ORIGINAL RESEARCH

Effectiveness of Continuous Care Interventions in Elderly Patients with High-Risk Pressure Ulcers and Impact on Patients' Activities of Daily Living

Caixia Han, BM; Furong Yang, BM; Lan Liu, BM

ABSTRACT

Objective • To explore the influence of continuous care interventions on the incidence of pressure ulcers in elderly patients with high-risk pressure ulcers and their activities of daily living (ADL).

Methods • The clinical records of 114 elderly patients at high risk of pressure ulcers (Patients had a Braden pressure ulcer risk score less than or equal to 18 and suffered no pressure pressure ulcers) who attended our hospital from February 2020 to February 2022 were collected for retrospective analysis. Among them, 54 patients treated with conventional nursing interventions were assigned to the control group (CG) (64-91 years old), and the remaining 60 treated with continuous care interventions were assigned to the observation group (OG) (61-91years old). The detection indices and clinical related data were collected from LIS system of our hospital. The self-rating depression scale (SDS) and self-rating anxiety scale (SAS) scores of the two groups were compared before and after the intervention, and the improvement in quality of life and ADL scores were counted. The post-care satisfaction and incidence of pressure ulcers were analyzed, and the caregivers' pressure ulcer care behaviors and pressure ulcer management abilities before and after treatment were compared between both groups of patients.

Results • The SAS and SDS scores were lower in the OG (38.33±3.21 and 39.07±4.15) than in the CG (44.74±4.13 and 45.80±3.92) after the intervention ($P < .05$); quality of life and ADL were higher in the OG (44.07±7.15 and 58.33±6.21) than in the CG (36.20±6.92 and 45.84±6.12) after the intervention ($P < .05$). The incidence of pressure ulcers in the OG (18.33%) was lower than that in the CG (37.04%) after the intervention ($P < .05$); total nursing satisfaction in the OG (91.67%) was higher than that in the CG (74.07%) after the intervention ($P < .05$), and caregivers' pressure ulcer care behaviors and pressure ulcer management abilities of patients in the OG (36.42±2.41 and 44.07±7.15) were higher than those in the CG (29.23±2.50 and 36.20±6.92) after the intervention ($P < .05$).

Conclusion • Continuous care interventions can be promoted for elderly patients with high-risk pressure ulcers outside the hospital, which can reduce the incidence of pressure ulcers, negative emotions, related complications and treatment costs, and improve the effective utilization of medical resources. In the future, continuous care guidelines and training plans can be developed for elderly patients with high-risk pressure ulcers, so as to improve the understanding and application ability of health care providers and nurses on intervention measures. (*Altern Ther Health Med.* [E-pub ahead of print.])

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INTRODUCTION

Pressure sores are most likely to occur at the bony prominence and are a type of wound in which the injury site is in the skin or subcutaneous tissue.[1] One study showed that pressure sores were among the top four complications in patients who were bedridden for long periods.[2] As China is gradually moving into an aging society, the number of elderly patients bedridden for various reasons is increasing yearly.[3] When the local tissues of the body of bedridden elderly patients are subjected to prolonged pressure, this leads to impaired blood circulation; pressure sores, also known as bedsores, are wounds caused by long-term pressure on localized tissue, impaired blood circulation, sustained ischemia and hypoxia, and nutritional deficiencies, leading to tissue breakdown and necrosis.[4] Statistics show that the incidence and prevalence of pressure ulcers in ICU are 10.0% - 25.9% and 16.9% - 23.8%, respectively.[5] These elderly patients have thin and dry skin, lack of sensitivity, and poor elasticity, which, combined with the fact that some patients are more severely ill,

malnourished, unable to adjust their position on their own, and have damp skin, can easily lead to pressure sores, making them a high-risk group for pressure sores.[6] Pressure ulcers bring a heavy burden, including pain-triggered negative emotions, unpleasant wound smell, social isolation, economic pressure, emotional stress caused by dependence on others and mortality.[7] Accordingto statistics, the medical cost of pressure ulcers is 0.91-1.1 billion dollars a year in the United States and 400-610 million pounds a year in the United Kingdom.[8] Pressure ulcers not only compromise the recovery of the primary disease but also lead to increased workload and difficulty in nursing care and can even worsen the condition or even kill the patients.[9] Whereas many patients' pressure ulcers tend to occur outside the hospital, more interventional approaches are needed to reduce the incidence of pressure ulcers in these elderly patients at high risk for pressure ulcers.[10]

