Universe Scientific Publishing Pte. Ltd.
73 Upper Paya Lebar Road #07–02B–03 Centro Bianco Singapore 534818
Website: www.usp–pl.com
E–mail: contact@usp–pl.com

ISSN 2315-456X

Advanced Emergency Medicine

2022 VOLUME 11 ISSUE 2

Universe Scientific Publishing

2

2022 Volume 11 Issue 2
ISSN: 2315–456X

# Advanced Emergency Medicine

Volume 11 Issue 2·2022
ISSN:2315-456X

# Advanced Emergency Medicine



Universe
Scientific Publishing

Universe Scientific Publishing

2022 | Volume 11 | Issue 2

# Advanced Emergency Medicine

http://aem.usp-pl.com/index.php/aem

## Contents

*original Articles*

**1 Effect of Vestibular Rehabilitation Training on Residual Dizziness in Patients with Benign Paroxysmal Positional Vertigo**

*Yue Liu, Peng Tang*

**4 The Mediating Role of Personality Strengths in the Relationship Between Gender Roles and Occupational Well-Being of Nurses**

*Rong Gao, Xiaoling Zhu, Zhongqiu Lu*

**11 Simultaneous Detection of Chlamydia Trachomatis, Neisseria Gonorrhoeae, Ureaplasma Urealyticum by Multiplex PCR-Running**

*Qiancheng Jiao, Xiaoling Zhu, Weiji Zheng, Yangyang Xie, Kang Yu and Sheng Ye*

**16 Validation of Konsung Compass 2000 Dry Biochemical Analyzer**

*Yingchun Li, Xue Zhang, Tong Chen, Xiangwei Fan, Haibo Qian*

**21 "Hang" and "Crash" in Fault Analysis of Philips HD Series Color Doppler Ultrasound in Summary of Medical Equipment Maintenance Experience**

*Qinfeng Liu, Jun Zhao, Jialan Chen, Enke Zhang*

**24 Auto-Encoder and Representation Learning Based MiRNA-Disease Association Prediction**

*Yutao Zhang, Xiya Lu*

**30 Effect of Two Kinds of Bone Replacement Materials on Bone Formation in Repairing Bone Defects around Mandibular Posterior Area: A Case Study of Bone Defects around Mandibular Posterior Area Caused by Boxing**

*Yuxian Zhang, Yao Huang, Xinyi Chen, Jingchen Zhang, Jiayi Gao, Yibo Wang, Yekun Deng*

**34 The Development Prospect of Chinese Rehabilitation Specialist Nurses under the Background of Aging**

*Dandan Zheng, Heyu Wu, Daniel Kyei Frimpong*

**36 Quantitative and Qualitative Research on the Fear of Recurrence and the Belief in Prevention of Recurrence in Elderly Patients with Coronary Heart Disease**

*Bing Zhang, Lingling Li, Shaojing Tian, Yakun Wang, Shuo Yang, Yanling Li, Bei Wang*

# Effect of Vestibular Rehabilitation Training on Residual Dizziness in Patients with Benign Paroxysmal Positional Vertigo

**Yue Liu, Peng Tang*  Corresponding author: Peng Tang**

**The third department of Neurology, the Shaanxi Provincial People's Hospital, Xian 710068, China.**

***Abstract:*** Objective: To study the effect of vestibular rehabilitation training on residual dizziness in patients with benign paroxysmal positional vertigo (BPPV). Methods: 70 patients with residual dizziness diagnosed as BPPV in Shaanxi Provincial People's hospital were divided into observation group and control group. The observation group was treated with manual reduction + vestibular function rehabilitation training, and the control group was treated with manual reduction. There were 35 patients in the two groups. Within two weeks before and after training, the patients' vertigo Disability Rating Scale score (DHI), vestibular dysfunction rating scale score (vADL) and vestibular symptom index score (vADL) were effectively evaluated. Results: before training, there was no significant difference in DHI, vADL and vADL scores between the observation group and the control group ($P > 0.05$). After training, there was significant difference in DHI, vADL and vADL scores ($P < 0.05$). Conclusion: vestibular rehabilitation training can effectively change the residual dizziness symptoms of patients with BPPV, and the treatment effect is significantly higher than that of patients with simple manual reduction. The treatment of residual dizziness symptoms of patients with BPPV can greatly promote and apply vestibular rehabilitation training.

***Keywords:*** Vestibular Rehabilitation Training; Benign Paroxysmal Positional Vertigo; Residual Dizziness; Treatment

## Introduction

Benign paroxysmal positional vertigo (BPPV) is a benign symptom. Patients often have paroxysmal vertigo with significant positional characteristics, also known as BPPV, which means that after the head moves to a specific position, there will be transient dizziness. It is a restrictive and peripheral vestibular disease. Usually, the vertigo will be less than 1 minute. The duration of vertigo can be used as the basis for distinguishing vertigo diseases. There is a difference between primary and secondary diseases, and it is easy to relapse. Generally, it is a high incidence period after the age of 40, and the incidence rate will increase with the increase of age. The incidence rate of BPPV in vertigo diseases is relatively high, accounting for about 25% of the total number of patients. Doctors usually adopt manual reduction and drug treatment, and also adopt reduction instrument auxiliary treatment, surgical treatment, vestibular rehabilitation training and other treatment methods according to the specific conditions of patients. Patients often have BPPV symptoms in the process of body movement, changing posture and head movement. In China, traditional Chinese medicine has achieved remarkable results in treating BPPV symptoms. China has carried out the research and treatment of this case earlier than western countries.

## 1. Data and methods

## 1.1 general information

70 patients with BPPV diagnosed in Shaanxi Provincial People's hospital from May 2021 to February 2022 were treated for dizziness symptoms by manual reduction. These 70 patients should meet the following conditions: they fully meet the diagnostic criteria of bbpv, and were randomly divided into the observation group and the control group. The male to female ratio in the observation group was 9:26, the age was 29-71, and the average age was (46.21 ± 8.69) years old, The time of vertigo was 0.2-5 years, with an average of (2.21 ± 1.32) years. The ratio of male to female in the control group was 10:25. The average age was (45.45 ± 9.98) years old. The time of vertigo was 0.6-5 years, with an average of (2.23 ± 1.41) years. There was no significant

difference in the age, sex and time of onset of symptoms between the two groups, which was comparable.

## 1.2 Method

For both groups of patients, manual reduction was used. The observation group also used vestibular function training for intervention treatment, mainly including the following specific processes: first, the head training was carried out to let the patients open their eyes first and then close their eyes. The head was bent forward, tilted back and turned left and right. One group of sitting position and one group of lying position were selected respectively, and the operation of various movements should be carried out slowly; Then carry out visual training. The patient should ensure that the head is upright, place a sitting object in front of the line of sight, move the object, and the patient's eyes follow the object to move up, down, left and right. First, use the lying position, and slowly change to the sitting and standing position for training; Then carry out static and dynamic balance training, and compare the patient's eye opening and eye closing conditions respectively. The patient changes from sitting position training to standing position training, and carries out turning training after adaptation, including starting training, turning training, bending training, etc; Functional activity training is also required. Patients can walk in a straight line indoors, climb stairs, descend stairs, take steep slopes, take circular or S-shaped roads, and walk backwards. The walking distance should be slowly increased, from short to long, and the speed should be from slow to fast. It is best to carry out training twice a day for about 20 minutes each time, and persist in training for two weeks. These methods are designed by professional rehabilitation instructors. There will be special attending physicians and nurses to guide the patients. They can handle some emergencies in time. There are no adverse events during the training process.

## 1.3 Scale and observation index

After two weeks of law-abiding reduction treatment and vestibular function rehabilitation training, the two groups of patients were scored on their own scales, and the vertigo disability rating scale, vestibular dysfunction rating scale of daily activities and vestibular symptom index were recorded respectively. The higher the score, the greater the impact on the patient's life; Evaluate and compare the vestibular function of patients. The higher the score, the worse the vestibular function of patients will be; The symptom scores of the two groups were compared. The higher the score, the more serious the symptom.

## 1.4 Statistical analysis

Spss20.0 was used to analyze the data, and ($x \pm s$) was used to measure the data. The counting data was expressed in percentage, and the comparison between the two groups was $\chi 2$ test, $P < 0.05$ means the difference is statistically significant.

# 2. Results

The scores of the vertigo disability rating scale of the two groups before and after training were compared. The DHI scores of the two groups before training were consistent, and the difference was not statistically significant ($P > 0.05$). After vestibular rehabilitation training, the scores of the observation group ($25.67 \pm 2.45$) were significantly lower than those of the control group ($34.68 \pm 4.56$), and the difference was statistically significant ($P < 0.05$). Compared the vestibular dysfunction scale of daily activities between the two groups before and after training, there was no significant difference in the scores of the two groups before training ($P > 0.05$). After vestibular function rehabilitation training, the scores of the observation group ($26.89 \pm 4.91$) were significantly lower than those of the control group ($46.22 \pm 4.21$), the difference was statistically significant ($P < 0.05$). The symptom index scores of the two groups before and after training were compared. There was no significant difference between the two groups before training ($P > 0.05$). After vestibular function rehabilitation training, the score of the observation group ($13.66 \pm 3.21$) was significantly lower than that of the control group ($19.71 \pm 2.54$), and the difference was statistically significant ($P < 0.05$).

# 3. Discussion

After a large number of studies, relevant scholars found that the causes of BPPV residual symptoms include the following

First, the BPPV, due to the patient's own function, leads to the spatial orientation function; Secondly, there were small BPPV residues in the semicircular canal after reduction treatment; Third, the patients' psychological mood is relatively low, resulting in disorder. About 60% of the patients will have residual dizziness after BPPV reduction. For this situation, drug treatment is mainly used, but the cost is relatively high, and some side effects will occur. Some patients still do not get good symptom relief after drug treatment. Therefore, the method of BPPV reduction treatment needs to be continuously improved. Vestibular rehabilitation training has achieved good results in clinical medicine. At present, manual reduction is mainly used. However, after manual reduction, there are still many patients with dizziness and unstable walking. Traditional Chinese medicine has achieved good results in the treatment of this disease. After the diagnosis of dizziness, some of them have no clear cause, and some of them have not fully recovered after treatment with western medicine. Therefore, in order to effectively control this symptom, it is best to use the combination of traditional Chinese and Western medicine. Through this vestibular rehabilitation training for BPPV patients in our hospital, we mainly practiced the patients' head, eyes, dynamic, static and functional activities. After scientific treatment and training, the symptoms of BPPV precipitation were effectively reduced, and the effect of BPPV absorption was improved. It also has certain benefits for the vestibule, and the residual dizziness symptoms of patients were effectively improved. After vestibular rehabilitation training for these BPPV patients, it can effectively improve the effects of nerve reflex and eye movement reflex, realize the self-improvement and improvement of vestibular function, enable patients to gradually adapt to the uncoordinated function of their bilateral semicircular canals, and effectively improve the symptoms of dizziness.

# Conclusion

After comparing the scores of the vertigo disability rating scale, the vestibular dysfunction rating scale of daily activities and the vestibular symptom index of the two groups, this article found that after the vestibular functional rehabilitation training, after data comparison, the scores of the patients in the observation group were lower than those in the control group, and the difference was statistically significant, It can significantly change the residual dizziness symptoms of BPPV patients and achieve a good recovery of vestibular function. This treatment is more conducive to the health of patients than relying solely on manual reduction. Therefore, vestibular training rehabilitation treatment is more suitable for extensive use in the treatment of BPPV patients.

# References

[1] Lin, CJ, Xi, SX, Wang, J, [The effect of vestibular rehabilitation training on improving the symptoms of vestibular decompensation led by nurse]. Fudan Journal (Medical Edition) 2021 (01).

[2] Wu ZM, Ren LL, Zhang SZ. [Vestibular rehabilitation: its principle, steps and monitoring]. Zhonghua Er Bi Yan Hou Tou Jing Wai Ke Za Zhi. 2022 Mar 7; 57(3): 363-366. Chinese. doi: 10.3760/cma.j.cn115330-20210531-00316. PMID: 35325953.

[3] Li WY, Wu PX, Li HW. [Effects and influencing factors of vestibular rehabilitation in 171 cases]. Zhonghua Er Bi Yan Hou Tou Jing Wai Ke Za Zhi. 2022 Mar 7; 57(3): 263-269. Chinese. doi: 10.3760/cma.j.cn115330-20210601-00321. PMID: 35325936.

[4] Zheng GL, Zhang Q, Chen JY, Jin YL, Liu LF, Yang J. [The clinical application of mobile internet remote guidance platform for vestibular rehabilitation]. Zhonghua Er Bi Yan Hou Tou Jing Wai Ke Za Zhi. 2022 Mar 7;57(3):276-281. Chinese. doi: 10.3760/cma.j.cn115330-20210528-00302. PMID: 35325938.

[5] Wu PX, Li WY, Li HW. [Vestibular rehabilitation: present and future]. Zhonghua Er Bi Yan Hou Tou Jing Wai Ke Za Zhi. 2022 Mar 7;57(3):350-354. Chinese. doi: 10.3760/cma.j.cn115330-20210601-00322. PMID: 35325950.

[6] Qi, XY, Song, N, Gu, P, Yang, X. Research progress of vestibular rehabilitation mechanism and treatment [J]. Chinese general practice 2022 (11).

# The Mediating Role of Personality Strengths in the Relationship Between Gender Roles and Occupational Well-Being of Nurses

**Rong Gao[1], Xiaoling Zhu[1], Zhongqiu Lu[1,2,*]**

1. **School of Nursing, Wenzhou Medical University, Wenzhou 325000, China.**
2. **The 1st Affiliated Hospital of Wenzhou Medical University, Wenzhou 325000, China.**

***Abstract:*** Background: The purpose of the study is to explore the relationships amongst gender roles, personality strengths and occupational well-being of nurses in Mainland China. Design: A cross‐sectional study was used. Method: A total of 318 nurses from a tertiary hospital in Wenzhou City, Zhejiang Province, were measured with general information questionnaire, gender role scale (simplified version), three-dimensional character advantage questionnaire, and medical worker occupational well-being scale. Results: The character strengths and occupational well-being scores of the nurses in this study were (57.29±7.16) and (79.59±12.67), respectively. Bisexuality in gender roles was positively correlated with personality dominance and occupational well-being (r=0.535, r=0.204,P<0.01); undifferentiated was negatively correlated with both (r=-0.529, r=-0.230,P<0.01); and personality dominance was positively correlated with occupational well-being (r=0.350,P<0.01). In the effect of nurses' gender roles on occupational well-being, personality strengths played a fully mediating role. Conclusion: Gender roles and character strengths are important factors affecting nurses' professional well-being, and gender roles can indirectly affect nurses' professional well-being through character strengths. Clinical nursing managers should take relevant measures to cultivate character strengths appropriate to different gender roles to improve nurses' occupational well-being.

***Keywords:*** Nurses; Gender Roles; Personality Strengths; Occupational Well-Being; Mediating Roles

## 1. Background

Occupational well-being refers to the fact that the subject is satisfied based on needs when engaged in a certain profession, the potential is fulfilled, the self-worth is realized, and the double good evaluation of the outside and the self is obtained. The subjective feeling of the state of satisfaction (Ozkara,2015;Ge,2010). Nursing staff is an indispensable backbone force in promoting a "healthy China", but their happiness has not been paid enough attention(Ouyang et al., 2019; Wang et al., 2020). Gender roles include four types: androgyny, masculine, feminine, and undifferentiated, which refer to different psychological characteristics or behavior patterns caused by gender differences (Bem,1981;Li,2019), which are related to personality advantages and professional well-being. Sex, and androgyny are the gender roles that predict happiness the most(Juster,2016;Cai,et al.,2008). The theory of character advantage shows that if you can use your own character advantages in daily life, you will maximize your own happiness (Peterson & Seligman, 2004). Most studies have shown that the higher the level of personality advantage, the higher the level of happiness(Douglass & Duffy, 2014; Hausler et al., 2017b; Xie et al., 2020). However, domestic researches on nurses' gender roles, personality advantages and professional well-being are mostly limited to the relationship between the two, and there are few studies on the relationship between the three. Therefore, this study intends to explore the relationship between the three, and analyze whether there is an intermediary role of personality advantages between gender roles and professional well-being, so as to provide a reference for improving nurses' professional well-being.

