

Article

A Single-Centre, Retrospective Research Evaluation of the Effect of Extended Intervention Model Based on Case Management of Treatment Compliance and Cardiac Function on Patients with Chronic Heart Failure

Songna Ren¹, Xuemian Yang¹, Yuan Niu², Xiaohui Hao¹, Suosuo Wang¹, Songjie Ren³, Yiqing Liu^{1,*}

¹Department of Cardiovascular Medicine, Xingtai Third Hospital, 054001 Xingtai, Hebei, China

²Hospital-Acquired Infection Control Department, Xingtai People's Hospital, 054031 Xingtai, Hebei, China

³Prevention Department, Anting Town Community Health Service Center, 201805 Shanghai, China

*Correspondence: Songna_1108@163.com (Yiqing Liu)

Submitted: 15 August 2023 Revised: 24 October 2023 Accepted: 13 November 2023 Published: 13 December 2023

Abstract

Objective: To explore the effect of case management-based extended intervention model on treatment compliance and cardiac function in patients with chronic heart failure. **Methods:** This study retrospectively analysed the clinical data of 203 patients with chronic heart failure at Xingtai Third Hospital from January 2019 to January 2022. In accordance with different intervention programs, the patients were divided into a study group (SG, n = 102) and a reference group (RG, n = 101). The SG received the extended intervention model based on case management, and the RG adopted the conventional intervention model. Comparison was conducted on the treatment compliance, cardiac function, activity of daily living scale (ADL) scores and readmission rates in both groups. **Results:** After intervention, the SG showed higher treatment compliance ($p < 0.05$), lower heart rate, higher left ventricular ejection fraction, ratio of transmitral peak rapid filling velocity to transmitral peak atrial filling velocity at mitral orifice and six-minute walk distance ($p < 0.001$) and significantly lower ADL score and readmission rates than the RG ($p < 0.05$). **Conclusion:** The extended intervention model based on case management positively influences the treatment compliance of patients with chronic heart failure and continuously improves patients' cardiac function, reduces the readmission rate, enhances daily living ability, comprehensively increases clinical efficacy and benefits patients for a long period.

Keywords

case management; extended intervention model; chronic heart failure; treatment compliance; cardiac function

Introduction

Chronic heart failure, which commonly affects the elderly, is a clinical syndrome caused by abnormal cardiac function or structure [1]. The incidence of chronic heart failure in developed countries has reached about 1%–2%, and the incidence in people over 70 years old has exceeded 10% [2]. This condition is an end-staged heart disease with clinical manifestations comprising dyspnoea, fatigue, peripheral oedema and pulmonary congestion caused by fluid retention [3]. Characterised by prolonged disease course and high rates of disability and mortality, chronic heart failure is difficult to cure completely at present and poses a great threat to the safety of patients [4–6]. Extended intervention model is a continuous model that extends hospital care to the patients' family; it enables patients to receive stable collaborative care in different health care places, reduces their mental and economic pressure and provides them with long-term effective care services [7]. The extended intervention model has been widely used in out-hospital nursing of diseases, such as diabetes, cerebral apoplexy and wind stroke [8,9], and is one of the ideal intervention methods in current clinical practices. However, in clinical practice, given the evident differences among patients, this model lacks pertinence in application, which results in a certain gap between its effectiveness and expectations [10]. Therefore, this study attempted to integrate case management into the extended intervention model to improve the scientificity and accuracy of nursing. For further confirmation of the application effect of the extended intervention model based on case management, retrospective evaluation of the medical records of patients with chronic heart failure in the past three years was conducted to explore an efficient clinical program that will benefit patients better.

