical health.

In addition, the uncertainty of the disease and survival leads to a loss of awareness of the value and meaning of life, and in severe cases may even lead to depression, irritability and other psychiatric disorders[16,17]. It has been pointed out that patients receiving postoperative chemotherapy need psychological support, which can greatly enhance patients' enthusiasm for treatment and treatment confidence. It has also been pointed out that positive and effective nursing interventions for pancreatic cancer patients after chemotherapy considerably mitigates the negative psychological status of patients, which is conducive to improving their long-term survival rate and prognosis, etc[18]. To ensure safe, smooth and effective chemotherapy and rehabilitation, and to enable patients to achieve an excellent postoperative recovery, the implementation of effective nursing interventions is imperative.

Predictive care is a new nursing model guided by modern nursing concepts, with the patient as the core and nursing procedures as the framework. They assess patients' high-risk factors for ventilator-associated pneumonia based on their condition, treatment outcome, and nursing experience, and perform symptomatic nursing interventions to achieve early detection, early treatment, and active prevention[19-22]. In this study, the predictive nursing intervention resulted in superior health status. Predictive care health education not only informs patients about pancreatic cancer disease and chemotherapy for pancreatic cancer, but also introduces patients to the stoma method. In addition, predictive care is more aware of the patients' psychological status and communicates with them frequently. Psychological counseling is the main method to relieve patients' negative emotions. Psychological counseling interventions are essential for pancreatic cancer patients because of their heavy psychological burden and negative emotions. In addition, the problems brought by the ostomy bag during the care process can easily damage the harmony of family members, and if the patient loses confidence in the treatment, the depression will worsen and the disease will deteriorate further[23,24].

The predictive nursing intervention was associated with lower SAS and SDS scores, and higher QoL score. Most importantly, the predictive nursing intervention led to lower incidence of adverse reactions. We believe this may be because (1) Predictive care nurses actively communicate with patients before and after chemotherapy to inform them in detail about chemotherapy-related matters and possible uncomfortable reactions, which can help patients prepare psychologically in advance. This avoids serious stress responses of patients during chemotherapy[25]; (2) During chemotherapy, nursing staff also provide targeted guidance and interventions for patients' diet, psychological status, and prevention of adverse reactions, guide patients to eat scientifically and avoid the adverse effects of improper diet on treatment; positive psychological nursing interventions can make patient psychologically comfortable and healthy, and can improve patients' treatment motivation, compliance.

https://www.doi.org/10.53964/jmnpr.2023003

Table 1. Baseline Data (mean±SD)

	Routine Group (*n*=34)	Prediction Group (*n*=34)	t/χ^2	*P*
Gender			0.591	0.442
Male	21	24		
Female	13	10		
Age (years)	43-81	42-79		
Mean age (years)	64.31±3.52	64.28±3.47	0.035	0.972

Table 2. Comparison of Health Status and Cancer-related Fatigue (mean ± SD, points)

Groups	*n*	EORTCQLQ		RFS	
		Before	After	Before	After
Routine group	34	2.57±0.54	4.11±0.47	5.78±1.58	5.38±1.21
Prediction group	34	2.53±0.55	6.25±0.36	5.81±1.56	4.23±1.17
t	-	0.303	-21.077	-0.079	3.984
P	-	>0.05	<0.05	>0.05	<0.05

Table 3. Anxiety, Depression, and Quality of Life (mean ± SD, points)

Groups	*n*	SAS		SDS		QoL	
		Before	After	Before	After	Before	After
Routine group	34	68.75±2.36	58.26±2.44	65.43±3.18	53.95±5.78	75.81±4.70	81.05±4.82
Prediction group	34	68.64±2.29	48.38±2.68	65.51±3.20	47.47±5.42	75.77±4.65	88.77±5.35
t	-	0.195	15.895	-0.103	4.769	0.035	-6.251
P	-	>0.05	<0.05	>0.05	<0.05	>0.05	<0.05

Table 4. Comparison of Adverse Reactions [*n* (%)]

Groups	*n*	Oral Infection	Myelosuppression	Gastrointestinal Reactions	Total Incidence
Routine group	34	4	1	3	8 (24%)
Prediction group	34	1	0	1	2 (6%)
χ^2	-	-	-	-	4.221
P	-	-	-	-	<0.05

Therefore, the avoidance of potentially unpleasant reactions helps to keep patients calm in the face of adverse reactions, and expand patients' disease-related knowledge, substantially minimizing the possibility of adverse reactions[26]; and (3) After the patients' chemotherapy, the nurses focused on observing the patients' physical condition, and according to the different physiques of different patients, they chose the corresponding nursing programs to ensure the relevance of clinical interventions, promote further recovery and improve the QoL of the patients[27].