## 2. Aim

Our study examines the mediating role of personality strengths the relationship between gender roles and occupational well-being among nurses in Wenzhou, China.

## 3. Methods

## 3.1 Design

Nurseswereinvitedtoparticipate a study on their psychologicalwell-being.Cross-sectional data included self-administered questionnaires on demographic information and occupational status, as well as questionnaires on gender roles, personality strengths, and occupational well-being.

## 3.2 Sample and Settings

Using the whole-group sampling method(Ni et al.,2010), 318 clinical nurses from December 2020 to February 2021 in a tertiary hospital in Wenzhou, Zhejiang Province, were selected as the study population. Inclusion criteria: (1) obtaining a nurse qualification certificate from the People's Republic of China; (2) practicing nursing for more than 1 year; (3) informed consent and voluntary participation. Exclusion criteria: (1) nurses in training or internship or nurses on study or vacation; (2) those who could not cooperate with the study for various reasons.

## 3.3 Data collection

### 3.3.1 General Information Questionnaire

The questionnaire designed by the researcher, it included the nurses' age, only child, children, marital status, education, labor relations, department, technical title, position, number of night shifts, and annual income after tax.

### 3.3.2 The Gender Role Scale (simplified version)

This scale was measured using the Bem Gender Role Simplified Scale, which was revised in 2003 by Lu Qin and Su Yanjie(Lu &Su,2003)in a Chinese cultural context. The scale has two subscales, the masculine characteristics subscale contains 14 items, the feminine characteristics subscale contains 12 entries, and the neutralization subscale contains 13 entries. The neutral items were not scored and only served as a distraction. The items were scored on a 7-point scale ("1" for not at all and "7" for fully). The Cronbach coefficient of the scale in this study was 0.945.

### 3.3.3 Three-dimensional personality strengths questionnaire

A three-dimensional personality strengths questionnaire developed by Duan et al was used(Wenjie & He, 2017), which included three dimensions of affinity (5 entries), curiosity (5 entries) and self-control (5 entries), with a total of 15 entries involving 15 personality strengths, and each entry was scored on a 5-point scale ("1" means very The mean score of each entry in this study was greater than 3, indicating a high level of personality strengths(Lin et al.,2018). The scale has good reliability and validity. The Cronbach coefficient of the scale in this study was 0.910.

### 3.3.4 The Occupational Happiness Scale

The Occupational Happiness Scale for Medical Workers developed by Dongmei Hu et al.was used to conduct the survey(Hu et al.,2011). The scale contains five dimensions of physical and mental health status (6 entries), value/competence manifestation (6 entries), social support (5 entries), work environment (3 entries), and economic income (4 entries), with a total of 24 entries. Each entry was scored on a 5-point scale, with 1 being completely non-conforming and 5 being completely conforming. Among them, 6 entries of physical and mental health are reverse scoring items. The total score ranged from 24 to 120, with higher scores indicating higher occupational well-being. The last item asked the subjects to score their current occupational well-being status, where 0 means least happy and 100 means most happy. The level of happiness of medical workers was classified by the scale scores, and the mean of the scale theoretical value entries [1,2] was classified as low level, (2,4] as medium level, and (4,5] as high level. The Cronbach coefficient of this scale in this study was 0.8.

### 3.3.5 Data collection process

Consent was obtained from the nursing department and each department before the formal survey, and one-on-one paper questionnaires were distributed on site by the investigator, who explained the purpose of the study and the requirements for completion to the respondents in detail, and after obtaining consent, they were filled out anonymously by the respondents themselves, and the questionnaires were collected on site. A pre-survey was first conducted on 50 clinical nurses who met the inclusion and exclusion criteria, and any problems in the survey process were solved in a timely manner. After the formal survey, invalid questionnaires were excluded, and each questionnaire was entered by two people using EXCEL to ensure the accuracy of the data. A total of 350 questionnaires were distributed, and 318 were effectively recovered, with a valid recovery rate of 90.9%.

### 3.3.6 Data analysis

SPSS 22.0 statistical software was used for data analysis. Count data were expressed as frequencies and percentages (%), and measurement data were all normally distributed and expressed as mean±standard deviation (M±SD); correlation analysis was performed using Spearman correlation analysis; the Bootstrap method was used to test and validate the mediating effect of personality strengths between nurses' gender roles and personality strengths. $P < 0.05$ was considered a statistically significant difference.

## 4. Results

## 4.1 Participant Characteristics

There are 318 female nurses participating in the survey, 47.2% of nurses are 26-30 years old; 48.7% of nurses have a working life of 6-10 years; 96.9% of nurses have a bachelor degree; and more than 80% of nurses The job title is a nurse; more than 60% of nurses are married and have children.

## 4.2 Distribution of nurses' different gender roles

According to the scores of all subjects, the medians of the masculinity scale and femininity scale were determined. In this study, the median of masculinization items was 5.14 points, and the median of feminization items was 5.75 points. Taking the median as the boundary, if the masculinization item scores high (including the median), it belongs to the type of masculinization. The feminization item has a high score and belongs to the feminization type. If the scores of the masculinization and feminization items are both high, it is an androgynous type, and if the scores are both low (not equal to the median), it is an undifferentiated type. The distribution of gender roles among the 318 nurses in this study is dominated by androgyny and undifferentiated, 111 (34.9%) and 123 (38.7%), respectively. The distribution of masculinity and femininity is less, 40 (12.6). %) and 44 people (13.8%).

## 4.3 Stepwise regression analysis of 15 personality strengths and professional well-being in different gender role types

It can be seen from Table 1 that in different gender role types, the enthusiasm in the 15 character strengths can enter the regression equation that ultimately predicts nurses' professional well-being, and is in predictive ability in intersex, masculine, and undifferentiated gender roles. In the highest dimension; cooperation is the second character advantage that enters the regression equation among androgynous, masculine and feminine gender roles. Its ability to predict professional well-being is weak in androgynous gender roles, which can only explain the variance of 5.2 %, but it is in the dimension with high predictive ability in the masculine and feminine gender roles. In these two dimensions, its explanatory variation exceeds 30%.

Table1 Stepwise regression analysis of 15 personality strengths and professional well-being in different gender roles

| | Dependent variable | Predictor variable | Adjusted R side | Standard coefficient β | t | p |
|---|---|---|---|---|---|---|
| Androgyny | Physical and mental health | enthusiasm | 0.114 | 0.349 | 3.888 | 0 |
| | Value/ability manifestation | cooperation | 0.052 | 0.246 | 2.649 | 0.009 |
| Masculine | Value/ability manifestation | enthusiasm | 0.545 | 0.271 | 2.149 | 0.039 |
| | | fair | | 0.469 | 3.921 | 0 |
| | | cooperation | | -0.46 | -3.405 | 0.002 |
| | | Studious | | 0.356 | 2.677 | 0.011 |
| | social support | enthusiasm | 0.361 | 0.464 | 3.469 | 0.001 |
| | | honest | | 0.31 | 2.318 | 0.026 |
| | working environment | enthusiasm | 0.208 | 0.478 | 3.353 | 0.002 |
| Feminization | Physical and mental health | enthusiasm | 0.123 | 0.379 | 2.656 | 0.011 |
| | Value/ability manifestation | curiosity | 0.31 | 0.383 | 2.796 | 0.008 |
| | | kind-hearted | | 0.263 | 2.072 | 0.045 |
| | | enthusiasm | | 0.278 | 2.038 | 0.048 |
| | social support | cooperation | 0.376 | 0.703 | 4.641 | 0 |
| | | curiosity | | 0.467 | 3.737 | 0.001 |
| | | fair | | -0.374 | -2.539 | 0.015 |
| | Income | humor | 0.15 | 0.412 | 2.93 | 0.005 |
| | working environment | humor | 0.241 | 0.509 | 3.831 | 0 |
| Undifferentiated | Physical and mental health | humor | 0.043 | 0.225 | 2.536 | 0.012 |
| | Value/ability manifestation | Studious | 0.185 | 0.254 | 3.074 | 0.003 |
| | | fair | | -0.257 | -3.134 | 0.002 |
| | | enthusiasm | | 0.255 | 3.028 | 0.003 |
| | social support | Studious | 0.101 | 0.28 | 3.262 | 0.001 |
| | | fair | | 0.189 | 2.199 | 0.03 |
| | Income | Studious | 0.072 | 0.281 | 3.226 | 0.002 |
| | working environment | Studious | 0.09 | 0.312 | 3.608 | 0 |

## 4.4 Pairwise correlation analysis of different types of gender roles, personality advantages, and professional well-being

The androgynous gender roles are positively correlated with personality advantages ($r=0.535$, $P < 0.01$) and professional well-being ($r=0.204$, $P < 0.01$); undifferentiated gender roles are positively correlated with personality advantages ($r= -0.529$, $P < 0.01$), professional well-being ($r=-0.230$, $P < 0.01$) were negatively correlated; personality advantage was positively correlated

with professional well-being (r=0.350, P＜0.01).

## 4.5 The mediating effect of personality advantage between nurses' different gender roles and professional well-being

In the mediating effect model in this study, the independent variable gender role type is coded as a dummy variable, and the mediating variable character advantage and the dependent variable occupational well-being are continuous variables.

It can be seen from Table 2 that taking masculinity as a reference, the mediating effect of androgyny on professional well-being through personality advantage is 3.974, and the 95% Bootstrap confidence interval is [1.917,6.499], excluding "0", indicating the mediating effect Significant; and after adding the intermediary variable personality advantage, the direct effect of androgyny on professional well-being is 0.150, and the confidence interval includes "0", indicating that its direct effect is not significant; undifferentiated mediating effect value of professional well-being through personality advantage Is -1.657, and the 95% Bootstrap confidence interval is [-3.164, -0.307], excluding "0"; indicating that the mediating effect is significant; and after adding the mediating variable character advantage, the direct effect of undifferentiation on professional well-being is -1.494 , The confidence interval includes "0", indicating that its direct effect is not significant. This result shows that personality advantages play a completely intermediary role in the process of androgynous and undifferentiated gender roles affecting professional well-being. That is, the role of androgyny and undifferentiated among nurses in different gender roles can affect their professional well-being. The underlying mechanism can be achieved by improving character strengths.

Table 2 Analysis of the mediating effect of personality advantages on nurses' professional well-being ( [b] indicates that the mediation effect is significant)

| Mediation path | estimated value | 95%CI | |
|---|---|---|---|
| Take the control group as a reference: | | Low value | High value |
| Androgyny→Character strengths→occupational well-being | 3.974b | 1.917 | 6.499 |
| Androgyny → occupational well-being | 0.150 | -4.460 | 4.759 |
| Undifferentiated→Character strengths→occupational well-being | -1.657b | -3.164 | -0.307 |
| Undifferentiated → occupational well-being | -1.494 | -5.8114 | 2.823 |

# 5.Discussion

In recent years, scholars have investigated the professional well-being of clinical first-line nursing staff, and the results show that the professional well-being of nurses in China is mostly at a medium level, which is the same as the results of this study (Wang et al., 2020)（Zhao et al.,2020）. Among them, the social support dimension has the highest score and the physical and mental health dimension has the lowest score. The reason is that nurses receive more support from family members, colleagues, and leaders, so they get the highest scores for social support. However, due to the special nature of nurses' work, such as irregular sleep and heavy work pressure, they are likely to induce a variety of diseases that harm physical and mental health. Therefore, hospital managers should take a variety of measures, such as scientific scheduling and improvement of facilities, to relieve nurses' work pressure and enhance their professional well-being.

Rossi first proposed the androgynous model of gender role types, that is, individuals can have all the characteristics of a typical masculine gender role and a typical feminine gender role at the same time(Rossi, 1964). There are differences in the professional

well-being of nurses between different gender roles in this study. Among them, androgynous nurses have the highest professional well-being scores. It is also the same as the research conclusions of other scholars(Esteban-Gonzalo et al., 2021). The results of this study show that personality advantage is positively correlated with professional well-being, indicating that the higher the level of personality advantage nurses have, the higher their level of happiness. This is in line with domestic and foreign research The results are consistent (Allan & Duffy, 2013; Hausler et al., 2017a, 2017b). Personality advantage, as a positive personality trait, can stimulate the self-protection mechanism in nurses and make positive responses when nurses are facing greater work pressure or in a bad working environment, so that nurses can maintain a positive happiness experience. Through research, positive psychologists have found that individuals have different character advantages, and learning to use good character advantages flexibly can effectively improve the individual's sense of well-being, thereby improving the individual's physical and mental health ( Kachel et al., 2021; Littman-Ovadia et al., 2016; Peterson & Seligman, 2004).

# 6. Conclusion

In summary, nurses with intersex gender roles have higher character advantages and higher levels of professional well-being. Hospital managers should break through the shackles of traditional gender dualism. They should not only make good use of the gender characteristics of nursing staff to achieve organizational coordination, but also pay attention to the development of individual gender roles and stimulate personal potential; nurses should have a certain understanding of their own gender roles. Know, discover one's own character advantages, and cultivate more character advantages in order to improve the comprehensive ability of personal nursing and enhance professional happiness. However, this study still has several shortcomings: 1. This study only included clinical female nurses. Although it was consistent with the overall gender distribution of clinical nurses, there was a certain bias. We hope to add the sample of male nurses in the future; 2. The sample size of this study is derived from Single center may cause a certain degree of selection bias. In the future, it is recommended to expand the sample size and carry out multi-center research.

# References


[1] Allan, BA., & Duffy, RD. (2013). Examining Moderators of Signature Strengths Use and Well-being: Calling and Signature Strengths Level. Journal of Happiness Studies, 15(2), 323-337.

[2] Bem, SL. (1981). Gender schema theory: A cognitive account of sex typing. Psychological Review, 88(4), 354-364.

[3] Cai, HJ., Huang, XF.,Song, HR.(2008) The relationship model between gender roles and subjective well-being: Based on the test of Chinese college students [article in Chinese]. Psychological News, (04): 474-486.

[4] Douglass, R. P., & Duffy, R. D. (2014). Strengths Use and Life Satisfaction: A Moderated Mediation Approach. Journal of Happiness Studies, 16(3), 619-632.

[5] Esteban-Gonzalo, S., Gonzalez-Pascual, JL., Gil-Del Sol, M., & Esteban-Gonzalo, L. (2021, Jun). Exploring new tendencies of gender and health in university students. Arch Womens Ment Health, 24(3), 445-454.

[6] Hausler, M., Strecker, C., Huber, A., Brenner, M., Hoge, T., & Hofer, S. (2017a). Associations between the Application of Signature Character Strengths, Health and Well-being of Health Professionals. Front Psychol, 8, 1307.

[7] Hausler, M., Strecker, C., Huber, A., Brenner, M., Hoge, T., & Hofer, S. (2017b). Distinguishing Relational Aspects of Character Strengths with Subjective and Psychological Well-being. Front Psychol, 8, 1159.

[8] Hu, DM., Ma, YD., Na,L., Li, GH., & Wei, HM.(2011). Formation and analysis of reliability and validity of the occupational well-being scale for medical workers [article in Chinese]. Chinese Journal of Hospital Statistics 18(2): 127-129.