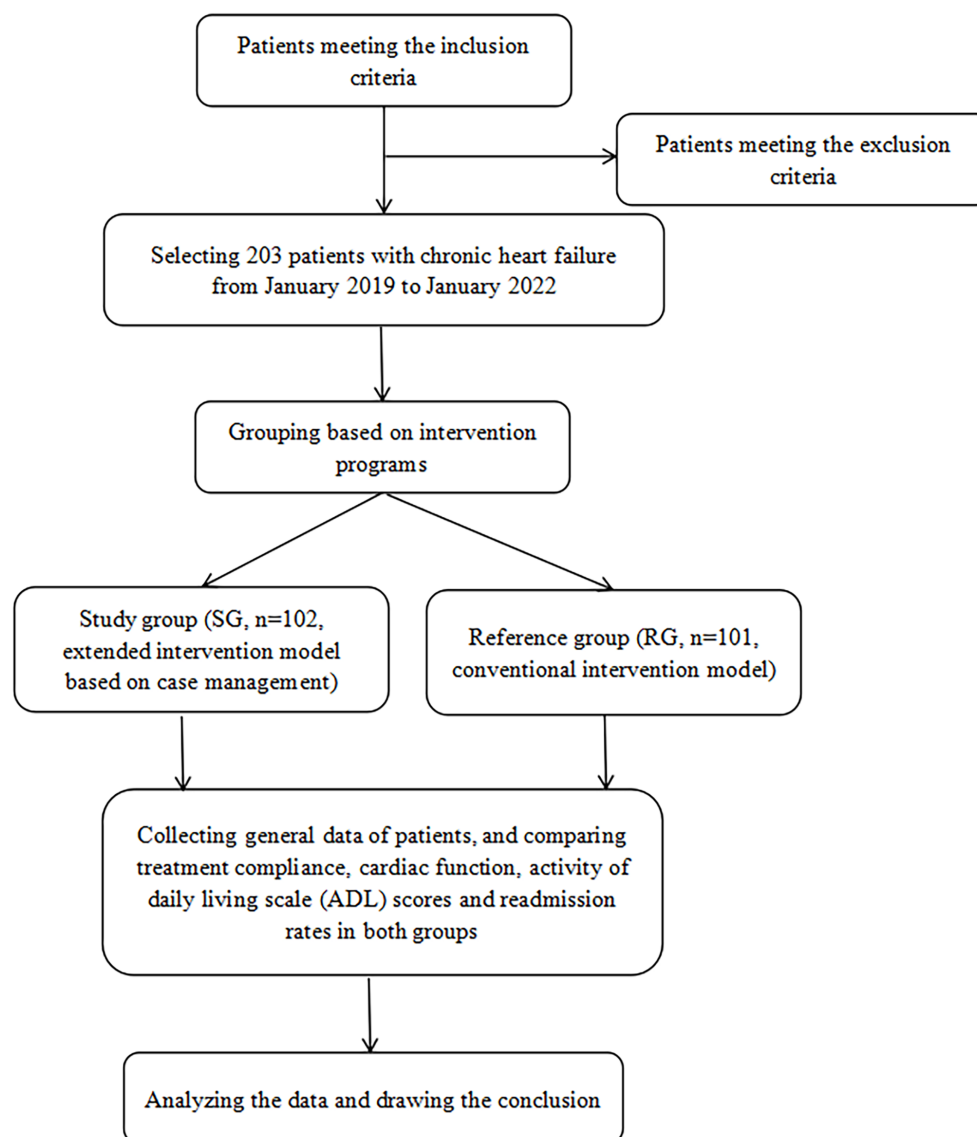


Fig. 1. Technical route.

Materials and Methods

General Data

The subjects comprised 203 patients with chronic heart failure at Xingtai Third Hospital from January 2019 to January 2022. The inclusion criteria were as follows. (1) Patients met the diagnostic criteria in the European Society of Cardiology (ESC) guidelines for acute and chronic heart failure [11]. (2) Patients had complete clinical data. (3) Patients had normal cognition and language expression ability and can cooperate to fill in research scales. The exclusion criteria consisted of the following. (1) Patients were <18 years old. (2) Patients had other malignant tumours or autoimmune diseases. (3) Patient medical records were missing. This study, which conformed to the princi-

ples of Declaration of Helsinki (2013) [12], has been approved by the ethical committee of Xingtai Third Hospital (approval No.: 20181202). This research used the intervention plans received by patients with chronic heart failure during hospitalisation as basis for grouping. A total of 102 patients who received an extended intervention model based on case management were allotted to the study group (SG), and 101 patients who adopted a conventional intervention model were assigned to the reference group (RG). Fig. 1 presents the technical route used in this study.

Methods

The RG adopted the conventional intervention model, including daily knowledge education, medication guidance, dietary guidance and matters requiring attention after discharge.

Table 1. Extended intervention model based on case management.