4.1 Strengths and Limitations

This study differs from traditional care by using predictive care and targeted interventions according to the different symptoms and physical conditions of the patients. In addition, this study also focused on patients' emotional problems and incorporated appropriate emotional interventions and health education to alleviate patients' emotions. This study investigated the effects of predictive care on pancreatic cancer patients receiving chemotherapy and provided some suggestions for the rehabilitation of pancreatic cancer patients receiving chemotherapy.

However, some limitations abound in our study: (1) The final sample size collected in this trial was small, which limited the generalizability of the findings due to the biased differences in postoperative outcomes between the two groups of patients; (2) A comparatively subjective criterion for evaluating outcomes was used in this study, which might mediate our findings towards null due to the large differences in subjective perceptions between individuals, different levels of education, and differences in the understanding of the questions in the scale; and (3) The postoperative follow-up period of this trial was short, and the long-term outcomes failed to be observed.

5 CONCLUSION

Taken together, the predictive care might be a reliable protocol for patients undergoing postoperative chemotherapy for pancreatic cancer. It is effective in improving their health status and quality of life, reducing cancer-related fatigue without increasing the probability of adverse effects, and is therefore worthy of clinical application.

Acknowledgements

Not applicable.

Conflicts of Interest

The authors declared no conflict of interest.

Author Contribution

Zhang H and Liu F contributed to the manuscript and approved the final version.

Abbreviation List

EORTC, European Organization for Research and Treatment of Cancer
QLQ, Quality of life questionnaire
QoL, Quality of life
rFS, Revised fatigue scale
SAS, Self-rating anxiety scale
SDS, Self-rating depression scale

References

[1] Akita H, Takahashi H, Asukai K et al. The utility of nutritional supportive care with an eicosapentaenoic acid (EPA)-enriched nutrition agent during pre-operative chemoradiotherapy for pancreatic cancer: Prospective randomized control study. *Clin Nutr Espen*, 2019; 33: 148-153. DOI: 10.1016/j.clnesp.2019.06.003

[2] Shakeel S, Finley C, Akhtar-Danesh G et al. Trends in survival based on treatment modality in patients with pancreatic cancer: a population-based study. *Curr Oncol*, 2020; 27: e1-e8. DOI: 10.3747/co.27.5211

[3] Michael N, Beale G, O'Callaghan C et al. Timing of palliative care referral and aggressive cancer care toward the end-of-life in pancreatic cancer: A retrospective, single-center observational study. *BMC Palliat Care*, 2019; 18: 13. DOI: 10.1186/s12904-019-0399-4

[4] Ramakrishnan P, Loh WM, Gopinath SCB et al. Selective phytochemicals targeting pancreatic stellate cells as new anti-fibrotic agents for chronic pancreatitis and pancreatic cancer. *Acta Pharm Sin B*, 2020; 10: 399-413. DOI: 10.1016/j.apsb.2019.11.008

[5] Miura S, Naito T, Mitsunaga S et al. A randomized phase II study of nutritional and exercise treatment for elderly patients with advanced non-small cell lung or pancreatic cancer: the NEXTAC-TWO study protocol. *Bmc Cancer*, 2019; 19: 528. DOI: 10.1186/s12885-019-5762-6

[6] Solheim TS, Laird BJA, Balstad TR et al. A randomized phase II feasibility trial of a multimodal intervention for the management of cachexia in lung and pancreatic cancer. *J Cachexia Sarcopenia Muscle*, 2017; 8: 778-788. DOI: 10.1002/jcsm.12201

[7] Zhang H. Significance of ambroxol hydrochloride in the treatment of infantile secretory otitis media. *J Mod Nurs Pract Res*, 2021; 1: 3. DOI: 10.53964/jmnpr.2021003

[8] Cloyd JM, Tsung A, Hays J et al. Neoadjuvant therapy for resectable pancreatic ductal adenocarcinoma: The need for patient-centered research. *World J Gastroenterol*, 2020; 26: 375-382. DOI: 10.3748/wjg.v26.i4.375

[9] Kinsley K, Pritchett W. Liposomal irinotecan: Nursing considerations in an outpatient cancer center. *Clin J Oncol Nurs*, 2018; 22: 221-224. DOI: 10.1188/18.CJON.221-224

[10] Albukhaty S, Al-Musawi S, Abdul Mahdi S et al. Investigation of dextran-coated superparamagnetic nanoparticles for targeted vinblastine controlled release, delivery, apoptosis induction, and gene expression in pancreatic cancer cells. *Molecules*, 2020; 25: 4721. DOI: 10.3390/molecules25204721