Some studies have shown that many interventions for elderly patients at high risk of pressure ulcers are performed at home and that some home or community care interventions can effectively reduce their prevalence.[11] Continuous care enables patients to receive continuous health care services after discharge, reduces complications, promotes disease recovery, and avoids readmission and emergency use due to re-worsening and aggravation of the disease, thus improving the quality of life of patients and saving health care resources.[12] Many studies have shown that applying continuous care in some surgical patients with chronic diseases, obstetrics and gynecology, and malignancies is also very effective. It mainly solves the problem of the absence of health guidance by professional medical staff when the patients are at home, so that their quality of life is significantly improved after discharge from the hospital.[13,14] It is difficult for patients with high-risk pressure ulcers to receive effective care and attention carried out during hospitablization after discharge, which may compromise the prevention results of pressure ulcers.

As a continuous, seamless and coordinated medical service, continuous care can educate and train patients and family members so that they can understand the risk factors of pressure ulcers, preventive measures and the importance of early identification, and it can help patients and family members access community resources and support services to promote the prevention and management of pressure ulcers. At the same time, the risk factors for the reoccurrence of pressure ulcers in elderly patients at high risk of pressure ulcers did not disappear after their discharge from the hospital.[15]Currently, there is limited research on the effectiveness of continuous care in elderly high-risk pressure sore patients. More studies are needed to provide evidence on whether continuous care can reduce the risk of pressure sores.

To explore the effect of continuous care in elderly patients with high-risk pressure ulcers, this paper retrospectively analyzed the medical records of 114 cases of elderly patients with high-risk pressure ulcers, thus assessing the value of continuous care interventions in elderly patients with high-risk pressure ulcers, which is reported below.

MATERIALS AND METHODS

This study utilized a retrospective cohort design. The clinical records of 114 elderly patients at high risk of pressure ulcers who attended our hospital from February 2020 to February 2022 were collected for retrospective analysis. Among them, 54 patients with conventional nursing interventions were the control group (CG), of which 24 were male and 30 were female. In addition, 60 patients, 22 males, and 38 females, were in the observation group (OG) using continuous care interventions. This retrospective study involved collecting cases from our hospital and received approval from the hospital's medical ethics committee. It was conducted in accordance with the Helsinki Declaration and its subsequent amendments or similar ethical standards.

Inclusion and exclusion criteria

Inclusion criteria: patients aged 60 years or older; patients with Braden pressure ulcer risk score less than or equal to 18 and without pressure ulcers (A Braden pressure ulcer risk score > 18 points indicates a low risk of pressure ulcers); long-term bedridden who face a high risk of pressure ulcers; patients with complete case data.

Exclusion criteria: patients or caregivers with cognitive impairment that hinders them from receiving scale-based evaluation; patients who had no clear caregiver (continuous care cannot be carried out without a clear caregiver); patients with multiple organ failure who need hosipitalizaiton and could not receive continuous care; patients with expected survival time < 3 months who could receive a whole cycle of continuous care; caregivers have difficulty in using tools such as telephones or the Internet,which affect the follow-up results.

Interventional care approaches

Patients in the CG were given conventional care, and uniform and standardized health education was given to patients, informing them of the preferred sites of pressure sores, precautions for pressure sore prevention, how to properly turn over, and nutritional support. Health education cards were distributed, and departmental contact numbers were informed. Post-discharge follow-up interventions mainly included pre-discharge dietary and medication guidance, telephone follow-ups, and registration of follow-ups.