Time	Intervention measures
Admission stage	Medical staff comprehensively understood patients' basic situation, evaluated their cognition of disease and treatment, self-management ability and psychological state, completed the information record and established personal files of patients. Medical staff also confirmed and shared information with relevant departments depending on patients' case record and implemented intervention measures on the basis of confirmation.
Hospitalisation phase	Based on the onset characteristics of heart failure, the medical staff conducted targeted individual nursing for patients, informed patients of respiratory skills and correct posture, encouraged them to carry out rehabilitation exercise [13] and implemented preventive intervention based on the risk factors of this disease. During intervention, the medical staff communicated with patients and families to improve the understanding of patients' condition and families, laying a foundation for subsequent extended intervention.
Discharge phase	Medical staff assisted patients in discharge procedures, advised patients to adhere to self-management measures, such as rehabilitation exercise and healthy diet, distributed disease prevention manuals [14] and emphasised the importance of continuous medication. In addition, dedicated personnel were arranged to keep patient records and provide health guidance and follow-up interventions for patients after discharge.
Out of hospital phase	Patients were followed up via telephone or WeChat once a week and outpatient review once a month for 6 months. Medical staff inquired about changes in patients' disease and physical conditions after discharge, provided scientific and accurate remote guidance based on previous records of patients and advised them to use medication on time and in proper quantities. In addition, based on the conditions of heart function, the medical staff guided patients in engaging in a moderate aerobic exercise, maintaining a light diet, paying attention to their low-salt and low-fat status and supplementing foods rich in protein and vitamins. Moreover, the medical staff focused on the patients' emotional and psychological state, guided them in facing the disease and life optimistically and actively and encouraged family members or friends to communicate with the patients to maintain the patients' happy mood a for a long time.

The extended intervention model based on case management was adopted in the SG, and an intervention group that consisted of cardiology specialist nurses, charge doctor, nutritionists and psychological counsellors was established to carry out knowledge training on case management and extended intervention model and discuss and formulate targeted clinical intervention programs. The details are shown in Table 1 (Ref. [13,14]). The intervention in both groups lasted for 7 months.

Observation Indicators

The general data of patients were collected and sorted out; these data included gender, age, weight, course of disease, marital status, education level, place of residence, cardiac function grading of New York Heart Association [15] and comorbidities.

(1) Treatment compliance. After intervention, the treatment compliance of patients was evaluated from four aspects: medication, diet, rest and emotional control. The specific criteria were as follows. (a) Medication. Compliance involved following the doctor's advice to use the right amount of medication on time and noncompliance the self-withdrawal or failure to follow the doctor's advice for regular and quantitative medication. (b) Diet. Compliance was considered when a patient maintained a light and healthy diet and noncompliance when they consumed oily and salty foods or did not eat on time. (c) Rest. Compliance was defined as regular work and rest and average daily sleep du-

ration of 6–8 h. Noncompliance was defined as disordered work and rest, staying up too long or too often and short or long sleep duration. (d) Emotional control. Compliance was defined as emotional stability, self-regulation and reasonable expression of negative emotions and noncompliance as frequent emotional fluctuations (irritability) or long-term negative emotional states and inability to express emotions reasonably. Complete compliance was considered when all aspects of compliance without the supervision of medical staff were met. Basic compliance involved the four aspects of compliance under the supervision of medical staff and noncompliance as the lack of cooperation with the medical staff for treatment and intervention. Treatment compliance = (complete compliance + basic compliance) case number/total case number × 100%.

(2) Cardiac function. Transmitral peak rapid filling velocity (E) and transmitral peak atrial filling velocity (A) were measured via colour Doppler ultrasonography before and after intervention (Voluson 730, GE Company, Atlanta, GA, USA; probe frequency: 25 MHz; batch number: K032620), and the ratio of these variables was calculated. Left ventricular ejection fraction (LVEF) and heart rate (HR) were calculated using Teichhilz updating formula, and six-minute walk distance (6MWD) was measured.

(3) Activity of daily living (ADL). Before and after intervention, professionals were arranged to guide patients to fill in the ADL scale [16], which consisted of 14 items, each item of 1–4 points, with a total score of 14–56 points. Scoring criteria. A single item with 1 point was classified