[11] Fu L. Investigation and analysis on the status Quo of safety knowledge of nursing staff in elderly cancer patients with cancer pain. *J Mod Nurs Pract Res*, 2021; 1: 8. DOI: 10.53964/jmnpr.2021008

[12] Sasaki N, Gomi F, Yoshimura H et al. FGFR4 Inhibitor BLU9931 attenuates pancreatic cancer cell proliferation and invasion while inducing Senescence: Evidence for senolytic therapy potential in pancreatic cancer. *Cancers*, 2020; 12: 2976. DOI: 10.3390/cancers12102976

[13] Naito T, Mitsunaga S, Miura S et al. Feasibility of early multimodal interventions for elderly patients with advanced pancreatic and non-small-cell lung cancer. *J Cachexia Sarcopenia Muscle*, 2019; 10: 73-83. DOI: 10.1002/jcsm.12351

[14] Chen L, Yao W, Ding L. Effects of self-care plus forecasting nursing on the treatment outcomes and emotions in patients with nasopharyngeal carcinoma after radiotherapy. *Evid Based Complement Alternat Med*, 2022; 2022. DOI: 10.1155/2022/5751903

[15] Brandão S. Project-based learning as a teaching methodology in undergraduate nursing students. *J Mod Nurs Pract Res*, 2022; 2: 2. DOI: 10.53964/jmnpr.2022002

[16] Lundy J, Harris M, Zalcberg J et al. EUS-FNA biopsies to guide precision medicine in pancreatic cancer: Results of a pilot study to identify KRAS wild-type tumours for targeted therapy. *Front Oncol*, 2021; 11: 770022. DOI: 10.3389/fonc.2021.770022

[17] Van Driessche A, De Vleminck A, Gilissen J et al. Advance care planning for adolescents with cancer and their parents: study protocol of the BOOST pACP multi-centre randomised controlled trial and process evaluation. *Bmc Pediatr*, 2021; 21: 1-16. DOI: 10.1186/s12887-021-02841-7

[18] Li Y, Shang L, Zhou L. Impact of compulsory exercise rehabilitation nursing based on nihss score on exercise ability and balance ability of patients with cerebral infarction. *J Mod Nurs Pract Res*, 2021; 1: 10. DOI: 10.53964/jmnpr.2021010

[19] Zhou M, Liu Y, Lin Q et al. Effect of predictive nursing intervention on the gastrointestinal side effects of I-131 re-treatment in patients with differentiated thyroid cancer (DTC). *Int J Clin Oncol Cancer Res*, 2022; 7: 41-44. DOI: 10.11648/j.ijcocr.20220702.15

[20] Gao J, Zhang Q, Zhao X et al. Influence of early predictive nursing on complications and quality of life in patients after colorectal cancer surgery. *Evid-Based Compl Alt*, 2022; 2022: 8410664. DOI: 10.1155/2022/8410664

[21] Osuna de la Peña D, Trabulo SMD, Collin E et al. Bioengineered 3D models of human pancreatic cancer recapitulate in vivo tumour biology. *Nat Commun*, 2021; 12: 5623. DOI: 10.1038/s41467-021-25921-9

[22] Lee SH, Chang PH, Chen PT et al. Association of time interval between cancer diagnosis and initiation of palliative chemotherapy with overall survival in patients with unresectable pancreatic cancer. *Cancer Med*, 2019; 8: 3471-3478. DOI: 10.1002/cam4.2254

[23] Feng J, Li H, Wang L et al. The value of predictive nursing in convalescent patients with liver cancer after operation and evaluation of nursing measures. *Panminerva Med*, 2021; Online ahead of print. DOI: 10.23736/S0031-0808.21.04295-6

[24] Li L, Liu L, Kang H et al. The influence of predictive nursing on the emotions and self-management abilities of post-colostomy rectal cancer patients. *Am J Transl Res*, 2021; 13: 6543-6551.

[25] Yang W, Liu T, Liang J. Efficacy of health education in nursing on gallstone patients. *J Mod Nurs Pract Res*, 2021; 1: 13. DOI: 10.53964/jmnpr.2021013

[26] Morishita J, Inoue T. Determining desire to live among patients with advanced hepatobiliary-pancreatic cancer for whom curative treatment is not indicated. *Glob Health Med*, 2021; 3: 163-170. DOI: 10.35772/ghm.2021.01017

[27] Tie J, Cohen JD, Lahouel K et al. Circulating tumor DNA analysis guiding adjuvant therapy in stage II colon cancer. *N Engl J Med*, 2022; 386: 2261-2272. DOI: 10.1056/NEJMoa2200075