[9] Juster, RP., Pruessner, JC., Desrochers, AB., Bourdon, O., Durand, N., Wan, N., Tourjman, V., Kouassi, E., Lesage, A., & Lupien, SJ. (2016). Sex and Gender Roles in Relation to Mental Health and Allostatic Load. Psychosomatic medicine, 78(7), 788–804.

[10] Kachel, T., Huber, A., Strecker, C., Hoge, T., & Hofer, S. (2021). Reality Meets Belief: A Mixed Methods Study on Character Strengths and Well-Being of Hospital Physicians. Front Psychol, 12, 547773.

[11] Li, HS.(2019) Research on the relationship between the gender role, career interest and professional commitment of intern nurses [article in Chinese]. Shandong University.
[12] Littman-Ovadia, H., Lavy, S., & Boiman-Meshita, M. (2016). When Theory and Research Collide: Examining Correlates of Signature Strengths Use at Work. Journal of Happiness Studies, 18(2), 527-548.
[13] Lu,Q., & Su,YJ. (2003) Revision of Bem Sex Role Inventory [article in Chinese]. Chinese Mental Health Journal ,17(8): 550-553,546.
[14] Lin,WY., Yan,WY., & Lin, XJ.(2018). The effects of character strengths on caring ability of nursing students [article in Chinese]. Chinese Journal of Nursing Education,15(9): 694-697.
[15] Ni,P., Chen, JL., Liu, N. (2010). Sample size estimation of quantitative research in nursing research [article in Chinese]. Chinese Journal of Nursing ,45(04): 378-380.
[16] Ozkara San E. (2015). Concept analysis of nurses' happiness. Nursing forum, 50(1), 55–62. https://doi.org/10.1111/nuf.12099.
[17] Ouyang, YQ., Zhou, WB., Xiong, ZF., Wang, R., & Redding, SR. (2019, Aug). A Web-based Survey of Marital Quality and Job Satisfaction among Chinese Nurses. Asian Nurs Res (Korean Soc Nurs Sci), 13(3), 216-220.
[18] Peterson, CF., & Seligman, ME. (2004). Character Strengths and Virtues: A Handbook of Classification. New York：Oxford University Press.
[19] Rossi, AS. (1964). Equality between the Sexes: An Immodest Proposal. Daedalus, 93(2).
[20] Wang, J., Okoli, C. T. C., He, H., Feng, F., Li, J., Zhuang, L., & Lin, M. (2020, Feb). Factors associated with compassion satisfaction, burnout, and secondary traumatic stress among Chinese nurses in tertiary hospitals: A cross-sectional study. Int J Nurs Stud, 102, 103472.
[21] Wenjie, D., & He, B. (2017). Development and initial validation of a short three-dimensional inventory of character strengths. Quality of Life Research, 26(9).
[22] Xie, J., Liu, M., Zhong, Z., Zhang, Q., Zhou, J., Wang, L., Ma, K., Ding, S., Zhang, X., Sun, Q., & Cheng, A. S. K. (2020, Aug). Relationships Among Character Strengths, Self-efficacy, Social Support, Depression, and Psychological Well-being of Hospital Nurses. Asian Nurs Res (Korean Soc Nurs Sci), 14(3), 150-157.
[23] Zhao, LH., Han,YP., & Wang,J.(2020). The mediating effect of occupational well-being on nurses' fatigue and organizational commitment [article in Chinese]. Chinese Nursing Management, 20(11): 761-767.

# Simultaneous Detection of Chlamydia Trachomatis, Neisseria Gonorrhoeae, Ureaplasma Urealyticum by Multiplex PCR-Running

**Qiancheng Jiao[1], Xiaoling Zhu[2], Weiji Zheng[3], Yangyang Xie[3], Kang Yu[1*], Sheng Ye[3, 4*](Q. Jiao and X. Zhu equally contributed to this work.)**

**1. The 1rd School of Medicine, Wenzhou Medical University, Wenzhou 325035, China.**

**2. School of Nursing, Wenzhou Medical University, Wenzhou 325035, China.**

**3. School of Laboratory Medicine and Life Sciences, Wenzhou Medical University, Wenzhou 325035, China.**

**4. Zhejiang Yuanchuang Medical Technology Co., Ltd, Wenzhou 325035, China.**

***Abstract:***Chlamydia trachomatis (CT), Ureaplasma urealyticum (UU) and Neisseria gonorrhoeae (NG) are the most common pathogens of sexually transmitted infections (STIs), frequently founded in urogenital infections, and showed a criminal role in increasing the risk of potential adverse outcomes. In this study a multiplex PCR assay for the simultaneous detection and accurate identification of 3 clinically relevant pathogens of STIs, i.e., CT, NG and UU in a single tube was developed and evaluated. The limits of detection for the multiplex PCR assay were ~10 copies of DNAs per reaction. This assay has comparable clinical sensitivity to the conventional monoplex real-time PCR assay and considerable potential to be routine molecular diagnostic tool for simultaneous identification of STIs at relatively low cost due to multiplexing.

***Keywords:*** Sexually Transmitted Infection; Multiplex PCR; Chlamydia Trachomatis; Ureaplasma Urealyticum; Neisseria Gonorrhoeae

## Introduction

Chlamydia trachomatis (CT), Ureaplasma urealyticum (UU) and Neisseria gonorrhoeae (NG) as the most frequent pathogens of sexually transmitted infections (STIs) are considered to be the main etiological agents of urogenital disease (Xu et al. 2018; Roy et al. 2021). Genital sexually transmitted CT, UU and NG are highly prevalent in women (Liang et al. 2018), increased the risk of potential adverse pregnancy outcomes, such as preterm birth, low birth weight, spontaneous abortion, perinatal mortality and ophthalmia neonatorum (Vallely et al. 2018), newborn respiratory distress syndrome.

To avoid the abuse of antibiotic, guidelines for sexually transmitted infected urethritis suggested that infected with high load should be treated rather than routine and treatment of asymptomatic person (Horner et al.2018). Therefore, the accurate determination of pathogens can avoid the risk of antibiotic resistance and overuse of antibiotics indicated for empirical treatments (Bartoletti et al. 2019).

Nucleic acid amplification tests performed more specific and sensitive than culture or enzyme immunoassay tests (Marangoni et al. 2012) and increased the finding of case (Pillay et al. 2021). Molecular diagnosis by PCR directly detects pathogen-specific nucleic acid, many of the recently diagnostic methods for STIs employ PCR methods (Muvunyi et al, 2011;Van Der Pol et al. 2017). Several commercial multiplex PCR kits have been developed and evaluated (Ursi et al. 2016; Barrientos-Durán et al. 2020).

In this survey, multiplex real-time PCR was optimized for accurate identification of CT, UU and NG in a single PCR tube with the use of three fluorescent probes.

# 1. Materials and Methods

## 1.1 Clinical specimens

The DNA samples from the patients were obtained from Hang Zhou KingMed Diagnostics Co., Ltd. Briefly, the swabs was placed in a sterile test tube containing 1 mL of sterile normal saline as the transport medium and washed by shock for a while. The swab was then squeezed dry on the wall and discarded. Then, the samples were stored at -20°C for further treatment.

## 1.2 Primer and probe design

According to the genome sequences of CT, UU and NG from GeneBank, the software Primer Express was used to design PCR primers and their corresponding TaqMan MGB probes. Melting temperature (Tm) values and secondary structures were mainly considered. All primers were desalted or HPLC purified grade.

## 1.3 PCR assay design

The PCR Amplification reactions were accomplished in a final volume of 25 μL. The PCR products were run on 2% agarose gel electrophoresis. Real-time PCR was conducted using the ABI7000/7300/7500 Real-Time PCR System and LightCycler 2.0.

## 1.4 PCR sensitivity and specificity

Using the optimized PCR conditions, the sensitivity and specificity of monoplex and multiple PCRs were analyzed with clinical samples and plasmid standard DNAs, respectively. A 10-fold diluted DNA series of $10^5$, $10^4$, $10^3$, $10^2$, 10 copies per reaction were used to assess sensitivity levels. PCR cycle conditions: 50 ℃ 2 min, 94 ℃ 2 min, 95 ℃ 15 s, 60 ℃ 45 s; 45 cycles. 11 pathogen DNAs of Actinomyces isrealii, Aerococcus viridians, Enterococcus faecalis, Enterobacter cloacae, Morganella morganii, Mycoplasma hominis, Pseudomonas aeruginosa, Streptococcus epidermidis, Candida albicans, Herpes simplex virus 1 and Herpes simplex virus 2 with urinary tract infection were selected to confirm the specificity.

# 2. Results and Discussion

## 2.1 Primer and probe screening

In this study, the specificity of primers was screened by using human whole genome DNA and other pathogens' nucleic acid as PCR template. Based on the results of specific amplification and sequencing, primer pairs of C1f/C1r; N1f/N1r; U5f/U5r were used for multiple PCR as shown in **Figure 1**. According to the screened primer sequence, the optimized primers and probes' sequences in **Table 1** were finally selected for multiplex real-time PCR system.

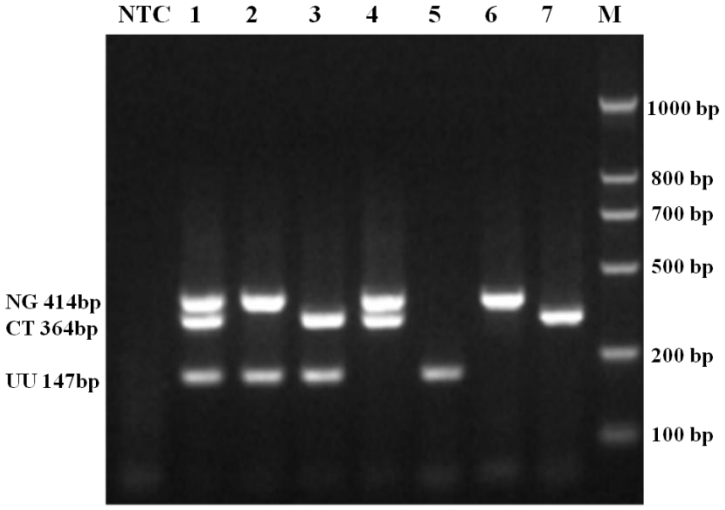


**Figure 1** Multiple PCR analysis of mixed 3 primer pairs. CT/NG/UU (lane 1), NG/UU (lane 2), CT/UU (lane 3), NG/CT (lane 4), UU DNA (lane 5), NG DNA (lane 6), CT DNA (lane 7).

**Table 1** Optimized primers and probes

| Assay | Primer Sequence (5'→3') | Probe Sequence (5'→3') | Product size |
|---|---|---|---|
| CT | C1f (27-mer): GCAAGATATCGAGTATGCGTTGTTAGG<br>C1r (25-mer): TTCATTGTACTCATTAAACGAGCGG | C1 probe (TaqMan MGB probe, 18-mer): VIC-AAAGATATGGACAAATCG-MGB | 364 bp |
| NG | G1f (21-mer): TATCGGAACGTACCGGGTAGC<br>G5r (21-mer): GTATTACCGCGGCTGCTGGCA | N1 probe (TaqMan MGB probe, 16-mer): NED-CCGATGACGGTACCTG-MGB | 414 bp |
| UU | U5f1 (26-mer): GTCAGGATCATCAAATCAATTCACAC<br>U5r1 (23mer): GATCCAACTTGGATAGGACGGTC | U2 probe (TaqMan MGBprobe, 17-mer): FAM-CCAGGAGCAATTAACT-MGB | 147bp |

## 2.2 Multiplex real-time PCR assay

Simultaneous amplification and detection of the three pathogens were achieved using the screened primers and fluorescent probes listed in **Table 1** and verified by electrophoresis (**Figure 1**). In the presence of a single target, the multiplex PCR produced detection limits of 10 copies of CT, NG or UU plasmid control DNAs, respectively, whereas detection limits were unchanged when two targets (CT/NG, CT/UU, or UU/NG) or all three targets were present in the PCR mixture.

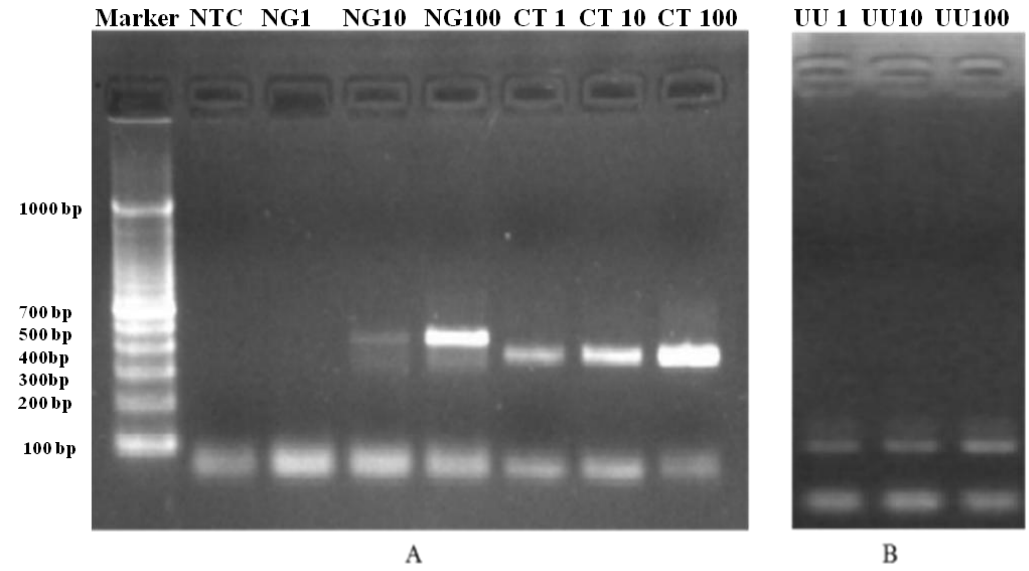


**Figure 2** Evaluation of the limit of multiplex PCR. DNA copy number gradients for all three pathogens were 1 copy, 10 copies and 100 copies per reaction.

Probe-based multiplex real-time PCR could simultaneously distinguish multiple pathogens (Carrillo *et al*. 2020). Here, new probes as shown in **Table 1** were designed and individually examined with crude DNAs of CT, NG and UU (data not shown) by the multiplex real-time PCR. The developed multiplex real time PCR of high throughput was successfully established in this survey and can be used as a simple and useful alternative to the monoplex real-time PCR for rapid and accurate identification of CT, NG and UU.

## 3. Acknowledgements

We thank Hang Zhou KingMed Diagnostics Company for providing the DNA samples of clinical specimens. This work was supported by Zhejiang Provincial Natural Science Foundation of China (Grant No. LGF18C050002) and Zhejiang Medical and Health Science and Technology Project (Grant No. 2018PY030 and 2020KY629).

## 4. Conflict of interest

The authors declare that they have no conflicts of interest.

## 5. References

[1] Xu, WH., Chen, JJ., Sun, Q., Wang, LP., Jia, YF., Xuan, BB., Xu, B., & Sheng, HM.(2018). Chlamydia trachomatis, Ureaplasma urealyticum and Neisseria gonorrhoeae among Chinese women with urinary tract infections in Shanghai: A community-based cross-sectional study. J Obstet Gynaecol Res 44 (3), 495-502.

[2] Roy, A., Dadwal, R., Yadav, R., Singh, P., Krishnamoorthi, S., Dasgupta, A., Chakraborti, A., & Sethi, S. (2021). Association of Chlamydia trachomatis, Neisseria gonorrhoeae, Mycoplasma genitalium and Ureaplasma species infection and organism load with cervicitis in north Indian population.Lett Appl Microbiol 73 (4), 506-514

[3] Liang, YY., Zhai, HY., Li, ZJ., Jin, X., Chen, Y., & Chen, SP. (2018). Prevalence of Ureaplasma urealyticum, Chlamydia trachomatis, Neisseria gonorrhoeae and herpes simplex virus in Beijing, China. Epidemiol Infect 147, e59.