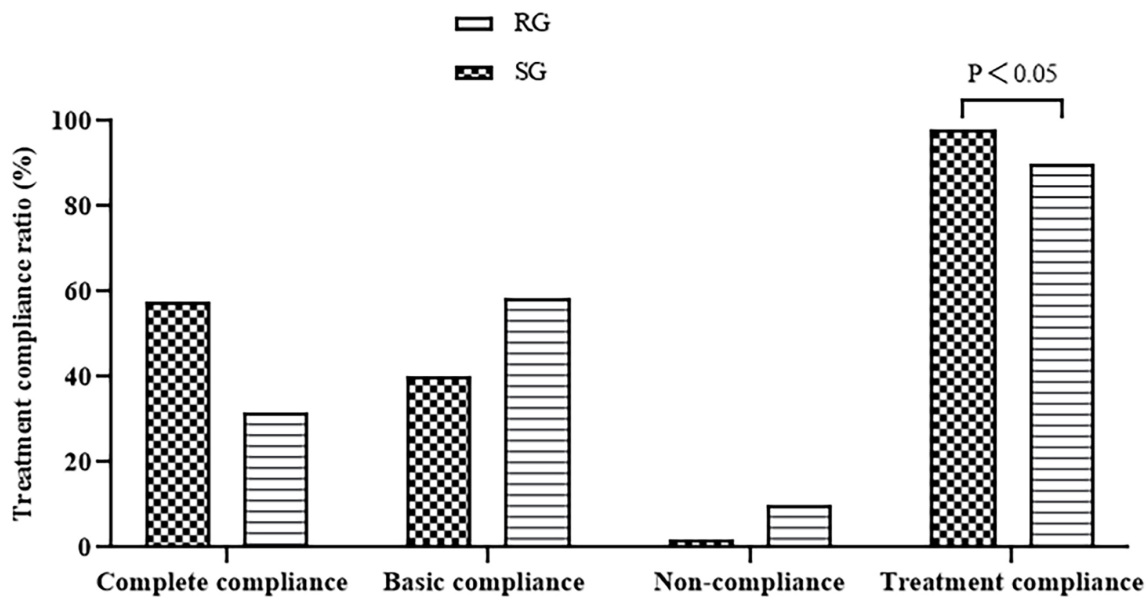


Fig. 2. Comparison of treatment compliance in both groups [n (%)]. Notes. The SG had 59 cases (57.84%) with complete compliance, 41 cases (40.20%) with basic compliance and 2 cases (1.96%) with non-compliance, and the treatment compliance was 98.04% (100/102). The RG had 32 cases (31.68%) with complete compliance, 59 cases (58.42%) with basic compliance and 10 cases (9.90%) with non-compliance, and the treatment compliance was 90.10% (91/101).

as normal condition, 2–4 points indicate a functional decline, and 2 or more items ≥ 3 points or total score ≥ 22 points meant a functional disorder. The higher the score, the poorer the ADL.

(4) Readmission rates. The patients were followed up for 6 months, and readmission rates were determined.

Statistical Methods

SPSS26.0 (IBM Corp., Armonk, NY, USA) was adopted for data processing, and GraphPad Prism 7 (GraphPad Software, San Diego, CA, USA) and Microsoft Office World 2006 (Microsoft Corporation, Redmond, WA, USA) were used as image drawing software. The enumeration data were tested by χ^2 test and expressed as [n (%)]. Normally distributed measurement data were tested using *t*-test, and those not conforming to normal distribution were tested via Mann–Whitney U test and expressed by mean \pm standard deviation (SD). $p < 0.05$ indicated statistically significant difference. In terms of sample size, the data of each patient in the hospital were collected in accordance with the corresponding methods and processed by SPSS statistical analysis.

Results

Comparison of Clinical Data in Both Groups

The results showed no significant difference in the clinical data of both groups ($p > 0.05$; Table 2).

Comparison of Treatment Compliance of Both Groups

The SG had a higher treatment compliance than the RG ($p < 0.05$; Fig. 2).

Comparison of Cardiac Function in Both Groups

Before intervention, both groups showed no significant difference in cardiac function indexes ($p > 0.05$). After intervention, the SG had a lower HR and higher LVEF, E/A and 6MWD than the RG ($p < 0.001$; Table 3).

Comparison of ADL in Both Groups

Before intervention, both groups showed no significant difference in ADL scores ($p > 0.05$). After intervention, the SG presented a significantly lower ADL score than the RG ($p < 0.001$; Fig. 3).

Comparison of Readmission Rates in Both Groups

The SG had a lower readmission rate than the RG (Table 4).