Patients in the OG were given continuous care interventions: (1) Professional nursing team: An extended care team was established, consisting of a number of senior nurses, and a responsible nurse was assigned to each patient to clarify the nurses' responsibilities and to provide comprehensive nursing interventions. (2) Nursing knowledge training: Patients and their families were provided with relevant nursing training before discharge, mainly including pressure sore prevention methods, pressure sore wound identification, common dressings for pressure sores and dressing change methods. (3) Reasonable diet plan: A reasonable diet plan is formulated According to the patients' condition and personal preference. The diet principle is a liquid diet with high protein and vitamins to improve patients' nutrition and recovery ability. (4) Family care: Patients' families

were guided to create a comfortable living environment for patients, encouraging them to maintain a healthy and optimistic attitude to overcome the disease and relieve psychological pressure. (5) Regular follow-up: A Follow-up plan was carried out, telephone follow-up was carried out every week, and home visits were made at 10 days, 1 month and 3 months after discharge. Before each follow-up visit, we follow up on the last visit to plan the next phase, strengthen the home guidance for patients, register and promptly solve the related problems patients and their families encounter. For those who are far away or otherwise unable to achieve home care, they can be instructed by phones and online.

Outcome measures

(1) The incidence of pressure ulcers in both groups within 3 months of care was counted based on the results of regular follow-up. (2) The anxiety and depression of the patients were evaluated on the day before the nursing intervention and on the last day after 3 months of nursing, and their anxiety and depression were assessed by the self-assessment scale for anxiety (SAS) and the self-rating scale for depression (SDS), with a total score of 100 for both SAS and SAS, with higher scores indicating more severe anxiety symptoms and depressive symptoms.[16] The SAS scale comprises 20 items reflecting subjective feelings of anxiety, with each item rated on a four-point scale based on the frequency of symptoms. Scores between 50 and 59 are categorized as mild anxiety, 60 to 69 as moderate anxiety, and above 69 as severe anxiety.The SDS scale consists of 20 items reflecting subjective feelings of depression, with each item rated on a four-point scale based on the frequency of symptoms. Scores between 53 and 62 are categorized as mild depression, 63 to 72 as moderate depression, and 73 or above as severe depression. (3) Patients' activities of daily living (ADL) scores were asseesed on the day before the nursing intervention and on the last day after 3 months of nursing, respectively. ADL scores include 10 areas of feeding, bathing, dressing, and bowel control, each with a total score of 10 out of 100, with higher scores representing better ADL.[17] Scores above 60 suggest that the patient can generally manage daily life independently. Scores between 60 and 40 indicate a need for some assistance in daily life. Scores between 40 and 20 suggest a significant need for assistance in daily living, while scores below 20 indicate a complete dependence on assistance for daily life. (4) Patients in both groups were surveyed on the day before the nursing intervention and on the last day after 3 months of nursing using the General Quality of Life Inventory-74 (GQOLI-74), which includes 4 dimensions of physical life, somatic functioning, psychological functioning, and social functioning with 74 entries, with higher scores indicating better quality of life.[18] (5) Caregivers in both groups were assessed for pressure ulcer care behaviors on the day before the nursing intervention and on the last day after 3 months of nursing from the perspective of nutritional support, skin management, and trauma care using a self-administered scale with a reliability of 0.72 to 0.83. The scale has 20 items with 60 points: the higher the score, the better the caregiving behaviors towards patients.[19] (6) The self-designed Pressure Sore Management Competence Scale was used to assess caregivers' ability to manage pressure sores in both groups on the day before the nursing intervention and on the last day after 3 months of nursing , including diet, pressure sore monitoring, lesion staging, complications, and pressure sore triggers, with a reliability of 0.75 to 0.86. The total score is 100 points; the higher the score, the better the caregiver's ability to manage pressure sores.[20] (7) On the last day after 3 months of nursing, a self-administered questionnaire was used to assess patient satisfaction, and the reliability of the scale was 0.84 to 0.91 after the nursing intervention in both groups. The total score of this questionnaire is 100, of which >90 is very satisfied, 60-90 is satisfied, and <60 is unsatisfied. Total satisfaction = (number of very satisfied cases + number of satisfied cases/ total number of cases × 100%).