[4] Vallely, LM., Egli-Gany, D., Pomat, W., Homer, CS., Guy, R., Wand, H., Silver, B., Rumbold, AR., Kaldor, JM., Low, N., & Vallely, AJ. (2018). Adverse pregnancy and neonatal outcomes associated with Neisseria gonorrhoeae, Mycoplasma genitalium, M. hominis, Ureaplasma urealyticum and U. parvum: a systematic review and meta-analysis protocol. BMJ open 8 (11), e024175.

[5] Horner, P., Donders, G., Cusini, M., Gomberg, M., Jensen, JS., & Unemo, M. (2018). Should we be testing for urogenital Mycoplasma hominis, Ureaplasma parvum and Ureaplasma urealyticum in men and women? - a position statement from the

European STI Guidelines Editorial Board. J Eur Acad Dermatol Venereol 32 (11), 1845–1851.
[6] Bartoletti, R., Wagenlehner, F., Bjerklund Johansen, TE., Köves, B., Cai, T., Tandogdu, Z., & Bonkat, G. (2019). Management of urethritis: Is it still the time for empirical antibiotic treatments?. Eur Urol Focus 5 (1), 29–35.
[7] Marangoni, A., Foschi, C., Nardini, P., D'Antuono, A., Banzola, N., Di Francesco, A., & Cevenini, R. (2012). Evaluation of the new test VERSANT CT/GC DNA 1.0 assay for the detection of Chlamydia trachomatis and Neisseria gonorrhoeae in urine specimens. J Clin Lab Anal 26(2), 70–72.
[8] Pillay, J., Wingert, A., MacGregor, T., Gates, M., Vandermeer, B., & Hartling, L. (2021). Screening for chlamydia and/or gonorrhea in primary health care: systematic reviews on effectiveness and patient preferences. Syst Rev 10 (1), 118.
[9] Muvunyi, CM., Dhont, N., Verhelst, R., Crucitti, T., Reijans, M., Mulders, B., Simons, G., Temmerman, M., Claeys, G., & Padalko, E. (2011). Evaluation of a new multiplex polymerase chain reaction assay STIFinder for the simultaneous detection of 7 sexually transmitted disease pathogens. Diagn Microbiol Infect Dis 71 (1), 29–37.
[10] Van Der Pol, B., Williams, JA., Fuller, D., Taylor, SN., & Hook, EW., 3rd (2016). Combined testing for Chlamydia, Gonorrhea, and Trichomonas by use of the BD Max CT/GC/TV assay with genitourinary specimen types. J Clin Microbiol 55 (1), 155–164.
[11] Ursi, D., Crucitti, T., Smet, H., & Ieven, M. (2016). Evaluation of the Bio-Rad Dx CT/NG/MG® assay for simultaneous detection of Chlamydia trachomatis, Neisseria gonorrhoeae and Mycoplasma genitalium in urine. Eur J Clin Microbiol Infect Dis 35 (7), 1159–1163.
[12] Barrientos-Durán, A., de Salazar, A., Alvarez-Estévez, M., Fuentes-López, A., Espadafor, B., & Garcia, F. (2020). Detection of sexually transmitted disease-causing pathogens from direct clinical specimens with the multiplex PCR-based STI Direct Flow Chip Kit. Eur J Clin Microbiol Infect Dis 39 (2), 235–241.
[13] Carrillo, JD., Mayorquin, JS., Stajich, JE., & Eskalen, A. (2020). Probe-based multiplex real-time PCR as a diagnostic tool to distinguish distinct fungal symbionts associated with Euwallacea kuroshio and Euwallacea whitfordiodendrus in California. Plant Dis 104 (1), 227–238.

Universe Scientific Publishing

# Validation of Konsung Compass 2000 Dry Biochemical Analyzer

**Yingchun Li, Xue Zhang, Tong Chen, Xiangwei Fan, Haibo Qian**
**Jiangsu Konsung Bio-Medical Science and Technology Co., Ltd., Jiangsu 110870, China.**

***Abstract:*** Dry biochemical analyzers have been increasingly popular in many tests by primary hospitals, field hospitals and other areas subject to economic and medical underdevelopment as well as poor transportation. With the increasing demand for POCT in primary medical care around the world, upgrading of dry biochemical analyzers has been a hot topic in technical research. Against such context, Konsung Compass2000 dry biochemical analyzer, a POCT system with high precision and accuracy, is developed. Furthermore, the upgraded dry biochemical analyzers can, in a more convenient and accurate way, monitor glucose, lipid and other indices affecting the course of chronic diseases.

***Keywords:*** POCT Dry Biochemical Analyzer; Blood Lipid; Blood Glucose

## Introduction

Biochemical testing, a most common method to identify underlying diseases in clinical dignosis, provides basis for doctors to decide on therapeutic regimen in combination with clinical signs. Generally, laboratory biochemical analysis employs automatic or semi-automatic biochemical analyzers; while household testing adopts dedicated devices for self-test. However, neither the laboratory equipment nor the devices for personal use are suitable for the clinical diagnosis of chronic diseases at the primary medical care system; the former, though of good performance, is very costly while the latter is biased by its poor stability and accuracy, which often leads to significant errors. Therefore, it is necessary to develop a biochemical testing system dedicated to primary medical care. To meet this demand by primary medical care system, we consulted a flood of literature of related topics, and finally created the dry biochemical analyzer as presented below..

## 1. Dry biochemical analyzer

Dry biochemistry has been widely used in clinical applications, from litmus paper that was used in the 16$^{th}$ century for determining the acidity and alkalinity of liquids to dry biochemical testing products used today. However, due to technical barriers, the existing dry biochemical analyzers are still mostly large or desktop devices, such as Reflotron (BM, West Germany) and Seralyzer (Ames, USA). Such large or desktop devices are cumbersome and cost much in maintenance, and additionally, most of them can only test plasma and serum, and their operators need to be strictly trained and can only operate them in laboratories.

There also are one-handed dry biochemical analyzers available, owing to the rapid development of biochemistry, optics, electronics, micro electrode technology and modern microcomputers as well as the increasing improvement of clinical enzymology; moreover, dry chemistry analysis now allows testing on samples from the whole blood, serum, plasma or other body fluids, instead of urine samples which were used; as for dry reagents (dry strips), three-layer strips that can eliminate interfering components, or multi-film strips are available now, replacing the simplest two-layer ones that could only be used for qualitative or semi-quantitative determination.

On this basis, many quantification methods are becoming popular, including reflectometry (dry strip by colorimetric method), differential potential method (dry strip by ion-based method), fluorescence reflectometry (dry strip by immunological method), and digital imaging based on the direct coupling with the CCD; and special or multi-functional semi-automatic or fully automatic dry chemical analyzers that are compatible with dry reagents have been developed and become more popular than single-purpose urine analyzers and blood glucose meters that were used.

## 1.1 Design principle

With multi-film solid-phase reagent technology, samples are loaded to reagent carriers (solidified in special structures) for analysis and determination. Therefore, dry biochemistry is also called solid phase chemistry. The dry biochemical analyzer features the dry reagent which is the reagent carrier solidified in a special structure.

## 1.2 Testing principle

Dry biochemical analyzers are mostly similar in the testing principle and technically depend on the test strips. The testing principle is shown in Fig. 1. The sample passes through the blood diffusion layer, to the blood filtration layer, the reagent layer, and then the support layer. Through diffusion and filtration, chemical reactions occur between the two phases at the reaction layer. Finally, the measured results are obtained at the support layer by reflection spectrophotometry.

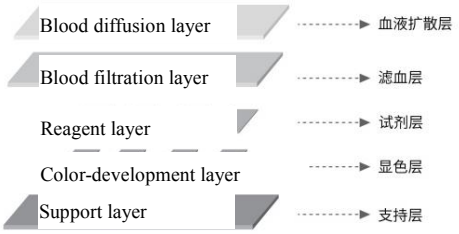


Fig. 1 Strip for Dry Biochemical Analyzer

# 2. Konsung Compass 2000

## 2.1 Konsung Compass 2000-1 and attached reagents

Konsung Compass 2000 and its attached reagents are shown in Fig. 2 and Fig. 3. The strips shown in Fig. 3, from left to right, are for blood lipid/glucose, renal function and liver function testing, and blood donor screening. They are able to provide quick POCTs of GLU, TG, HDL, TC, ALT, AST, ALB, UA, UREA, CR and HB in whole blood and serum.

Fig. 2 Konsung Compass 2000

Fig. 3 Strip for Konsung Compass 2000

## 2.2 Acquisition of measured results

Using photonics reflection, for a solid-phase reaction layer of the dry strip, the thickness is X, and the external light passes through the solid-phase reaction layer and is reflected at the lower interface; in addition to light absorption, there is obvious scattering during transmission and reflection. The light intensity is I0, and the incident light intensity and the emitted light intensity on the deferential-layer thickness dx, which is the distance x from the lower interface, are i and j respectively. Then the differential equation is built and solved, resulting in the reflectivity R (R = j/I0) at the upper surface, which is determined by the scattering coefficient S, the absorption coefficient K per unit thickness of the solid-phase reaction layer and the thickness X of the solid-phase reaction layer. Since K is proportional to the concentration C of the tested substance and, when S and X are constant values, the reflectivity R is only associated with to the concentration C of the tested substance. Thus, the concentration C of the tested substance can be obtained.

## 2.3 Konsung Compass 2000 vs. conventional devices

## 2.3.1 Accuracy of Konsung Compass 2000

With the correlation coefficient $R^2$ as one of the indexes reflecting the system accuracy, the correlation between Konsung Compass 2000 and the results obtained in the laboratory is shown in Table 1. By using the regression equation obtained, the calculated $R^2$ of glucose, lipid, liver and renal functions are ≥ 95%.

Table 1 Correlation Between Konsung Compass 2000 and Laboratory Results

| | **Whole blood** | | **Serum** | |
|---|---|---|---|---|
| **Item** | $R^2$ | Conclusion | $R^2$ | Conclusion |
| **GLU** | 0.99 | Qualified | 0.97 | Qualified |
| **TG** | 0.99 | Qualified | 0.98 | Qualified |
| **HDL** | 0.96 | Qualified | 0.96 | Qualified |
| **TC** | 0.95 | Qualified | 0.97 | Qualified |
| **ALT** | 0.95 | Qualified | 0.98 | Qualified |
| **AST** | 0.95 | Qualified | 0.99 | Qualified |
| **ALB** | 0.99 | Qualified | 0.99 | Qualified |
| **CRE** | 0.99 | Qualified | 0.99 | Qualified |
| **UA** | 0.98 | Qualified | 0.97 | Qualified |
| **UREA** | 0.97 | Qualified | 0.98 | Qualified |

## 2.3.2 Repeatability (precision) (CV%) of Konsung Compass 2000

The quality controls at high and low levels are tested for 10 consecutive times. The CV% of Landau quality control on Konsung Compass 2000 is shown in Table 2, which is ≤ 10% for each index.

Table 2 Results of Landau Quality Control at Two Levels

| | R1 | | R2 | |
|---|---|---|---|---|
| **Item** | CV% | Conclusion | CV% | Conclusion |
| **GLU** | 4.3% | Qualified | 4.5% | Qualified |
| **TG** | 5.5% | Qualified | 2.3% | Qualified |
| **HDL** | 3.6% | Qualified | 4.6% | Qualified |
| **TC** | 5.5% | Qualified | 6.9% | Qualified |
| **ALT** | 5.3% | Qualified | 8.2% | Qualified |
| **AST** | 3.4% | Qualified | 3.7% | Qualified |
| **ALB** | 6.9% | Qualified | 9.5% | Qualified |
| **CR** | 5.6% | Qualified | 3.5% | Qualified |
| **UA** | 3.0% | Qualified | 3.2% | Qualified |
| **UREA** | 9.8% | Qualified | 4.9% | Qualified |

# 3. Advantages of Konsung Compass 2000

## 3.1 Advantages in POCT

Konsung Compass 2000 is a POCT device equipped with dry strips, with technical improvements and updates in some aspects based on the advantages of POCT devices. Compared with the previous POCT devices, Konsung Compass 2000works more efficiently, making it possible to shorten theturn around time (TAT), thus reducing costs, and to expand the detection range such that it can provide quick POCTs of GLU, TG, HDL, TC, ALT, AST, ALB, UA, UREA, CR and HB in human whole blood and serum.

## 3.2 Advantages over common testing equipment in hospitals

By reference to the results obtained by biochemical analyzers commonly used in clinical labs of hospitals in China, the results obtained by Konsung Compass 2000 are validated and found to be excellent in accuracy and stability. The traditional laboratory testing is completed by large liquid-phase biochemical devices that requires centrifugation of venous blood while Konsung Compass 2000 only requires fingertip blood. As a POCT system, Konsung Compass 2000 not only provides early detection, diagnosis and treatment of chronic diseases, but also brings good news to the development of health care in primary medical institutions and inaccessible remote areas.

# 4. Prospect

In this study, Konsung Compass 2000 is analyzed based on copious literature[11-15]on analyzer performance validation. This analyzer is a reliable POCT system and can be used to determine GLU, TG, HDL, TC, ALT, AST, ALB, UA, UREA, CR and HB in whole blood and serum samples. Featuring simple and flexible operation, quick POCT and low cost, this analyzer can be used in clinical screening anytime and anywhere, and would be applied in various workplaces or to urban and rural health care, especially in inaccessible rural areas. With the development of health care and the increasing needs of patients, the testing efficiency in clinical auxiliary diagnosis must be raised accordingly. Therefore, the research and development of POCT technology and equipment will remain popular for long time.

# References

[1] Guidelines for Risk Assessment and Management of Cardiovascular Disease in China [J]. Chinese Circulation Journal, 2019, 34 (01): 4-28.

[2] Zhao, C, Ren, R, A Probe into Prevention and Treatment Measures for Chronic Diseases [A]. Dalian Medical University,

Medicine & Philosophy. Collections of Papers of the Summit Forum on Medicine Sciences & Humanities and the First Meeting of the Fourth Editorial Board of Medicine & Philosophy [C]. Dalian Medical University, Medicine & Philosophy Periodical Office:Medicine & Philosophy of Chinese Society for Dialectics of Nature, 2016: 7.

[3] Dean, D, et al. Development and Evaluation of a Point-of-Care Test (POCT) in a Low Resource Setting with High Rates of Chlamydia Trachomatis Urogenetic Infections in Fiji. [J]. Journal of Clinical Microbiology, 2021.

[4] Lu, F, et al. A Fluorescence Color Card for Point-of-Care Testing (POCT) and its Application in Simultaneous Detection. [J]. The Analyst, 2021.

[5] Duan, XY, Wang, S, Wu, LC. Application and Management of POCT in Emergency Medicine [J]. Laboratory Medicine and Clinic, 2020, 17 (17): 2582-2585.

[6] Guo, ZL. Application of BNP Level Measured by Bedside POCT in Differential Diagnosis of Pulmonary and Cardiogenic Dyspnea [J]. The Journal of Medical Theory and Practice, 2020, 33 (11): 1846-1847.

[7] Bao, J, Yang, YJ, Chen, YM, Liu, H, Cao, LX, Discussion on Current Application Status and Development Prospect of POCT Technology [J]. Medical Innovation of China, 2016, 13 (30): 138-141.

[8] Cheng, SY, et al. Mobile Health for Diagnosis-PixoTest HbA1c POCT System [J]. Journal of Medical and Biological Engineering, 2020, 40 (1): 138-142.