Discussion

Chronic heart failure presents great difficulty in terms of clinical treatment and comes with many complications; in addition, patients are prone to relapse after discharge, which results in repeated hospitalisation; this condition not

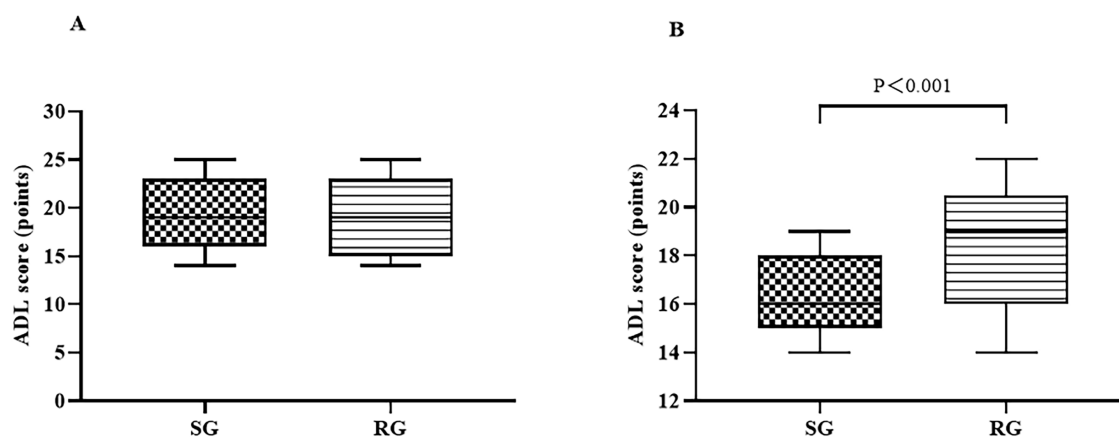


Fig. 3. Comparison of ADL in both groups [mean \pm SD]. (A) shows the comparison of ADL scores in both groups before intervention. The ADL scores in the SG and RG were (19.30 ± 3.81) and (19.18 ± 3.86) points, respectively. (B) presents the comparison of ADL scores in both groups after intervention. The ADL scores in the SG and RG were (16.34 ± 1.72) and (18.40 ± 2.63) points, respectively. Notes: ADL, activity of daily living scale.

Table 2. Comparison of clinical data of Both groups.

Items	SG (n = 102)	RG (n = 101)	$\chi^2/t/Z$	<i>p</i>
Gender			0.828	0.363
Male	59 (57.85)	52 (51.49)		
Female	43 (42.16)	49 (48.51)		
Age (years)	62.82 ± 8.53	62.25 ± 9.24	-0.460	0.645
Weight (kg)	66.65 ± 4.93	67.38 ± 5.27	-1.027	0.306
Course of disease (years)	4.12 ± 1.42	4.02 ± 1.93	-0.282	0.778
Marital status			0.180	0.671
Married	88 (86.27)	85 (84.16)		
Unmarried/Divorced/Widowed	14 (13.73)	16 (15.84)		
Education level			0.630	0.428
High school and above	26 (25.49)	21 (20.79)		
Middle school and below	76 (74.51)	80 (79.21)		
Place of residence			0.239	0.625
Urban areas	55 (53.92)	51 (50.50)		
Rural areas	47 (46.08)	50 (49.50)		
NYHA grading			0.389	0.823
Grade II	31 (30.39)	34 (33.66)		
Grade III	61 (59.80)	59 (58.42)		
Grade IV	10 (9.80)	8 (7.92)		
Diabetes			0.088	0.766
Yes	24 (23.53)	22 (21.78)		
No	78 (76.47)	79 (78.22)		
Coronary disease			0.039	0.843
Yes	35 (34.31)	36 (35.64)		
No	67 (65.69)	65 (64.36)		
Hypertension			0.399	0.527
Yes	49 (48.04)	53 (52.48)		
No	53 (51.96)	48 (47.52)		

Notes: NYHA, New York Heart Association; SG, study group; RG, reference group.

Table 3. Comparison of cardiac function in both groups.

Groups	n	HR (times/min)		LVEF (%)		E/A		6MWD (m)	
		Before intervention	After intervention	Before intervention	After intervention	Before intervention	After intervention	Before intervention	After intervention
SG	102	102.50 ± 8.60	80.73 ± 7.55	35.48 ± 5.06	46.48 ± 6.11	1.05 ± 0.12	1.30 ± 0.17	335.69 ± 38.67	414.09 ± 46.50
RG	101	103.04 ± 9.02	86.58 ± 8.44	36.76 ± 4.47	41.44 ± 4.70	1.04 ± 0.12	1.18 ± 0.17	336.71 ± 36.59	365.48 ± 42.86
t/Z		-0.468	-4.720	-1.917	-5.672	-0.287	5.512	-0.257	-6.653
p		0.640	<0.001	0.055	<0.001	0.774	<0.001	0.797	<0.001

Notes: HR, heart rate; LVEF, left ventricular ejection fraction; E/A, the transmitral peak rapid filling velocity/the transmitral peak atrial filling velocity; 6MWD, six-minute walk distance.