Statistical analysis

All data were calculated using Statistic Package for Social Science (SPSS) 20.0 (SPSS Inc., Chicago, IL, USA). The rates were compared by the chi-square test, expressed as χ^2. The Chi-square test can be used to compare the difference between observed frequency and expected frequency, to determine the correlation between classified variables or to compare the differences between different groups.; all measurement data conformed to a normal distribution and were analyzed using the independent samples *t* test, expressed as *t*. The independent samples t-test can help to determine whether there is a significant difference in the mean of two independent samples. GraphPad Prism 7 (GraphPad Software, Inc., San Diego, CA, USA) was used for image drawing. $P < .05$ was considered statistically remarkable.

RESULTS

Baseline data

It was found that there was no statistical difference ($P > .05$) between the two groups in terms of age, gender, education, diabetes, Braden pressure ulcer risk score, caregiver age, caregiver-patient relationship, whether the caregivers lived together, and caregiver education, as shown in Table 1.

Comparison of incidence of pressure sores in both groups

Within 3 months of nursing, there were 11 cases of pressure ulcers in the OG and 20 cases in the CG. The incidence of pressure ulcers in the OG (18.33%) was statistically lower than that in the CG (37.04%, $P < .05$) (Table 2).

Impact of care programs on negative emotions

The negative emotions of the two groups before and after three months of care were counted. It was found that there was no statistical difference between the SAS scores and SDS scores before care ($P > .05$). After 3 months of nursing, the SAS and SDS scores of the two groups decreased significantly ($P < .05$), indicating that the depression and anxiety of the two groups were alleviated. In addition, after nursing, he scores of the OG after care were lower than those of the CG ($P < .001$),

Table 1. Baseline data table

	Observation group (n = 60)	Control group (n = 54)	t/χ^2	*P* value
Age	77.6±8.0	79.3±7.5	1.167	.246
Gender			0.714	.398
Male	22 (36.67)	24 (44.44)		
Female	38 (63.33)	30 (55.56)		
Education			3.013	.222
Primary school and below	34 (56.67)	39 (72.22)		
Middle to high school	18 (30.00)	10 (18.52)		
High school or above	8 (13.33)	5 (9.26)		
BMI			0.899	.343
≥25 kg/m^2	28 (46.67)	30 (55.56)		
<25 kg/m^2	32 (53.33)	24 (44.44)		
Surgery			0.364	.546
Yes	41 (68.33)	34 (62.96)		
No	19 (31.67)	20 (37.04)		
Hypertension			1.364	.243
Yes	29 (47.54)	32 (52.46)		
No	31 (58.49)	22 (41.51)		
Diabetes			1.185	.276
Yes	25 (41.67)	28 (51.85)		
No	35 (58.33)	26 (48.15)		
Braden pressure ulcer risk score	13.80±1.20	13.45±1.35	1.466	.146
Caregiver age	61.2±8.7	62.5±8.2	0.819	.415
Caregiver-patient relationship			1.063	.588
Spouse	33 (55.00)	32 (59.26)		
Children	19 (31.15)	18 (33.33)		
Others	8 (13.33)	4 (7.41)		
Whether the caregivers lived together			2.617	.106
Yes	39 (65.00)	41 (78.85)		
No	21 (35.00)	11 (21.15)		
Caregiver education			1.373	.503
Primary school and below	28 (46.67)	26 (48.15)		
Middle to high School	17 (28.33)	19 (35.19)		
High school or above	15 (25.00)	9 (16.67)		

indicating significantly milder depression and anxiety in the observation group than in the control group (Figure 1).

Comparison of quality of life and ADL between the two groups

The two groups' quality of life and ADL before and after three months of care were counted. It was found that there was no statistical difference between the ADL scores and GQOLI-74 scores before care ($P > .05$), and the scores of the OG aftercare were lower than those of the CG ($P < .001$) (Figure 2).

Comparison of nursing satisfaction of both groups

It was found that the total satisfaction of the OG was 91.67%, which was higher than that of the CG (74.07%) ,indicating that patients in the observation group were more satisfied with the accepted nursing services, and the treatment or care had achieved good results and remarkable advantages. ($P < .05$) (Table 3).

