

# World Journal of *Clinical Cases*

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**ABOUT COVER**

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## Randomized Controlled Trial

## Impact of continuous care on cardiac function in patients with lung cancer complicated by coronary heart disease

Ting Gao, Jin-Lan Luo, Pan Guo, Xi-Wen Hu, Xiao-Yan Wei, Yan Hu

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Despite sharing similar pathogenic factors, cancer and coronary heart disease (CHD) occur in comparable populations at similar ages and possess similar susceptibility factors. Consequently, it is increasingly commonplace for patients to experience the simultaneous occurrence of cancer and CHD, a trend that is steadily rising.

**AIM**

To determine the impacts of continuing care on lung cancer patients with CHD following percutaneous coronary intervention (PCI).

**METHODS**

There were 94 lung cancer patients with CHD following PCI who were randomly assigned to the intervention group ( $n = 38$ ) and the control group ( $n = 41$ ). In the intervention group, continuing care was provided, while in the control group, routine care was provided. An evaluation of cardiac and pulmonary function, medication compliance, a 6-min walk test, and patient quality of life was performed.



## RESULTS

Differences between the two groups were significant in left ventricular ejection fraction, 6-min walk test, oxygen uptake, quality of life and medication compliance ( $P < 0.05$ ). In comparison with the control group, the enhancement in the intervention group was more significant. The intervention group had more patients with high medication compliance than the control group, with a statistically significant difference ( $P < 0.05$ ).

## CONCLUSION

After undergoing PCI, lung patients with CHD could benefit from continued care in terms of cardiac and pulmonary function, medications compliance, and quality of life.

**Key Words:** Lung cancer; Continuing care; Coronary heart disease; Percutaneous coronary intervention

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**Core Tip:** Despite sharing similar pathogenic factors, cancer and coronary heart disease (CHD) occur in comparable populations at similar ages and possess similar susceptibility factors. Consequently, it is increasingly commonplace for patients to experience the simultaneous occurrence of cancer and CHD, a trend that is steadily rising. Our study is to determine the impacts of continuing care on lung cancer patients with CHD following percutaneous coronary intervention (PCI). After undergoing PCI, lung patients with CHD could benefit from continued care in terms of cardiac and pulmonary function, medications compliance, and quality of life.

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## INTRODUCTION

Despite sharing similar pathogenic factors, cancer and coronary heart disease (CHD) occur in comparable populations at similar ages and possess similar susceptibility factors. Consequently, it is increasingly commonplace for patients to experience the simultaneous occurrence of cancer and CHD, a trend that is steadily rising[1]. There is research indicating a correlation between CHD and the risk of lung cancer, particularly in the context of screening lung cancer patients with a history of CHD[2]. Lung cancer accounts for 18% of all cancer-related deaths, with 25% of lung cancer patients being affected by the disease due to non-smoking[3,4]. However, among individuals who succumb to cardiovascular disease, the mortality rate attributed to cardiovascular causes is comparable to that of lung cancer[5]. Percutaneous coronary intervention (PCI) which is based on the use of drugs as part of the treatment of CHD is an effective method for treating the disease in clinical practice. Through PCI, vascular stenosis caused by atherosclerosis can be directly unblocked, coronary blood flow can be increased, and myocardial ischemia can be effectively alleviated, improving both clinical symptoms and prognosis in patients with CHD[6]. Despite the fact that CHD can be effectively treated with PCI, improve long-term prognoses, and, patients' quality of life often overlook pertinent precautions and problems following PCI.

Continuing care referring to a series of steps designed to ensure continuity and coordination of healthcare as patients move from one location to another or from one level of care to another, it is considered an important component of effective treatment for drug use disorders[7]. To provide continuing care, healthcare practitioners must be well-trained in chronic care and access current information about the patient's goals, preferences, and clinical status. Currently, continuous care is widely acknowledged as a crucial element of effective treatment for drug use disorders, particularly for patients experiencing severe issues that necessitate professional care and intervention[8]. There is evidence to suggest that continuous care, which includes making more active efforts to maintain patient engagement, may lead to longer-lasting positive outcomes. Moreover, patients who consistently take their medication, have limited social support, lack motivation for early treatment, and face a higher risk of recurrence, might derive greater benefits from continuous care compared to patients with a more favorable prognosis[9,10].