Table 4. Comparison of readmission rates in both groups [n (%)].

Groups	n	Readmission rates
SG	102	8 (7.84)
RG	101	25 (24.75)
χ^2		10.659
p		0.001

only seriously affects their health level and normal daily life but also causes heavy burden on their families and society [17–19]. Although the current treatment effect of this disease is gradually improving, the conventional intervention model used by hospitals often stops at the discharge of patients. Given the lack of correct guidance and supervision of medical staff, some patients exhibit noncompliance behaviours to the treatment, such as self-medication, irregular work and rest and unhealthy diet after discharge; in addition, some patients stop medication by themselves, leading to disease relapse shortly after discharge [20–22]; thus, a continuous and effective intervention must be adopted. A study confirmed that extended intervention improves the prognosis of patients, with a good effect on clinical treatment [23]. However, a critical problem is that the conventional intervention model fails to fully consider the characteristics of pathogenesis and treatment of patients with chronic heart failure and lacks changes related to individual differences of patients [24]. In view of this dilemma, Xingtai Third Hospital actively reviews previous cases, summarises the clinical experience and introduces the concept of case management on the basis of the extended intervention model to improve the pertinence of intervention measures, thereby providing more high-quality and continuous personalised intervention for patients with chronic heart failure.

The extended intervention model based on case management uses the files established by specific information and disease characteristics of patients as a basis. Through individualised file management, coordinated and continuous nursing services are implemented for patients after discharge to reduce the health care costs and attain the well-being of patients. The results of this study show that the treatment compliance of the SG (98.04%) was higher than that of the RG (90.10%) ($p < 0.05$), which means that the extended intervention model based on case management receives more recognition from patients and attains a higher treatment compliance among patients. The reason may be the accurate lifestyle guidance provided by the medical staff regarding to the patients based on their work and rest, diet and physical condition under the extended intervention model based on case management. Thus, the intervention measures in this model are in line with patients' actual situation, and patients can fully realise the importance of cooperation during intervention. After discharge, under the supervision of medical staff, patients can also constantly correct their incorrect disease cognition, follow their doctor's advice and establish healthy and scientific living habits through regular telephone follow-up [25].

The extended intervention model builds a bridge between hospitals and families, which effectively extends the intervention management of patients. Case management aids in the fine implementation of intervention measures, and scientific personalised management can be conducted based on "one-to-one" case file information [26]. Compar-

ison of the cardiac function indexes of the two groups after intervention revealed that the SG with extended intervention model based on case management had better cardiac function. In addition, the SG had a lower readmission rate than the RG ($p < 0.05$) possibly because the adopted model breaks the barriers between hospitals and families and gradually extends the unique treatment and nursing management of hospitals to families of patients. Thus, patients also receive continuous and scientific intervention management outside the hospital to improve cardiac function and ADL, take better care of themselves and improve their quality of life. However, this study is a single-centre research with limited sample size and low representativeness. Thus, more comprehensive research is needed for this model in the future.

Conclusion

In summary, the extended intervention model based on case management positively influences the treatment compliance of patients with chronic heart failure. Extended out-of-hospital intervention guidance can cultivate patients' good medication, diet and lifestyle, which improve patients' cardiac function, reduce the readmission rate, enhance the daily living ability, comprehensively increase the clinical efficacy and benefits patients for a long period.

Availability of Data and Materials

Data to support the findings of this study are available on reasonable request from the corresponding author.

Author Contributions

SNR, XY and YL contributed to the concept and designed the research study. YN and XH performed the research. SNR and YL provided help and advice on the experiments. SW and SJR contributed to the analysis and interpretation of the data. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

This study, which conformed to the principles of Declaration of Helsinki (2013) and has been approved by the ethical committee of Xingtai Third Hospital (approval No.: 20181202). As a retrospective study, there is no need for informed consent from patients.

Acknowledgment

Not applicable.

Funding

This research received no external funding.

Conflict of Interest

The authors declare no conflict of interest.

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