[9] Liu, J, Yao, SP, Expert Consensus on the Application of Point-of-Care Testing (POCT) in Community Medical Institutions [J]. China Medical Equipment, 2019, 16 (08): 143-145.

[10] Van, HV, et al. Organization and Quality Monitoring for Point-of-Care Testing (POCT) in Belgium: Proposal for an Expansion of Legal Framework for POCT into Primary Health Care. [J]. Acta clinicaBelgica, 2021: 1-8.

[11] Shao, MX, Li, SJ, Li, XJ, Cao, WJ, Performance Evaluation of Huizhong MQ-8000 Glycosylated Hemoglobin Analyzer [J]. Labeled Immunoassays and Clinical Medicine, 2021, 28 (07): 1249-1252.

[12] Jing, H, Sun, J, Li, D, Jing, B, Ma, YX, Wang, SH, Performance Evaluation of Four POCT Glucose Meters and Comparative Analysis on Glucose Test Results of Automatic Biochemical Analyzer [J]. Smart Healthcare, 2021, 7 (14): 8-11 +15.

[13] Ji, YY, Feng, JW, Bai, Y, Huang, AJ, Shen, H, Performance Evaluation of BC-6800plus Automatic Hematology Analyzer [J]. China Medical Equipment, 2021, 18 (02): 20-24.

[14] Gong, Y, Lu, RQ, Guo, L, Performance Evaluation of Roche Modular Automatic Biochemical Analyzer for Determination of Blood Urea Nitrogen, Creatinine and Uric Acid [J]. International Journal of Laboratory Medicine, 2011, 32 (11): 1225-1226 +1230.

[15] Feng, Q, Deng, DY, Zhou, LH, Chen, D, Li, ZA, Zhi, GH, Xue, YS. Evaluation of Analytical Performance of Automatic Biochemical Analyzer for Determination of Serum LDL Cholesterol [J]. Jilin Medical Journal, 2013, 34 (13): 2407-2409.

[16] Zhao, MY, Wang, L, [J]. Comparative analysis of the same test items between blood gas analyzers and fully automatic blood analyzers/fully automatic dry biochemical analyzers [J]. Biomedical Engineering and Clinical Medicine ,2022, 26(01):104-107.

[17] Gao, Y, Xiao, LJ, Analytical validation of the detection performance of Johnson & Johnson V-350 Fully Automatic Dry Biochemical Analyzer [J]. China Medical Device Information, 2021, 27(15): 22-24.

[18] Chen, JH, Yang, GL, Huang, Y, Performance validation of a fully automatic dry biochemical analyzer [J] Laboratory Medicine and Clinic. 2012,9(23).

Universe Scientific Publishing

# "Hang" and "Crash" in Fault Analysis of Philips HD Series Color Doppler Ultrasound in Summary of Medical Equipment Maintenance Experience

**Qinfeng Liu[1], Jun Zhao[3], Jialan Chen[2*], Enke Zhang[1]**

**1. Medical Equipment Management Department, Shaanxi Provincial People's Hospital, Xi'an 710068, China.**

**2. Department of Gynaecology, Shaanxi Provincial People's Hospital, Xi'an 710068, China.**

**3. Services and Solutions Implementation Department of Philips Healthcare, Xi'an 710000, China.**

***Abstract:*** Color doppler ultrasound is an important imaging equipment to examine systemic diseases in hospital.Over the past years, the Philips HD series ultrasound system have attracted great attention for their outstanding imaging ability. This paper introduce the structure principle of HD series ultrasound system,and introduces the difference and different troubleshooting methods when HD color doppler ultrasound system displays' Hang 'and' Crash 'faults.

***Keywords:*** HD Series; Structure Principle; "Hang" and "Crash"; Troubleshooting Methods

## 1. Instruction

Ultrasound imaging diagnosis is one of the four medical imaging diagnosis techniques in hospitals, because it has the characteristics of non-ionic radiation, non-invasive examination and repeatability examination, it is widely used in clinical practice in hospitals[1,2].At present, the ultrasound equipment most frequently configured in hospitals is B-type ultrasonic examination equipment, referred to as B-ultrasound, which shows the tissue and organ structure of the human body through ultrasonic probe scanning and image algorithm, and can distinguish the substantial, gaseous and liquid structures in the tissue, and is widely used in the examination of organ lesions[3,4]. Color Doppler ultrasound, referred to as color doppler ultrasound, uses the autocorrelation technology to process the doppler signal to form the blood flow signal in the human body, and superposes it on the image signal of B ultrasound in real time, which can display the distribution of blood vessels, the direction and speed of blood flow, abnormal blood flow signals and other rich hemodynamic information[5]. It is used to check all kinds of blood vessels, digestive system, urinary system, gynecology, obstetrics, glands and other systemic diseases.

Philips HD series color doppler ultrasound, including Envisor, HD6, HD7, HD11, HD15 and other different models, covering both high and low end models, has been popular due to its excellent imaging capabilities.Although the HD series color super model is numerous, but its system platform, hardware type and structure principle are basically similar. Therefore, when encountering some fault types, we can learn from each other and use the same ideas to solve the problem.This paper briefly introduces the structure and principle of HD series color doppler ultrasound, and focuses on the analysis of clinical engineers' thinking and troubleshooting methods when we encounter different types of crash faults in color ultrasound maintenance.

## 2. Fundamentals of HD series color doppler ultrasound

The principle of HD series color doppler ultrasound is basically similar. The system structure is mainly composed of the front part, the back processing part, the display part, the power supply system and other peripherals and accessories. The front part of the system can be referred to as E - Box, which is responsible for the signal transmitting and receiving in the front part of the system, processing the received signal, modulating and demodulating voltage, beam processing and other functions.It includes various ultrasonic probes of different sizes and frequencies, signal acquisition module, beam processing module, etc. The back processing part is mainly composed of image processing module and control module. The control module includes

track ball, touch screen, keyboard, printer and other peripherals, and the display part mainly includes image display. When color doppler ultrasound starts to work, the front part of the system generates synchronized trigger pulse signals, and the signal acquisition module receives ultrasonic signals reflected from human organs and tissues.The beam processing module converts the ultrasonic signals received by the signal acquisition module into high-frequency electrical signals, and the image processing module at the back processing part converts high-frequency electrical signals into video signals to display the human body section on the image display[6-8].

# 3. Failure summary and analysis

In the classic HD series of Philips color doppler ultrasound, if an error message is detected internally, the system will display "Hang" or "Crash", which is occasionally encountered by doctors in daily use. In fact, although the faults caused by these two phenomena may be the same or similar, they each represent different types of faults, and their causes and maintenance methods are also different.

These two types of failure are distinguished to help doctors and clinical engineers distinguish the nature of the two types of failure, so that they can properly deal with the two types of failure and provide the most appropriate treatment for the failed device in a timely manner.

"Hang" refers to the color doppler ultrasound master server hanging, unresponsive. In fact, due to data and software updates, it is sometimes possible for the system to return to normal after waiting for a period of time. However, in the current fault situation, the system does not respond to input from other terminals such as the main keyboard, touch screen or trackball.

"Crash" occurs when the hardware inside the system detects an error state or a software conflict. When crash occurs, the system starts the system conflict recorder, and a dialog box pops up on the screen, The following information is displayed: The instrument has detected an internal error and is collecting information to help diagnose the problem. The machine can not be used normally, the system forcibly shut down.Doctors can do nothing about the situation, but turn to engineers for help.

When the main server of color doppler ultrasound hangs up and has no response, first of all, we should observe the screen. If the time continues to go, the image also changes with time, but the trackball and keyboard have no response. We might as well continue to wait for a period of time, there is a high probability that the main server is only temporary no response. After waiting some time, the host server may resume the response. This is the simplest and cheapest way to handle it. In another case, the dialog box that appears on the screen may be hidden. For example, when the user customizes a maternity preset condition, if the user enters an invalid parameter or a parameter beyond the upper and lower limits, the system will pop up a dialog box indicating that the input is invalid. If the user clicks somewhere outside the dialog box at this time, the server may hang up and wait for the user to click the "OK" command, resulting in no response from the keyboard and trackball operation. The correct way to do this in this case is to click OK in the dialog box and then re-enter the parameters within the range.

The system Crash or software conflict caused by "Crash" encountered by doctors in use is generally divided into two types. The first type is the breakdown of color doppler ultrasound. In this case, every time the machine is powered on, the system will crash. The same happens when you restart the machine, and the system is not working properly.There is nothing a doctor can do about this situation, so he can only seek help from the maintenance engineers of the manufacturer or hospital. The second type of failure is intermittent. A Crash may occur every few days or a week, but the restart usually works normally.

First of all, for these two types of crash, we need to analyze the cause of crash through the log browser in the system, and the error information can provide important information . For example, the error message "Could not establish communication with E-Box" indicates that the servers of front part and back processing part cannot establish a connection. We need to check the hardware related to communication between the front and back processing boards.

When the system crashes, we can see a blue screen or we can see "Corrupted hard drive" on the screen, which means the hard drive is damaged or crashes.In this case, we can fix the problem by reinstalling the software. Hard drive damage is often

caused by incorrect shutdown.In order to prevent the occurrence of hard disk damage, we must let ultrasound doctors remember common operation habit.The ultrasound doctors need to adhere to the correct switching process every day.They must ensure that the system is completely shut down before disconnecting the power cord. If the voltage is often unstable, engineers may consider installing a UPS or a stabilized power supply to prevent transient voltage from affecting the system.

Secondly, if the ultrasonic machine breaks down,as the ultrasonic application cannot start normally ,we cannot view the error log information in the host system . At this point, we can enter the simulation mode. In the simulation mode, the image only shows the noise of the surrounding environment, but other functions of the system application are normal, so we can enter the system background to check the error log information normally.

Finally, in the event of a system crash, it is possible for the RST self-test system to start even if the ultrasound application cannot start.

It is very meaningful to enter the RST self-check mode. First, if you can enter the RST main interface, it indicates that the PC can run normally. Secondly, if the test interface can be opened normally, it indicates that the communication between PC and e-box is normal. At the same time, the test results are very specific to the fault because of the repeated running of the test.

# 4. Conclusion

This paper briefly described the system structure and principle of Philips HD series color Doppler ultrasound,mainly introduced the different causes of the breakdown of HD series color Doppler ultrasound and the corresponding solutions.In view of the different Crash situations caused by "hang" and "Crash", it is necessary to analyze them separately and find appropriate treatment methods to avoid taking some detours for granted, so as to solve the fault more quickly and save the maintenance cost of the hospital.

Ackonwledgements

This work was supported by grants from Innovation Capability Support Plan of Shaanxi Province(2017KCT-36),Natural Science Special Project of Shaanxi Province(2020SF-035).

# References

[1] Hu, J, Zhou, ZY, Ran, HL, et al. Diagnosis of liver tumors by multimodal ultrasound imaging.[J]. Medicine (Baltimore), 2020, 99: e21652.

[2] Laghi Franco A, Saad Marina, Shaikh Hameeda, Ultrasound and non-ultrasound imaging techniques in the assessment of diaphragmatic dysfunction.[J] .BMC Pulm Med, 2021, 21: 85.

[3] Lu, HQ, Sun, S, Zhang, XF, [Research on Quality Evaluation System of Ultrasound Diagnostic Equipment Maintenance]. [J].Chinese journal of medical instrumentation, 2019, 43(3): 223-225.

[4] Nielsen MB, Søgaard SB, Bech Andersen S, et al. Highlights of the development in ultrasound during the last 70 years: A historical review. Acta Radiologica. 2021;62(11):1499-1514.

[5] Katamay R, Fleischlin C, Gugleta K et al. Volumetric blood flow measurement in the ophthalmic artery using colour Doppler.[J] .Klin Monbl Augenheilkd, 2009, 226: 249-53.

[6] Goodman MA, Utilizing airborne/structure borne ultrasound for predictive maintenance inspections[C]// Society for Machinery Failure Prevention Technology Meeting. UE Systems, Inc. 14 Hayes Street Elmsford, NY 10523, 2005.

[7] Zhou, Q, Maintenance of ultrasound diagnostic equipment[J]. China Medical Equipment, 2011.

[8] Xiong, Q, Common Faults and Maintenance of Ultrasound Equipment[J]. Mechanical Management and Development, 2016.

1. Innovation Capability Support Plan of Shaanxi Province (2017KCT-36)；

2. Natural Science Special Project of Shaanxi Province(2020SF-035)

Universe Scientific Publishing

# Auto-Encoder and Representation Learning Based MiRNA-Disease Association Prediction

**Yutao Zhang[1], Xiya Lu[2*]**

**1. Fuzhou University, Fujian 350108, China.**

**2. Beijing Information Science and Technology University, Beijing 100101, China.**

***Abstract:*** As expressions of miRNAs are often associated with diseases, understanding the pathophysiology of illness at the miRNA level is beneficial for the treatment and prevention of associated diseases, as well as the creation of related medicines. Recent computational methods for predicting miRNA-disease associations integrate their pertinent heterogeneous data. The difficulty in this study is how to extract the implied associations from sparse data. In the present study, by drawing on natural language processing, a learning-based method is used to extract dense and high-dimensional representations of illnesses and miRNAs from integrated disease semantic similarity, miRNA functional similarity, and heterogeneous related interaction data. To predict disease-miRNA associations, we use a deep autoencoder and its reconstruction error as a measurement. Our experimental results suggest that our strategy is comparable to cutting-edge methods for predicting disease-related miRNAs.

***Keywords:*** MiRNAs Auto-Encoder Gaussian Interaction Profile Kernel Function

## 1. Introduction

MicroRNAs are single-stranded non-coding tiny RNAs that are produced by the human body[1]. Recently miRNA has been discovered to be engaged in a number of biological processes, including cell proliferation, development, apoptosis, differentiation, and so on, thanks to the fast growth of genome sequencing technology and computer technology, according to quantities of studies. Understanding the pathophysiology of illness at the miRNA level is beneficial for the treatment and prevention of associated diseases, as well as the creation of related medicines.

Therefore, it's a popular topic about predicting miRNA and its potential disease subjects in the field of biomedicine. This has aided in the study of disease etiology, the development of novel medicines, and the formulation of customized diagnoses and treatments for a variety of complicated human diseases. Thus, we should build an accurate and efficient model in order to study the potential link between microRNA and disease. Computational prediction models not only rely on expensive and time-consuming biological experiments, but can also play a role by predicting the association of potential miRNAs with diseases and prioritizing candidate miRNAs. In addition, doing research about this topic can also create and promote befitting prediction models.

## 2. Research methods

## 2.1 Mirna-disease relationships

The Human MicroRNA Disease Database provided the miRNA-disease data used in this research (HMDD). The database contains thousands of experimentally validated miRNA illness correlations. With 5430 documented correlations, HMDD v2.0 contains 492 miRNAs and 329 illnesses. And there are 1206 miRNAs and 893 diseases in HMDD v3.2, with 35548 verified associations. We linked this research's data collection to a database of 492 miRNAs and 329 diseases for this investigation. We obtained 12030 known relationships between miRNAs and illnesses from HMDD after processing the data. We use a matrix A to represent disease and RNA. If there is a link between miRNA mi and disease dj, then Aij = 1, if there is no association or there may be an association but currently it is not found, then Aij=0. Therefore, the miRNA-disease

association matrix is a two-dimensional matrix composed of 0 and 1.

## 2.2 Disease semantic similarity

The National Library of Medicine provided the mesh database, which includes numerous illness descriptions. The illness semantic similarity was calculated using a directed acyclic graph (DAG). We define A(D) and B(D) for the node D. The node set is A(D), while the edge set is B(D). Node D and its ancestor nodes are included in A(D), and B(D) reflects the direct relationship between the parent and child nodes. The disease semantic similarity matrix is defined by SS, and the similarity between diseases di and dj is denoted by SS(di, dj).