There are studies have indicated that continuous care in the aftermath of PCI can enhance the quality of life and behavior of CHD patients[11,12]. As of now, there is a lack of sufficient studies that can shed light on how ongoing care affects CHD patients after PCI in terms of outcomes. Therefore, based on existing research, the objective of this article is to provide a comprehensive analysis of the influence of continuous nursing on cardiac function and quality of life in CHD patients who have undergone PCI.

## MATERIALS AND METHODS

### Study setting and participants

The randomized controlled study was conducted at a hospital in China. We randomly selected lung cancer patients with coexisting CHD who had undergone an initial PCI between March 2021 and December 2022 for this study.

The inclusion criteria for the study were as follows: (1) Patients diagnosed with both lung cancer and coronary heart disease based on diagnostic criteria; (2) patients who underwent PCI during their hospitalization; (3) patients who were able to communicate and read; and (4) patients within the service network of the research site. Several exclusion criteria were applied in this study: (1) Patients experiencing complications following surgery; and (2) patients who were unconscious, had mental illness, or were unable to participate.

### Randomization

The study included a total of 94 participants, with 47 assigned to the intervention group ( $n = 47$ ) and 47 to the control group ( $n = 47$ ). The allocation of participants into these groups was done using a computerized random allocation sequence generated by a researcher. In the intervention group, the 47 recruited patients received 4 wk of continuing care. On the other hand, the control group underwent routine treatment. During the course of the study, only nine participants in the intervention group and six participants in the control group dropped out.

**The intervention group:** Creating a team for continuing care; evaluation of the health condition of patients with CHD after PCI and propose corresponding intervention strategies; strengthening health education; monitoring and tracking participants was conducted in a variety of ways, which interfered with the participants' compliance with medication; using social network tools to management patients.

**The control group:** Patients were briefly introduced to the environment, including explanation of the help buttons in the ward and were given health education on the disease, diet and exercise guidance, psychology guidance and care, medication guidance and follow-up after hospital discharge.

### Outcomes

Cardiovascular and pulmonary functions were evaluated before and after 1 mo of intervention using cardiac ultrasound. In addition, the left ventricular ejection fraction (LVEF) and forced vital capacity (FVC) were determined.

A 6-min walk test (MWT) was conducted prior to and one month after intervention, and the distance covered during the test was recorded. Maximum oxygen uptake ( $VO_2$ ) was also measured.

Patients' quality of life was evaluated by the Seattle Angina Questionnaire (SAQ)[13]. The SAQ scale comprises five dimensions. A higher score indicates a higher quality of life. Cronbach's alpha coefficient was calculated using previous studies as 0.756.

### Data analysis

The statistical analysis was performed using SPSS 19.0. A descriptive analysis of the demographic and clinical characteristics of the two groups was conducted. For continuous variables, independent *T*-tests should be performed. The chi-square test is used for categorical variables. Changes in outcomes were determined with the paired *t*-test before and after the intervention. A *P* value of 0.05 is considered statistically significant.

## RESULTS

### Characteristics of participants in terms of demographics and health

This study recruited 79 participants, with a mean age of 51.03 (SD = 6.49) and 50.78 (SD = 5.81) respectively in the control and intervention groups. Male participants constituted the majority of participants. Based on the results of the control group and intervention group, the average body mass index for each group was ( $25.42 \pm 4.07$ ) and ( $26.71 \pm 5.06$ )  $kg/m^2$ . Over half of the participants smoked and drank. In terms of demographic and health-related characteristics, no statistically significant differences were observed between the intervention and control groups at baseline (Table 1).

### Comparison of cardiac function and pulmonary function

After the four-week intervention, the LVEF was markedly improved in the intervention group in comparison with the control group ( $P < 0.05$ ), whereas the FVC did not show any statistically significant difference between the two groups ( $P > 0.05$ ). In spite of this, a statistically significant difference in LVEF was found between before and after the intervention in both control and intervention group ( $P < 0.05$ ). As shown in Table 2.