Comparison of caregiving behaviors and pressure sore management between both groups of caregivers

The caregivers' caregiving behaviors and pressure sore management ability in both groups were found to be statistically not different before the intervention ($P > .05$). The caregivers in the OG had significantly higher caregiving behaviors and pressure sore management ability than those in the CG after the care ($P < .001$), suggesting that the caregivers in the observation group could provide more professional management of pressure ulcers and help to prevent pressure ulcers and reduce pain and discomfort with higher nursing quality and safety (Figure 3).

Table 2. Table of incidence of pressure sores

	Stage I pressure ulcers	Stage II pressure ulcers	Stage III pressure ulcers	Occurrence of pressure sores
Observation group (n = 60)	9 (15.00)	2 (3.33)	0 (0.00)	11 (18.33)
Control group (n = 54)	11 (20.37)	7 (12.96)	2 (3.70)	20 (37.04)
χ^2				5.022
P value				.025

Table 3. Nursing satisfaction table

	Observation group (n = 60)	Control group (n = 54)	χ^2	*P* value
Very satisfied	29 (48.33)	15 (27.78)		
Satisfied	26 (43.33)	25 (46.30)		
Dissatisfied	5 (8.33)	14 (25.93)		
Total satisfaction	55 (91.67)	40 (74.07)	6.333	.012

Figure 1. Effect of care programs on negative emotions. (A) SAS scores of patients in both groups before (53.54±4.62 vs 54.08±4.70) and after 3 months of care (38.33±3.21 vs 44.74±4.13). (B) SDS scores of patients in both groups before (58.87±6.14 vs 59.58±6.20) and after 3 months of care (39.07±4.15 vs 45.80±3.92).

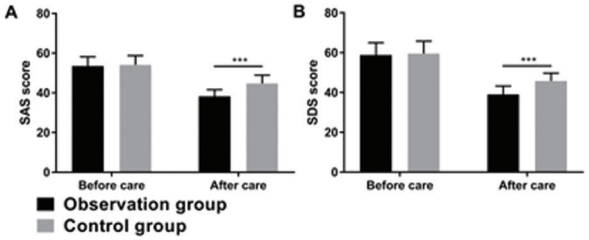


Figure 2. Effect of care programs on quality of life and ADL. (A) ADL scores of patients in both groups before (40.24±4.62 vs 39.50±4.71) and after 3 months of care (58.33±6.21 vs 45.84±6.12). (B) GQOLI-74 scores of patients in both groups before (34.85±6.14 vs 33.40±6.22) and after 3 months of care (44.07±7.15 vs 36.20±6.92)

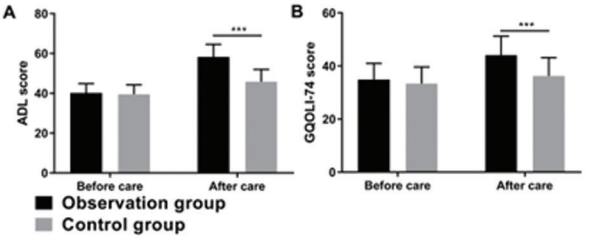
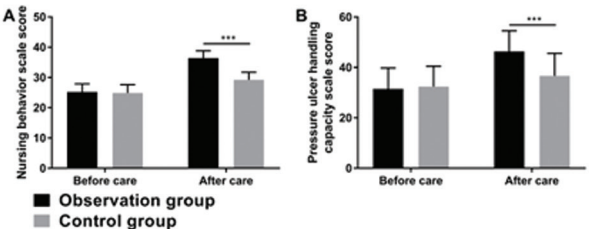


Figure 3. Changes in caregiving behaviors and pressure sore management ability before and after caregiving. (A) Caregiver behavior scale scores before (25.24±2.62 vs 24.87±2.74) and after 3 months of care (36.42±2.41 vs 29.23±2.50) for both groups of patients. (B) Caregivers' pressure sore management ability scale scores before (31.51±8.24 vs 32.40±8.09) and after 3 months of care (46.37±8.15 vs 36.64±8.92) for patients in both groups.