## 2.3 Functional similarity of mirna

Based on the notion that miRNAs with similar activity are frequently associated with similar illnesses. The similarity of two miRNAs can be assessed by analyzing the similarities of two diseases associated with miRNAs. In our research, we got the data directly and then utilized it to generate a 383x383 matrix MS. MS (mi, mj) represents each element in MS and displays the functional similarity of miRNA mi and mj. SD is the same size as SS and KD, with the exception that SD, a is the weight, which can range from 0 to 1. Variable values produce significantly diverse prediction outcomes, which will be explained.

## 2.4 Gaussian interaction profile kernel similarity

In our study, in order to transform the originally sparse and discontinuous data into dense and continuous data, we chose to use Gaussian interaction profile kernel function. Using known human miRNA–disease data, Gaussian similarity for both miRNAs and illnesses can be estimated. We constructed a matrix which is 383x383 and 492x492 respectively representing for MiRNA similarity and disease similarity. The Gaussian interaction kernel similarity of illnesses is represented by GD(di, dj). Similarly, the miRNA Gaussian profile interaction kernel similarity is denoted by GM(mi, mj).

## 2.5 Representation

In this article, in order to further make the data dense for extracting the implied associations, we drew on techniques from natural language processing to train two models to represent diseases and miRNA by learning vectors of representation, using the word embedding method.

Firstly we numbered each disease and miRNA with a unique number. it was utilized as a search to obtain vector di from an embedding matrix d, with each row indicating a different miRNA or illness. d is initialed at random. and then, after a number of epochs of training, we can obtain the characteristics of the specified dimension.

The illness semantic similarity is a matrix that is sparse, and utilizing it alone is challenging to obtain appropriate prediction performance. furthermore, the kernel similarity of the gaussian interaction profile GD is estimated using known human miRNA–disease relationships, which is insufficiently precise. so, to get great prediction performance, it is essential to combine the disease semantic similarity ds with the gaussian interaction profile kernel similarity gd. we just let them add up linearly like:

$$DSS(d_i,d_j) = \alpha DS(d_i,d_j) + (1-\alpha)GD(d_i,d_j)$$

DSS has the same dimensions as DS and GD. DSS has the same dimensions as DS and GD. And the weight, whose value is between 0 and 1. Varied values result in dramatically various prediction results. According to earlier research, each component in matrices DS and GD is in the range [0,1]. Our approach takes DSS($d_i$, $d_j$) as the distance between two illnesses, di and dj. Cosine similarity can be used to compare the similarity of two vectors. that is extensively used in data mining and information retrieval. It is based on the cosine of the angle between them. We employed cosine similarity to assess the distance between two illnesses, and DSS is used as labels for ground-truth. In order to get a non-negative within the range of [0,1], we calculate it in the following way:

$$DSSD(d_i,d_j) = \frac{1}{2} + \frac{1}{2}\frac{d_i \cdot d_j}{||d_i||d_j||}$$

Here, di is the vector that represents the illness, di. SD0 represents the calculated distance between illnesses di and dj,

while SDdi represents the ground-truth similarity. To learn disease representation D, we built a regression model. In high-dimensional disease spaces, two vectors with a high similarity score are significantly comparable. As indicated below, the di disease model seeks to reduce loss across all samples:

$$argmin\frac{1}{N_d}\sum^{N_d}||DSSD(d_i,d_j)^2 - DSS(d_i,d_j)^2||$$

where the number of training samples is denoted by Nd. At each training iteration, as a criterion, the mean squared loss is used, and the disease matrix D is updated using the stochastic gradient descent (SGD) approach with backpropagation.As for the representation of miRNA, we use the same method.

## 2.6 Integration strategies and predicting

To begin, we use the Word Embedding function to vectorize the words. The disease representation vector and miRNA representation vector processed by the embedding function are spliced into disease-miRNA pairs. Then we utilize an autoencoder, which is an unsupervised learning approach initially developed by Hinton in the 1980s.There are two components to our autoencoder: encoding and decoding. The input is compressed into a low-dimensional vector in the encoding phase, and the decoding part restores the vector to the original input as the output. The backpropagation algorithm makes the two parts the same.

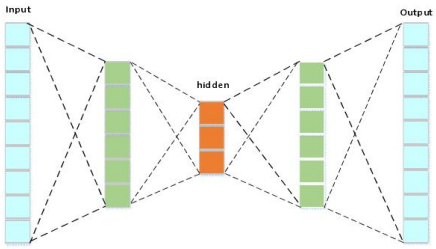


Figure 1 Auto-encoder process diagram

Finally, our autoencoder's loss is the total of all restructuring mistakes from all training samples, and it is stated as follows:

$$l(x,\tilde{x}) = \sum_{i=1}^{N} j(x_i - \tilde{x}_i)j^2 + \lambda j J_h(x_i)j^2$$

The number N represents the number of known miRNA and disease relationships. The squared loss is the first loss item, the hyperparameter is $\lambda$. The deep autoencoder is trained to reduce the aforementioned loss, and autoencoder parameters are updated on a regular basis.

# 3. Results

## 3.1 The data information

The Human microRNA Disease Database provided us with the mi-RNA-disease data (HMDD). There are 1206 miRNAs and 893 diseases in HMDD v3.2, with 35548 verified associations. We linked the data collected in this investigation to a database containing 492 miRNAs and 329 diseases. And we found 12030 known relationships between miRNAs and illnesses from HMDD after analyzing the data. Then we gained the mesh database from the National Library of Medicine. The illness semantic similarity was calculated using a directed acyclic graph(DAG).

## 3.2 Analysis and comparison

To correctly measure the model's prediction performance, use the average AUC, AUPR, precision, recall, and F1 of 10 5-fold cross-validation as assessment markers, where The area under the ROC curve with FPR as the abscissa and TPR as the ordinate is known as AUC, whereas the area under the PR curve is denoted as AUPR, with recall as the abscissa and accuracy as the ordinate:

$$TPR = TP / (TP + FN)$$
$$FPR = FP / (FP + TN)\, recall = TP / (FP + TN)$$
$$precision = TP / (TP + FP)$$

**Figure 1 Comparison of AUC values of different methods in three diseases**

| Types | WBSMDA | HDMP | MIDP | Our method |
|---|---|---|---|---|
| **breast cancer** | 0.7538 | 0.7959 | 0.8057 | 0.8262 |
| **lung cancer** | 0.8002 | 0.9059 | 0.8924 | 0.9266 |
| **colon cancer** | 0.7053 | 0.8120 | 0.7971 | 0.8704 |

Table 1 shows the experimental outcomes. It indicates that our method has the highest AUC in lung cancer, reaching 0.9266; The average AUC values of MIDP, WMSMDA and HDMP algorithms are 0.8317, 0.7531, 0.8081 and 0.8744.The performance is slightly better than other algorithms.

WBSMDA, miRNAs were discovered by combining known miRNA-disease connections, miRNA functional similarity, disease semantic similarity, and Gaussian interaction profile kernel similarity. The final score for putative miRNA-disease association inference was computed by combining the Within-Score and Between-Score[2]. HDMP, people created a computer model of human disease-related miRNA prediction (HDMP) by taking into account each miRNA's k most comparable neighbors. To generate more trustworthy relevance ratings for the unlabeled miRNAs, the k closest neighbors of each miRNA and miRNA functional similarity were merged. Furthermore, HDMP gave more weight to miRNAs that were part of the same miRNA family or cluster[3]. MIDP, people created a computer model of human disease-related miRNA prediction (HDMP) by evaluating each miRNA's k most comparable neighbors. The k closest neighbors of each miRNA and miRNA functional similarity were used to generate more trustworthy relevance ratings for the unlabeled miRNAs. Furthermore, HDMP gave more weight to miRNAs in the same miRNA family or cluster[4].

In the miRNA-disease association prediction task, our method was compared with DNN,RWR_DNN and MCMDA. The analysis of AUROC, AUP-R, Precision and F1-score shows that our method is slightly better than others.

DNN, DNNs map input data into a low-dimensional space using many layers of non-linear functions, encapsulating highly non-linear network structure in efficient low-dimensional characteristics. DNN's multi-layer design is essential for learning richer network representations[5]. RWR, for each miRNA-disease combination, people mapped the disease's causative genes and miRNA target genes into the PPI network. The random walk with restart (RWR) technique was then used to generate a gene rank list. In the above-mentioned gene list, each miRNA target gene was assigned a likelihood value. The higher the likelihood value, the closer the miRNA target gene was to a known illness gene[6]. MCMDA, based on the known miRNA-disease connections, people presented a matrix completion technique for MDA (MCMDA). For predicting possible connections, MCMDA used the matrix completion technique to update the adjacency matrix of known miRNA-disease relationships[7].

# 4. Discussion

Prediction of miRNA-disease association is a research hotspot in recent years, which has far-reaching significance for revealing the mechanism of complex diseases at the molecular level, so it has important research value. Most of the methods used to calculate and forecast disease-related miRNA make use of similarity data, and some approaches do not make full use of biological data in similarity calculation, thus the use of known correlation data is not explored thoroughly. However, major

challenges in current research include small sample sizes, a lack of negative sample data, and related miRNA prediction of new illnesses.

In this research, we used the Gaussian interaction profile kernel function to transform sparse and discontinuous data into dense and continuous data. And then we made use of natural language processing techniques to train two models to describe illnesses and miRNA by learning vectors in order to make the data more continuous. We integrated by using Word Embedding and Autoencoder. In fact, our results is similar to other methods.

According to existing research, while this work analyzes and explores the prediction of disease-associated miRNA and addresses certain difficulties, there are still some issues to be resolved and opportunity for development at this point.

Firstly, The method in this paper does not use multiple sources of miRNA or disease-related data, but only based on the miRNA-disease association, disease semantic similarity, functional similarity of miRNA, and Gaussian interaction kernel similarity are estimated. Maybe, some gene expression data as well as topological information.

What's more, integrating two similarities using a regression model is not necessarily a good approach in my opinion. It's better to use some other methods such as autoencoder for multi-source data integration[8].

Due to time limitations, we will try these possibilities in our future studies and research.

# 5. Tables and figures

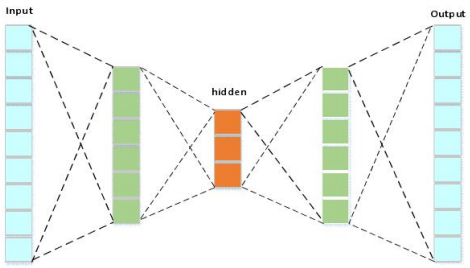


Figure 1 Auto-encoder process diagram

**Table 1 Comparison of AUC values of different methods in three diseases**

| Types | WBSMDA | HDMP | MIDP | Our method |
|---|---|---|---|---|
| **breast cancer** | 0.7538 | 0.7959 | 0.8057 | 0.8262 |
| **lung cancer** | 0.8002 | 0.9059 | 0.8924 | 0.9266 |
| **colon cancer** | 0.7053 | 0.8120 | 0.7971 | 0.8704 |

**Table 2 5-fold cross validation results of different models**

| Types | AUROC | AURP | Precision | Recall | F1-score |
|---|---|---|---|---|---|
| **DNN** | 0.9322 | 0.9279 | 0.8688 | 0.8101 | 0.8324 |
| **RWR_DNN** | 0.9199 | 0.9203 | 0.8380 | 0.8507 | 0.8442 |
| **MCMDA** | 0.9229 | 0.9315 | 0.8483 | 0.8697 | 0.8587 |
| **Our method** | 0.9420 | 0.9408 | 0.8720 | 0.8987 | 0.8736 |

# References

[1] Wang, X Z., 2020. A Research on Prediction Method of Disease Related-miRNA Based on Biased Heat Conduction Recommended Algorithm.

[2] Chen, X., Chenggang ClarenceYan, et al, 2016. WBSMDA: Within and Between Score for MiRNA-Disease Association prediction.

[3] P. Xuan, K. Han, M. Guo, Y. Guo, J. Li, J. Ding, Y. Liu, Q. Dai, J. Li, Z. Teng, 2013 Prediction of microRNAs associated with human diseases based on weighted k most similar neighbors, PLoS One 8.

[4] P. Xuan, K. Han, Y. Guo, J. Li, X. Li, Y. Zhong, Z. Zhang, J. Ding. 2015 Prediction disease-associated microRNAs based on random walk.

[5] EdgarManzanarez-Ozuna, Dora-Luz Flores, EverardoGutiérrez-López, David Cervantes and Patricia Juárez,2018. Model based on GA and DNN for prediction of mRNA-Smad7 expression regulated by miRNAs in breast cancer.

[6] Liao, F., Chen, X., Peng, PL., Dong, WG., 2020, RWR-algorithm-based dissection of microRNA-506-3p and microRNA-140-5p as radiosensitive biomarkers in colorectal cancer.

[7] Li, J.-Q. et al. 2017 MCMDA: matrix completion for MiRNA–disease association prediction. Oncotarget, 8, 21187–21199.

[8] Vladimir Gligorijević, Meet Barot, Richard Bonneau, deepNF: deep network fusion for protein function prediction, Bioinformatics, Volume 34, Issue 22, 15 November 2018, Pages 3873–3881.

Universe Scientific Publishing

# Effect of Two Kinds of Bone Replacement Materials on Bone Formation in Repairing Bone Defects around Mandibular Posterior Area: A Case Study of Bone Defects around Mandibular Posterior Area Caused by Boxing

**Yuxian Zhang, Yao Huang, Xinyi Chen, Jingchen Zhang, Jiayi Gao, Yibo Wang, Yekun Deng***
**Suzhou University, Suzhou 215031, China.**

***Abstract:*** Objective: To investigate the effect of two kinds of bone replacement materials on bone formation in repairing bone defect around mandibular posterior area. Methods: A total of 60 patients with Bone defects around mandibular posterior area caused by boxing were selected from a hospital from January 2020 to June 2020. They were divided into Perio Glas (group P) and Bone Plant (group B) by random number table method, with 30 patients in each group. Perio Glas Bone graft was used in group P and Bone Plant graft was used in group B. The vertical height and buccal lingual bone plate width of the two groups were observed at baseline and after treatment, and the success rate of implants was compared between the two groups. Results: The success rate of implant in group P was significantly lower than that in group B ($P < 0.05$). The vertical height and buccal lingual bone plate width in group P were significantly lower than those in group B ($P < 0.05$). Conclusion: Compared with Perio Glas, Bone Plant can better maintain the vertical height and buccal lingual Bone plate width of patients with Bone defects around mandibular posterior area caused by boxing, and has better effect of inducing Bone regeneration and osteogenesis.

***Keywords:*** Materials; The Mouth; Bone Regeneration; Implant

## 1. Introduction

Oral and maxillofacial injuries are the most common injuries in boxing. Oral and maxillofacial injuries caused by boxing are characterized by high incidence, high treatment cost and long treatment time, etc., and have long been the issue of highest concern [i]. Guided bone regeneration technology has been clinically established in the field of bone graft repair of bone defects [ii]. At present, Perio Glas and Bone Plant are artificial inorganic Bone replacement materials commonly used in oral and maxillofacial Bone grafting to repair Bone defects. Perio Glas and Bone Plant have different physical and chemical properties and osteogenic properties. There are few reports on the effect of Bone regeneration and osteogenesis induced by Perio Glas and Bone Plant in repairing Bone defects around mandibular posterior area. In order to provide reference for the clinical treatment of the bone defects around the mandibular posterior teeth caused by boxing, the effects of two kinds of bone replacement materials on the bone formation of the defects around the mandibular posterior teeth were studied.