### Comparison of exercise endurance

After the intervention, 6MWT and peak value of  $VO_2$  in both groups was increased ( $P < 0.05$ ), and the increases were more obvious in the intervention group than in the control group ( $P < 0.05$ ; Table 3).

### Comparison of exercise endurance and medication compliance

It has been shown that the intervention group's quality of life was significantly improved after the 4-wk intervention



**Table 1 Characteristics of the participants in terms of their demographics and health**

Variables	Control group (n = 38)	Intervention group (n = 41)	P value
Gender			
Male/female	21/17	26/15	0.46
Age (yr)	50.07 ± 5.88	51.04 ± 6.16	0.47
Body mass index (kg/m <sup>2</sup> )	24.8 ± 2.77	25.12 ± 3.97	0.76
Education level			
Primary school and below	13	15	0.88
Junior and senior high school	20	19	
College degree or above	8	7	
Smoking			
Yes	28	31	0.84
No	10	10	
Alcohol drinking			
Yes	20	26	0.33
No	18	15	

**Table 2 Comparison of cardiac and pulmonary functions**

Variables	Control group (n = 38)	Intervention group (n = 41)	P value
LVEF (%)			
Before	46.21 ± 4.72	47.01 ± 6.23	0.52
After	50.05 ± 5.80	57.61 ± 7.42	< 0.001
P value	0.001	< 0.001	
FVC (L)			
Before	3.53 ± 0.97	3.63 ± 1.16	0.68
After	3.65 ± 1.01	3.99 ± 1.18	0.17
P value	0.59	0.16	

LVEF: Left ventricular ejection fraction; FVC: Forced vital capacity.

when compared to the control group's in terms of all aspects of quality of life ( $P < 0.05$ ). Prior to and after the 4-wk intervention, a statistically significant difference was observed in all aspects of quality of life in both groups ( $P < 0.05$ ) (Table 4).

## DISCUSSION

As a result of the study-supported continuing care program, the cardiac function, life quality and medication compliance of lung patients with CHD was improved. Numerous studies have shown that patients who undergo PCI treatment during their hospital stay may still experience recurrence of their disease once they leave the hospital, resulting in diminished quality of life for these patients[14-16]. In most cases, discharged patients with CHD fail to follow the doctor's instructions when it comes to taking their medication because of contempt, financial concerns, *etc.* As a result, major adverse cardiovascular events (MACEs) are much more likely to recur after PCI, quality of life is compromised for CHD patients following PCI, and MACE and mortality rates increase greatly. Providing efficacious nursing interventions to rehabilitate patients, improving their medication compliance, reducing MACE incidence, and improving their quality of life have become major issues that need to be addressed in clinical practice.

Continuous care is a low-intensity treatment phase that follows a more intensive initial stage, such as inpatient care or an intensive outpatient program. Therefore, continuous care is synonymous with "aftercare" or "gradual care". In this model, the goal of continuous care is to consolidate and maintain the results achieved in the initial stage of treatment. If

**Table 3 Comparison of exercise endurance**

Variables	Control group (n = 38)	Intervention group (n = 41)	P value
6MWT (m)			
Before	219.90 ± 34.67	216.53 ± 24.25	0.61
After	232.18 ± 33.12	256.98 ± 32.00	0.001
P value	0.10	< 0.001	
VO <sub>2</sub> [mL/(kg min)]			
Before	11.23 ± 3.47	11.65 ± 4.30	0.63
After	15.72 ± 4.98	20.16 ± 5.06	< 0.001
P value	< 0.001	< 0.001	

VO<sub>2</sub>: Maximum oxygen uptake; 6-MWT: 6-min walk test.

**Table 4 Comparison between groups of patients in terms of Seattle Angina Questionnaire and medication compliance**

Variables	Control group (n = 38)	Intervention group (n = 41)	P value
SAQ-PL			
Before	59.89 ± 8.68	60.11 ± 11.16	0.92
After	62.29 ± 9.73	72.46 ± 10.51	< 0.001
P value	0.26	< 0.001	
SAQ-AS			
Before	53.25 ± 8.03	54.09 ± 10.66	0.69
After	59.71 ± 7.68	70.13 ± 11.19	< 0.001
P value	< 0.001	< 0.001	
SAQ-AF			
Before	66.78 ± 6.29	65.74 ± 7.80	0.51
After	79.87 ± 4.65	84.52 ± 9.91	0.01
P value	< 0.001	< 0.001	
SAQ-TS			
Before	74.91 ± 7.75	76.57 ± 8.02	0.35
After	80.08 ± 9.20	87.91 ± 9.96	< 0.001
P value	0.009	< 0.001	
SAQ-DP			
Before	68.22 ± 7.54	68.26 ± 8.27	0.98
After	75.17 ± 6.18	82.02 ± 6.01	< 0.001
P value	< 0.001	< 0.001	
Medication compliance	7.42 ± 1.96	9.46 ± 2.99	< 0.001

SAQ: Seattle Angina Questionnaire.

these results have not been achieved, one of the objectives of continuous care is to establish abstinence and prevent subsequent recurrence from deteriorating to the extent that further acute treatment is required[17,18]. Studies have demonstrated that continuation care for prostate cancer reduces bad mood, improves life quality score and self-care ability, and provides clinical guidelines for prostate cancer care. In elderly rectal cancer patients who undergo radical resection with a permanent stoma, a continuing care bundle is an effective intervention that increases self-efficacy, self-care knowledge, enhances the ability to change the stoma appliance, relieves negative emotions, and improves patient satisfaction[19]. As a result of continuing care, medication compliance and quality of life could be improved, MACE

incidence could be reduced, and the prognosis for patients with CHD following PCI could be improved.

LVEF is the most widely accepted measure of cardiac function rehabilitation, while 6-MWT represents one of the most common sub-extreme exercise tests that can be used to assess patients' overall activity capacity and cardiac function. In the study, the comparison of the LVEF and 6MWT before and after continuous nursing was applied revealed a significant improvement in the intervention group, as well as a significant improvement in the control group and intervention group. As a consequence, continuous nursing was beneficial to the improvement of cardiac function in patients. The benefits of continuing nursing have been benefits cardiac function recovery after. Continual nursing care includes transferring patients to community hospitals following PCI for professional rehabilitation exercises before they are transferred to community hospitals. Through continuous nursing care, cardiac rehabilitation patients avoid unbalanced development in the community. In addition, it also helps patients form beneficial habits during cardiac rehabilitation in specialist hospitals, thereby improving their cardiac rehabilitation quality[11].

Poor medication compliance following discharge from the hospital is the primary cause of MACE in patients with CHD who have undergone PCI. This non-adherence significantly impacts the patient's quality of life and increases the risk of mortality. Traditional hospital care and follow-up practices are inadequate in meeting the long-term needs of PCI patients. However, the implementation of continuous care in clinical settings has demonstrated improvements in medication adherence and overall quality of life for patients. Research has shown that continued care leads to increased patient compliance with medications and subsequently improved quality of life post-PCI[11]. In a 9-mo follow-up after discharge, the intervention group exhibited higher medication compliance rates compared to the control group. Continuing care plays a vital role in enhancing patients' understanding of their health, highlighting the significance of medication adherence, and emphasizing the risks associated with discontinuing medications. The collection and evaluation of patients' post-PCI recovery data, along with the implementation of relevant interventions, have resulted in higher medication compliance rates among patients, their families, and communities.