## 2. Material and methods

### 2.1 General information

A total of 60 patients with Bone defects around posterior teeth caused by boxing were selected from A hospital from January 2020 to June 2020. They were divided into Perio Glas (group P) and Bone Plant (group B) by random number table method, with 30 patients in each group. P group, gender: 18 males, 22 females; The age ranged from 52 to 79 years, with an average of (68.81±5.25) years. Group B, gender: 17 males and 23 females; The age ranged from 53 to 80 years, with an average of (68.43±5.14) years. Inclusion criteria: Cone-beam CT examination indicated bone defects around the mandibular

posterior tooth area, and immediate implant treatment was planned; The remaining buccal and lingual width of the implant site and the height of the remaining bone were sufficient. Exclusion criteria: severe bone defect, periodontal disease and gingivitis; Malocclusion, night bruxism and lateral mastication.

## 2.2 Material

Perio Glas (manufacturers: American states biological products co., LTD., approval number: feed the drug safety machinery (into) the word no. 2003585, 2015 materials and ingredients: silicon dioxide, sodium oxide, calcium, phosphorus pentoxide, biocompatibility: good, indications: periodontal bone defects, maxillofacial surgery, bone defect filling, adverse reactions: Not). Bone Plant (Manufacturer: EZEKIEL Company, Korea, Approval No. : China Food and Drug Administration Wu (Jin), 2015 No. 3510312, material composition and composition: hydroxyapatite, tricalcium phosphate, biocompatibility: good, indication: periodontal Bone defect, maxillofacial surgery Bone defect filling, adverse reaction: none).

## 2.3 Surgical method

Minimally invasive flap implantation was used in both groups. 0.2% compound chlorhexidine gargled for 2.0-3.0 min, routine disinfection area of iodophor was covered with towel, local infiltration of lidocaine anesthetized mandibular rear tooth planting area, residual teeth were extracted, granulation tissue was removed, and physiological saline was rinsed. Alveolar ridge top horizontal incision to stick under the periosteum, buccal do zhang incision reduction, stripping periosteum separator sticky periosteal flap, exposed alveolar bone, pioneer drilling and reaming, parallel bar detection embedded direction, step by step to enlarge Kong Bei hole diameter, default saline flushing, observe the granulation tissue residue, implants implanted suitable types, manual torque, torque wrench Ensure that the implant torque > 35 N•cm to ensure the initial stability of the implant, implant covered with screws. Perio Glas or Bone Plant were implanted into the Bone defect area around the implant, and bio-Gide bio-collagen membrane was cut into appropriate size to cover the Bone replacement material, and the window was tightly sutured to ensure no Bone powder and periosteal exposure in the operative area. Postoperative oral antibiotics for 6 d, oral losolprofen sodium tablets or ibuprofen sustained-release capsules for local analgesia, 1 week later, stitches removed. Six months after the operation, the abutment was installed and repaired, the abutment horizontal impression model was made, the fixed denture was made, and the abutment was connected and fixed by 4 ~ 6 longitudinal screws.

## 2.4 Observation target

Implant success rate: evaluated 12 months after treatment, success was defined as no loosening of the implant, radiology suggested no low-density shadow around the implant, bone absorption less than 0.2mm after implant loading, and no discomfort, pain, numbness and other symptoms.

Bone tissue indicators: Cone-beam CT was taken at baseline and 12 months after treatment to measure the width and vertical height of buccal and lingual bone plates. The width and height of alveolar bone in the dental implant area were measured along the buccal and lingual bone plates, respectively, and the mean value of 3 measurements was taken.

## 2.5 Statistical method

All data were statistically processed by SPSS 20.00 statistical software. If the measurement data were normally distributed, the comparison between groups was performed by independent sample T test in the form of mean ± standard deviation (). The counting data were expressed in the form of N (%) by chi-square test. Test level $\alpha$=0.05.

# 3. Results

## 3.1 Comparison of implant success rate between the two groups

The success rate of implant in group P was significantly lower than that in group B ($P < 0.05$). See table 1.

Table 1 Comparison of implant success rate between the two groups [N (%)]

| Group | Number of implants | Failure | Successful |
|---|---|---|---|
| P | 67 | 12（17.91） | 55（82.08） |
| B | 65 | 4（6.15） | 61（93.84） |
| $X^2$ | | | 4.281 |
| *P* | | | 0.000 |

## 3.2 The vertical height and buccal lingual plate width of the two groups were compared at baseline and after treatment.

The vertical height and buccal lingual bone plate width in group P were significantly lower than those in group B (P < 0.05). Are shown in table 2.

Table 2 Comparison of vertical height and buccal and lingual plate width between baseline and after treatment [ $\overline{x} \pm s$ ]

| Group | Vertical height（mm） | Width of the buccal-tongue side bone plate（mm） |
|---|---|---|
| P（*n*=30） | | |
| Baseline period | 1.46±0.25 | 4.66±0.45 |
| Post-treatment | 4.15±0.33 | 5.09±0.46 |
| B（*n*=30） | | |
| Baseline period | 1.44±0.27* | 4.60±0.54* |
| Post-treatment | 5.13±0.48△ | 6.27±0.51△ |

Note: Compared with P group, t=0.297, 0.467, *P > 0.05; T =9.215, 9.410, △P < 0.05.

# 4. Discussion

After the defect of bone around the mandibular posterior area, the alveolar bone is absorbed due to the increase of occlusal load and lack of corresponding physiological stimulation, and the residual alveolar bone width is often insufficient. Oral implant repair In order to achieve good oral aesthetics and long-term implant stability, patients treated with implant implantation need guided bone regeneration therapy to support the required bone mass during implant implantation [iii]. Guided bone regeneration technology uses biofilm barrier to protect bone defects and bone replacement materials, block the external influence on the bone graft area, promote the generation of bone regeneration fibrocells, and support the space required for osteogenesis of osteoblasts, which can effectively solve the problem of bone defects encountered in implant surgery.

In Perio Glas, calcium and phosphorus can form carbonate hydroxyapatite layer under the influence of P-H value, causing calcium and phosphorus plasma migration, calcium phosphate and silicon release, stimulating osteoblast proliferation, further generating collagen fibers, forming bone-bioglass interaction interface, and mediating bone regeneration. However, Perio Glas has certain limitations. Perio Glas bioglass has high brittleness, and the planting effect is not ideal for planting areas with excessive pressure load [iv]. Bone Plant is a new concept 3D-channel matrix porous massive Bone replacement material, which is designed and improved on the basis of traditional Bio-OSS theory. It is composed of 60% hydroxyapatite and 40% tricalcium phosphate, and is a hexahedral tubular honeycomb structure. Compared with the traditional Bio-OSS particles, the defects of bone meal loss and difficult to maintain the spatial structure of the defect site in the process of bone grafting can be solved to a certain extent. For large bone defects, the matrix porous block bone structure can retain the block shape. For small bone defects, the bone can also be crushed into granular shape, with flexibility and practicality. After Bone Plant is broken, it becomes a cavity structure instantly due to the special 3D-channel structure, which is stably fixed at the

Bone defect site and can maintain a certain area of Bone graft. After gently pressing, the cavity structure is closed instantly, forming a dense and closed Bone graft effect, which significantly reduces material flow, dispersion and displacement. Secondly, the porous structure of Bone Plant can absorb part of blood to play a hemostatic role, and can increase the contact between artificial Bone meal and blood hemoglobin factor, providing blood supply and nutrients for new Bone regeneration. The porous structure of Bone Plant can effectively absorb Bone marrow blood, thus leading to Bone conduction and inducing Bone tissue regeneration. Therefore, Bone Plant has more advantages in maintaining the spatial structure stability of regenerated Bone [v].

# 5. Conclusion

In order to more objectively verify the effect of two bone replacement materials on bone formation in repairing the bone defect around mandibular posterior area, t test was used to compare the bone tissue indexes of vertical height and buccal and lingual bone plate width of the two groups at baseline and after treatment, and chi-square test was used to compare the success rate of implants between the two groups. The results showed that the success rate of implant in group P was lower than that in group B. The vertical height and buccal lingual bone plate width of group P were lower than that of group B. In conclusion, compared with Perio Glas, Bone Plant can better maintain the vertical height and buccal lingual Bone plate width of patients with Bone defects around the mandibular posterior area caused by boxing, and has a better effect of inducing Bone regeneration and osteogenesis.

In conclusion, this study investigated the effect of two bone replacement materials on bone formation in repairing the bone defect around the mandibular posterior area.

# References

[1] Hu, WH, Shao, Y, Li, ZD, et al. Analysis of the mechanism of blunt force splenic injury based on finite element method [J]. Journal of Southern Medical University, 201, 41(3): 430-438.

[2] Li, QQ, Effect of membrane-guided bone regeneration technique on immediate dental implant and its effect on bone repair [J]. Clinical research, 2019, 27(4): 109-110.

[3] Meng, L, Jin, L, Liu, Y, Effect of guided tissue regeneration combined with bone grafting on periodontal intramedullary defect [J]. Chin J aesthetic medicine, 2019, 28(3):136-138.

[4] Li, H, Luo, WP, Yang, Z, PerioGlas bone replacement for maxillary anterior dental implants [J]. Chinese Journal of Aesthetic Medicine, 201, 30(3): 138-141.

[5] Lee, WM, Comparison of osteogenic ability and effect of bio-OSS and Bone Plant in immediate mandibular posterior area surrounding Bone defect [D]. Chongqing: Chongqing Medical University, 2018.

About the authors：Yuxian Zhang 1998.10, Han,Zhijin County, Bijie City, Guizhou Province, Suzhou University, Cells, Bone development, 215031.

Universe Scientific Publishing

# The Development Prospect of Chinese Rehabilitation Specialist Nurses under the Background of Aging

**Dandan Zheng[1], Heyu Wu[2*], Daniel Kyei Frimpong[1]**

**1. Health Science Center, Yangtze University, Jingzhou 434000, China.**

**2. Union Hospital, Tongji Medical College, Huazhong University of Science and Technology, Wuhan 430000, China.**

***Abstract:*** **Objective:** To explore the correlation between the supply-demand contradiction and development of rehabilitation nursing talents in China through the analysis of China's aging population. It provides ideas for the increasingly professional and regularization of rehabilitation nursing in China, and provides evidence-based suggestions for the employment of rehabilitation specialist nurses. **Design:** Review Article. **Methods:** Literature review. **Finding:** Due to the traditional concept of Chinese society and the low recognition of rehabilitation specialist nurses, the training institutions for rehabilitation specialist nurses are not perfect, and the education level of rehabilitation specialist nurses is uneven, making it difficult to meet the needs of Chinese rehabilitation nurses. **Conclusion:** Call on more nursing talents to participate in the construction of rehabilitation nursing in China.Explore the prospects for the development of rehabilitation specialist nurses around the world, take China as an example, and provide evidence-based advice for the employment of rehabilitation specialist nurses.

***Keywords :*** Rehabilitation Nurses; Aging; Chinese Nurse; Specialist Nurses

## 1. Definition of Rehabilitation Specialist Nurse

A specialist nurse refers to a clinical registered nurse with a high theoretical level and practical ability in a certain clinical nursing field, skilled in applying the theory and skills of specialist nursing, able to independently solve difficult problems of a specialist, specializing in the professional nursing, and rich in clinical experience. Nurses[1], whose basic responsibilities include clinical nursing, clinical management, teaching, nursing consultant and clinical research[2]. Rehabilitation nursing is an important branch of nursing. It is based on the requirements of the general rehabilitation medical plan, around the goal of comprehensive rehabilitation, and cooperates with other rehabilitation professionals to carry out functional recovery and functional reconstruction for people with various functional disabilities due to injuries, illnesses and disabilities. training guidance and comprehensive care[3]. At present, it is mainly divided into orthopaedic rehabilitation specialist nurses, stroke rehabilitation specialist nurses, geriatric rehabilitation specialist nurses, convalescent rehabilitation specialist nurses, and disabled and chronic disease rehabilitation specialist nurses[4]

## 2. The relationship between aging society and rehabilitation specialist nurses

Under the background of China's aging and the epidemic, the shortage of rehabilitation specialist nurses is becoming more and more serious. Rehabilitation care is based on the premise and foundation of increased training of health and social care professionals.With the development of society, the acceleration of the aging process and the change of people's medical and health needs and concepts, the requirements for disease treatment are no longer limited to prolonging life, but more emphasis on functional recovery, social participation ability recovery and improvement of quality of life, etc., so that the The demand for rehabilitation nursing is increasing, therefore, the training of specialist nurses to speed up rehabilitation is very necessary in the context of China's aging society. The "National Nursing Career Development Plan (2016-2020)" also clearly

proposes "expanding the field of nursing services", which means that the Chinese nursing industry will form a situation in which rehabilitation nursing, clinical nursing and home nursing are integrated and developed in parallel[5].

## 3. The development status of Chinese rehabilitation nursing talents

In recent years, the training of rehabilitation specialist nurses and the development of rehabilitation nursing in China have received extensive attention from all walks of life. Taking elderly rehabilitation nursing as an example, there are currently fewer than 300,000 nursing personnel in Chinese nursing institutions, of which only 40,000 hold practicing certificates. According to the internationally recognized proportion of three elderly people needing one professional nursing talent, the demand for elderly rehabilitation nursing talents in my country is about 10 million, and the supply and demand are seriously imbalanced[7]. Rehabilitation and physiotherapy institutions all over the country are in urgent need of rehabilitation nursing professionals, and the contradiction between supply and demand is very serious. On the one hand, there is an oversupply of rehabilitation nursing service personnel, and there is a huge gap; on the other hand, nurses trained in colleges and universities are only willing to work in tertiary hospitals, and are not willing to work in their peers. This situation is largely due to the fact that the current nursing talent guarantee system for rehabilitation nursing services in my country is not perfect, and it is unable to attract professional nursing talents to join the rehabilitation career[8][9].

## 4. Provide educational opportunities and proportionate remuneration for rehabilitation nurses

2021 General Office of the State Council. The National Development and Reform Commission's "Work on Promoting the Shortcomings of the Life Service Industry to Improve the Quality of People's Life" proposes to strengthen the training of undergraduate-level talents and support nursing, rehabilitation, housekeeping, childcare and other related majors. Strive to increase the number of undergraduates in nursing, rehabilitation, home economics, childcare and other life service industries by 100,000 compared with 2020 by 2025[6]. In order to meet the social and market demand, take the international health and social care professionals' professional core literacy standards as the core, vigorously promote the construction of relevant rehabilitation nursing professions in China, reform the talent training mode, cultivate talent training programs, reform the curriculum teaching methods, establish a diversified evaluation system, and train professional health and social care Professional talents to fill the gaps in the industry are of great significance to improve the quality of care and promote the development of the rehabilitation nursing industry[10].The issue of remuneration and benefits directly affects nurses' career choice, and on the other hand, it also largely affects nurses' work attitude and polarity. With such social perceptions, the salary level of rehabilitation nursing has remained low for a long time and lacks social security.

## 5. Rehabilitation nurses are in touch with internationalization to reform the talent training model

In recent years, different levels of nursing skills competitions have been carried out from the whole country to the provinces and cities, which have had a positive impact on improving the comprehensive ability and practical operation of nursing students. Therefore, the effectiveness of the programme design and implementation of the World Skills Competition, the National Clinical Skills Competition for College Students in Higher Medical Schools, the National Vocational College Rehabilitation Professional Skills Competition, and the Local College Nursing Competition were summarised. The competition promotes learning, teaching, reform and construction, promotes nursing education and teaching reform, continuously improves students' comprehensive ability, and builds a socialist geriatric nursing competition mechanism with Chinese characteristics. national conditions, help improve the training of rehabilitation nursing talents, and cultivate excellent talents for the rehabilitation nursing profession.The development of the rehabilitation nursing profession is of great

importance to the development of professional health and social care personnel in China, and is crucial to improving the quality of care and promoting the development of the healthcare sector.

# Discussion

Globally, the New Coronary Pneumonia epidemic that began in 2020 has had a profound and long-term impact on human social development, with the health protection of vulnerable groups increasingly affected by the epidemic as it becomes more widespread in scale and scope, longer in duration, and more influential and destructive. The rehabilitation nursing profession adapts to the needs of the society and the market, and the training of practitioners is a test, opportunity and challenge. It is an extended service and an important supplementary role of medical care. To achieve the strategic goal of a healthy China, we must start with all-round and full-cycle medical and health services for the people, improve the comprehensive quality of rehabilitation and nursing personnel, and attach importance to and improve the personnel training and service quality of various types of medical and health services at all levels.attract a large number of nursing talents with appropriate policies, provide considerable salary levels and opportunities, allow more nursing staff to practice in the rehabilitation nursing business, and fill the vacancies of professional rehabilitation nursing staff. as well as community nurses and other healthcare occupations.

# References


[1] Wickham S. What are the roles of clinical nurses and midwife specialists[J]. Br J Nurs, 2013, 22 (15) : 867-75.

[2] Ma, WH, Wang, XQ, Yang, Q, & Xu, ZQ. (2009). The current situation and suggestions of rehabilitation nurse training in my country. Journal of Nursing Management (10), 28-29.

[3] Zheng, CE, Li, XY. Practical rehabilitation nursing [M]. Beijing: People's Health Publishing House, 2012: 3-10.ining in my country. Journal of Nursing Management (10), 28-29.

[4] Moginnes, A, Easton, S, Williams, J, et al. The role of the community stroke rehabilitation nurse[J]. Br J Nurs, 2010, 19 (16) :1033-1038.

[5] Medical Administration. Interpreting the National Nursing Career Development Plan (2016-2020)[EB/OL].(2016-11-24)[2020-07-12].

[6] General Office of the State Council. National Development and Reform Commission," Several Opinions on Promoting the Living Service Industry to Make Up for the Shortcomings and Improve the Quality of People's Life" State Office Letter [2021] No. 103 [EB/OL].[2021-10-13].

[7] Cheng, CP, & Wu, C, (2018). A study on the development of old-age health industry in developed countries under the health strategy: A case study of the United States, Germany, and Japan. Contemporary economic management(03), 83-88.

[8] Wang, Y, Wang, JD, Zhou, CY, Wang, CQ, & Zhu, Y, (2019). Multiple collaborative participation in the combination of medical and nursing services for the elderly in China. Medicine and society (12), 61-64. The doi: 10.13723 / j.y xysh. 2019.12.015.

[9] Peng, DD. (2019). A healthy aging, medical research and investment issues (Ph.D. Dissertation,central university of finance and economics). https://kns.cnki.net/KCMS/detail/detail.aspx?dbname=CDFDLAST2021&filename=1 020606265.nh

[10] Song, LJ, Zhu, AY, Du, M, & Jiang, Y, (2020). Thinking on health and social care talent cultivation based on the achievement transformation of world Skills Competition. Guangdong vocational and technical education and research (06), 171-174.

Universe Scientific Publishing

# Quantitative and Qualitative Research on the Fear of Recurrence and the Belief in Prevention of Recurrence in Elderly Patients with Coronary Heart Disease

**Bing Zhang[1#], Lingling Li[2#], Shaojing Tian[1], Yakun Wang[1], Shuo Yang[1], Yanling Li[2], Bei Wang[3#*]**

**1. Department of Emergency Medicine, Affiliated Hospital of Hebei University, Baoding 071000, China.**

**2. Department of Tuberculosis, Affiliated Hospital of Hebei University, Baoding 071000, China.**

**3. Department of Obstetrics, Affiliated Hospital of Hebei University, Baoding 071000, China.**

**# These authors contributed equally to this work.**

***Correspondence author: Bei Wang, Department of Obstetrics, Affiliated Hospital of Hebei University.**

***Abstract:*** **Objective**: To explore the fear of recurrence and the belief in prevention of recurrence in elderly patients with coronary heart disease. **Methods**: A total of 178 elderly patients with coronary heart disease were included, and quantitative and qualitative research methods were used to explore the fear of recurrence and the belief in prevention of recurrence in elderly patients with coronary heart disease. The quantitative research tool was a self-made fear of coronary heart disease recurrence questionnaire; the qualitative research was guided by the phenomenological method, semi-structured in-depth interviews with 11 elderly patients with coronary heart disease, and the data were collected by recording, and the Colaizzi method was used to analyze the data. **Results** Elderly patients with coronary heart disease were afraid of recurrence; they knew the etiology of coronary heart disease, but the controllable rate of the cause and effect was extremely low. **Conclusion**: Due to the belief in fatalism and the lack of control over the etiology of coronary heart disease, elderly patients with coronary heart disease are afraid of recurrence.

***Keywords:*** Elderly; Coronary Heart Disease(Chd); Fear of Recurrence; Health Beliefs; Quantitative and Qualitative Research

## 1. Introduction

Coronary atherosclerotic heart disease (CHD), referred to as coronary heart disease, is a common cardiovascular disease in the elderly, mainly due to the imbalance of coronary blood flow and myocardial demand caused by coronary organic lesions. Myocardial damage is characterized by chronic persistence and high recurrence[1]. According to a survey, the recurrence rate of CHD patients is as high as 40%[2]. Secondary prevention is the focus, but prevention has little effect. At present, with regard to the recurrence of CHD, it is uncertain whether it is a medical and lifestyle issue or a psychosocial issue. Although patients want to learn more about preventing relapse in CHD, there is a lack of knowledge about their beliefs about perceived risk factors being controllable, and therefore, beliefs that risk factors are uncontrollable may lead to fear and anxiety in patients. This study aims to explore the fear of recurrence and the belief in prevention of recurrence in elderly CHD patients through quantitative and qualitative research methods, so as to provide a reference and basis for the scientific and effective implementation of CHD secondary prevention.

## 2. Objects

A total of 178 elderly CHD patients hospitalized in the Department of Cardiovascular Medicine of a tertiary hospital in a city were included, including 96 males and 82 females, with an average age of 67.21±4.89 years. Inclusion criteria: (1) a clear diagnosis of CHD; (2) age ≥ 60 years; (3) informed consent. Exclusion criteria: patients with aphasia and cognitive

impairment.

# 3. Methods

Quantitative research combined with qualitative research

## 3.1 Quantitative Study

### 3.1.1 General information of research subjects

Self-formulated, including demographic and clinical characteristics, such as age, gender, religious belief, marital status, educational level, personal monthly income, course of disease, medical insurance, and knowledge of the disease.

### 3.1.2 Fear of Coronary Heart Disease Recurrence Questionnaire

Originated from the adaptive items of the Fear of Cancer Recurrence Scale[3], the questionnaire items were revised and established by using specific language for CHD and following the guidance and advice of relevant experts. A total of 8 items, using Likert 5-level scoring method, each item is 0~4 points, 0=strongly disagree, 4=strongly agree, the 4th and 8th items are scored in reverse, and the rest of the items are positive to score. The reliability and validity test was carried out. The Cronbach's alpha coefficient of the questionnaire was 0.881, and the test-retest reliability was 0.892, indicating good reliability and validity. This questionnaire can be used to investigate the fear of recurrence in elderly CHD patients.

### 3.1.3 Study subjects' control of etiology

Scale: 0=no control at all; 1=no real control; 2=some control; 3=good control; 4=excellent control.

### 3.1.4 Statistical analysis

SPSS 22.0 was used for statistical analysis of the data.

## 3.2 Qualitative research

### 3.2.1 Knowledge about the etiology of CHD

The subjects were first asked to describe what they understood about CHD and whether they feared relapse, and second, they were asked to describe what they thought was causing CHD. Contains: full meal, straining to defecate, rain, overwork, depression/anger, smoking, drinking, stress, worry, co-morbidities, lack of exercise, stress, high blood lipids, high blood pressure, lifestyle, environmental factors, overweight, age, gender , diet, alcohol consumption, excessive agitation, family history, diabetes, anxiety, depression. Records were made when subjects reported information different from the above.

The subjects were asked to answer "If you had to choose the most important cause of your CHD from the above items, which would you choose?"

# 4. Results

## 4.1 Fear of recurrence

### 4.1.1 Quantitative results of fear of recurrence

The total score of fear of recurrence was (16.42 ± 4.31), 60.7% (108/178) of CHD patients expressed fear of recurrence, the number of causes of recurrence was (2.95 ± 0.73), and the score of causality was low (1.62 ± 0.67).

Table 1 Fear of recurrence in elderly CHD patients（n=178）

| Items | Fear of recurrence score（$\bar{x} \pm s$） |
|---|---|
| 1 Uncertainty about health bothers me | 2.67±0.89 |
| 2 I think I am healthier now than before I got sick | 2.12±0.78 |
| 3 I always think about my health when planning for the future | 3.01±0.99 |
| 4 I have less health concerns than other CHD patients | 1.43±0.49 |
| 5 Because of my health, I focus on the future | 2.61±0.82 |
| 6 I am worried about CHD recurrence | 3.11±0.89 |
| 7 When I think about my health, I feel uneasy | 2.88±0.87 |
| 8 Not feeling anxious when I hear about CHD | 1.76±0.56 |
| Total score | 16.42±4.31 |

## 4.1.2 Qualitative resuls of fear of recurrence

Almost three-quarters of the study subjects reported that they feared that CHD would recur, causing more serious consequences and even death.

What the hell is going on here, I'm worried about relapse, and I'll give up. (Subject 48, male, 70 years old)

If it relapses, it may become a vegetative person even if it does not die. It is better to die. (Subject 9, male, 63 years old)

If it did happen, I wouldn't have any other problems if I died. (Subject 11, female, 67 years old)

Some study subjects learned that relapses would be more severe by observing other patients in the hospital and consulting with health care workers.

That was his fourth seizure. The doctor told me that quite a few patients had multiple relapses, up to 9 or more, and I was surprised. With each recurrence, the condition worsens. (Subject 79, male, 83 years old)

Some patients are very afraid of relapse due to reports from friends or relatives that CHD has led to severe dependence or death.

In a particularly bad state, sitting in a wheelchair, unable to speak. (Subject 57, male, 62 years old)

I was worried that I would die like my mother did. (Subject 43, female, 76 years old)

## 4.2 Knowledge about CHD etiology and prevention of recurrence

## 4.2.1 Quantitative results on knowledge of CHD etiology and recurrence prevention

82.3%of the subjects were able to say the definition of CHD, and 96.4%of the subjects considered at least one etiology, with an average (2.95 ± 0.73) etiologies, with hypertension as the primary cause. The controllability score of etiology is (1.62±0.67), and different individuals think different etiologies have different controllability.

## 4.2.2 Qualitative results on perceptions of stroke etiology and recurrence prevention

In the interviews, about 50% of the subjects agreed with the recognized risk factors, and some patients took the

initiative to obtain information and take action to control risk factors such as high blood pressure. Two patients reported high confidence in the treatment, others felt that compliance with the physician was imperative.

My blood pressure must be down to normal within a month. (Subject 28, male, 62 years old)

While focused on preventing recurrence, they were also conflicted, anxious, and reluctant to waste medical staff's time.

I'm still scared to learn more about CHD, I don't want to think too much. (Subject 44, male, 72 years old)

I was curious, wanted to know what exactly caused the relapse, and wanted to make sure it didn't happen again. (Subject 54, male, 75 years old)

My wife says I should talk to a doctor, but I don't want to waste their time. (Subject 67, female, 65 years old)

Some of the study subjects emphasized the factors of poor behavior, especially smoking and drinking.

I love smoking and can't quit. (Subject 13, male, 71 years old)

I wonder if there is any way I can stop drinking. (Subject 35, male, 68 years old)

Some study subjects were unsure whether strenuous activity should be avoided because of the risk of CHD relapse.

I was told that doing too much housework would cause my illness to relapse. (Subject 12, female, 71 years old)

I have been working all my life, and I can't be idle. I have a lot to do. I don't want to lie in bed every day and eat and wait to die. (Subject 64, female, 64 years old)

Some CHD patients discuss the absence of any warning signs, deepening the idea of relapse.

It's terrible, you don't know when it will come, how it will come, and what the consequences will be. (Subject 31, male, 80 years old)

Some CHD patients are accustomed to fatalism in response to CHD recurrence.

If it recurs again, it is fate, there is no way, just accept it. (Subject 59, male, 82 years old)

# 5. Discussion

With the acceleration of population aging and the improvement of living standards in my country, the incidence of CHD continues to rise. Re-stenosis and blockage of coronary arteries are caused by aging of the body, resulting in a high recurrence rate[4]. Fear of recurrence is very common among elderly CHD patients, and they are more afraid of physical disability or communication impairment caused by recurrence than cancer patients.Qualitative findings highlight that patients' fear of relapse often resonates with family members, close friends, or other patients.

Subjects in this study received treatment in specialized departments and received formal health education upon discharge, and most of them had knowledge about CHD. Risk factors for CHD include high blood pressure, smoking, diabetes, physical inactivity, obesity, hypercholesterolemia, poor diet, depression, and excessive alcohol consumption. Ways to reduce CHD risk include eating a healthy diet, exercising regularly, maintaining a healthy weight, and quitting smoking[5]. Quantitative and qualitative findings showed a lack of confidence in prevention and low scores in patients with causal controllability beliefs. Hypertension is the biggest risk factor for CHD and can be partially controlled; most study subjects believe that smoking is more risky than other factors, but it cannot be truly controlled. Uncontrollable risk factors increase the likelihood of CHD recurrence[6].

Qualitative research has shown personal beliefs or experiences related to fear of relapse, including: (1)Involves death or disability; (2)fatal surrogate experiences; (3)lack of warning; (4)overwork-induced CHD; and (5)fatalism. There are studies reporting that heavy housework triggers CHD. Subjects expressed fatalism, which may have helped them accept the possibility of relapse, and in a sense, fatalism serves the purpose of protecting individuals from liability. This paper argues that qualitative research appears to be more appropriate to interrogate the individual status of disease onset.

The causes of CHD are well known, but confidence in prevention is lacking. Many people with CHD fear relapse due to fatalistic beliefs and a lack of control over the cause. Before providing evidence-based secondary prevention information to patients, it is necessary to address the patient's fear of the disease and establish the correct belief in relapse prevention.

**Fund Project and Number: S&T Program of Hebei（192777102D）**

# References

[1] Liu, XW, Chen, YM., The effect of psychological intervention on the length of stay and recurrence of coronary heart disease patients[J]. Heilongjiang Medicine, 2016, 40(4): 302-305.

[2] Guo, SQ, Hou, HP, The effect of community nursing health education on patients with coronary heart disease and the observation of recurrence rate[J]. Journal of Integrated Chinese and Western Medicine Cardiovascular Diseases, 2019, 7(23): 112.

[3] Northouse, LL, Mastectomy patients and the fear of cancer recurrence.Cancer Nurse[J]. 1981,4: 213-220 .

[4] Zhu, FL, TCM syndrome differentiation and treatment to prevent and control the recurrence of coronary heart disease [J]. Zhonghua Health Care, 2019, 2:70-71.

[5] Jin, L, Efficacy of trimetazidine in the treatment of coronary heart disease angina pectoris and its effects on cardiac function, blood lipids and recurrence risk [J]. Jilin Medicine, 2022, 43(3): 699-700.

[6] Ma, XL, Application of targeted nursing with comprehensive assessment in elderly patients with coronary heart disease and hypertension [J]. International Journal of Nursing, 2018, 37 (3): 360-363.