The quality of life represents a crucial indicator for evaluating the therapeutic outcomes of PCI. Furthermore, existing research has demonstrated that continuous care, psychological support, and other related interventions can enhance the quality of life for patients with CHD who have undergone PCI by bolstering their psychological well-being and promoting positive social behavior[20]. In the updated 2022 edition of the PCI treatment manual, the cardiovascular interventional and therapeutics (CVIT). Association has included novel recommendations for modifications. These suggestions serve as a valuable resource for patients diagnosed with both CHD and lung cancer who are undergoing PCI and require continuous care[21]. The developed program implemented in this study has shown to significantly improve the post-PCI quality of life of patients, as evidenced by the high achievement rates of mutually formulated and implemented goals. Patients were encouraged to sustain these positive changes by diligently monitoring their symptoms, engaging in regular exercise, adhering to a balanced diet, quitting smoking, limiting alcohol consumption, following prescribed medication, and maintaining regular follow-up appointments. As a result, these behaviors have substantially enhanced their overall quality of life.

Despite the valuable findings of this study, it is important to acknowledge its limitations. This study was conducted solely within one hospital setting, necessitating further comprehensive investigations with multiple sites and a larger sample size to validate the conclusions. Additionally, the follow-up period of one month provided insights into the short-term effects observed among PCI patients. Hence, future research should explore whether sustained, long-term effects are manifested. Continuous care can be burdensome for economically disadvantaged patients, particularly those residing in rural areas. Finding ways to decrease the financial cost associated with continuous care, while simultaneously enhancing its efficiency, is an important aspect that requires careful consideration for the future.

## CONCLUSION

Lung patients undergoing PCI who receive continuing care may have improved cardiac and pulmonary function, medication compliance, and quality of life.

## ARTICLE HIGHLIGHTS

### Research background

Lung cancer and coronary heart disease (CHD) have become the major diseases worldwide and often occur simultaneously in the same patient. This comorbidity poses great challenges for treatment, especially for those patients who underwent percutaneous coronary intervention (PCI). Therefore, it has important theoretical and practical implications to explore how to improve the prognosis and quality of life of such patients through continuous care.

### Research motivation

The concerns of the complex physical and mental problems that patients face during the course of their disease, and the potential importance of continuous care in clinical practice in improving patient quality of life.

### Research objectives

This study aims to explore the impact of continuous care in patients with lung cancer and CHD undergoing PCI.

## Research methods

Continuous care was provided in the intervention group and the usual care in the control group.

## Research results

There were significant differences between the groups in left ventricular ejection fraction, 6-min walking test, oxygen uptake, quality of life, and medication adherence ( $P < 0.05$ ). The improvement was more significant in the intervention group compared to the control group. Higher in the intervention group than the control group, and the difference was statistically significant ( $P < 0.05$ ).

## Research conclusions

After PCI, patients with CHD with lung disease may benefit from continuity of care, including cardiac and pulmonary function, medication adherence, and quality of life.

## Research perspectives

By exploring in depth the impact of continuous care in patients with PCI lung cancer with CHD, we expect to provide more effective treatment strategies and care options for clinicians and caregivers, which thus improve patient outcomes and quality of life.

## FOOTNOTES

**Co-first authors:** Ting Gao and Jin-Lan Luo.

**Author contributions:** Gao T and Luo JN designed the research; Guo P, Hu XW, Wei XY and Hu Y contributed new reagents/analytic tools; Guo P, Hu XW, Wei XY and Hu Y analyzed the data; Gao T and Luo JN wrote the paper. All authors were involved in the critical review of the results and have contributed to, read, and approved the final manuscript. Gao T and Luo JN contributed equally to this work as co-first authors equally to this work. The reasons for naming Gao T and Luo JN as co-first authors are threefold. First, the research was a collaborative effort, and the designation accurately reflects the distribution of responsibilities and burdens. This ensures effective communication and post-submission management, enhancing the paper's quality and reliability. Second, the team encompassed diverse expertise and skills, and the designation reflects this diversity, promoting comprehensive and in-depth examination, enriching readers' understanding. Third, Gao and Luo contributed equally throughout the research process. Their designation acknowledges equal contribution and teamwork spirit. We believe naming them co-first authors accurately reflects our team's collaborative spirit, equal contributions, and diversity.

**Institutional review board statement:** The study was reviewed and approved by the Hubei Cancer Hospital Institutional Review Board.

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