DISCUSSION

The incidence of pressure ulcers is high in the elderly long-term bedridden group, and the cost of treatment after the occurrence of pressure ulcers is relatively high, which not only causes great pain to patients but also increases the economic burden of patients and their families.[21] Elderly patients with high-risk pressure ulcers are mainly cared for by their families. Still, the relatively heavy volume of care and financial burden, coupled with the greater discretion and blindness of care, make it difficult to achieve ideal results.[22] Continuous care is a model of care based on the theory of humanistic care, and its care services are characterized by continuity and coordination, with the aim of ensuring that patients receive different levels of health care even outside the hospital.[23]

In this study, the incidence of pressure ulcers in the OG was lower than that in the CG, and the total scores of ADL and quality of life were higher than those in the CG, which showed that the effect of continuous care was remarkable in controlling and preventing the occurrence of pressure ulcers and improving the quality of life of patients. In this paper, continuous care is proposed to continuously guide patients and families to solve care problems at home by designating a person to instruct training before discharge, multiple telephone follow-ups, and home follow-ups at 10 d, 1, and 3 months after discharge. Through this series of initiatives, the confidence and ability of patients and their families to participate in their care was sufficiently increased to enable them to participate actively in health rehabilitation.[24] Some statistics show that pressure ulcers not only bring pain to patients, but also bring huge medical costs and huge economic burden to patients' families [25]. Effectively reducing the incidence of pressure ulcers in patients can also reduce medical costs and economic burden.We also found that patients in the OG had lower SDS and SAS scores and higher satisfaction with care than the CG after 3 months of continuous care. This suggests that continuous care has a better effect on the management of self-care for patients. The improvement in self-care and the reduction in the incidence of pressure ulcers also further improved patients' quality of life and their satisfaction with the care provided by our nursing staff during care, and reduced patient dysphoria.

Continuous care is a continuation of inpatient care services, which is a continuous and coordinated care service provided by health care professionals for patients who return to their families after discharge from the hospital, giving follow-up and guidance through effective interaction between health care professionals and patients and their families, and ultimately promoting patients' health with good social and economic benefits.[26] At the end of the study, caregiving behavior scale scores and pressure sore management skills scale scores were higher in the OG than in the CG, indicating that the continuous care model helped improve caregiving behaviors and increase professionalism in dealing with pressure sores. The reason for this may be related to the fact that most caregivers of elderly patients at risk for pressure ulcers who are recuperating at home are spouses, most of whom are older and have relatively poor comprehension and memory skills, and that health education during hospitalization alone is not sufficient to improve caregiving behaviors in this population.[27] Conversely, continuous care establishes a responsible nurse for each patient to watch over them. The nurse is able to grasp the basic situation of patients at high risk of pressure ulcers at the first time and follow up with them at home in a timely manner. The incidence of pressure ulcers was effectively reduced by timely assessment and guidance to caregivers through on-site inspections, on-site guidance, and regular telephone follow-up visits, and by timely correction of caregivers' poor behavior regarding pressure ulcer prevention. Each patient experienced an improved pressure sore risk through a more personalized care approach, resulting in improved emotional well-being and enhanced quality of life. Research by Keelaghan et al. also highlighted the pivotal role of continuous care in patients admitted to nursing homes, significantly reducing the incidence of pressure sores upon admission.

Nevertheless, there are still some shortcomings. First, Therefore, this study is retrospective in nature and is limited by the follow-up duration of the collected samples. The long-range effects of the intervention were not measured, and it was not possible to analyze whether there was a relationship between the effects of the intervention and changes over time. Second, the effectiveness of care for patients at high risk of pressure ulcers can be affected by their caregivers' ability to care for them, but this study did not explore the factors affecting their ability. So, it is hoped that this will be explored in subsequent research. In addition, continuous care usually requires family members to have certain medical and nursing skills so that they can effectively take care of people in need of special care. If family members do not have these skills or are unable to provide the necessary care, continuous care may not be able to meet the needs. Finally, retrospective studies are susceptible to inherent biases that are challenging to avoid. These biases may introduce errors or distortions, resulting in unrepresentative samples and inability of the samples to accurately reflect the characteristics and distribution of cases, so more randomized controlled trials are needed to verify the conclusions. Prevention of pressure ulcers is still the key. It is hoped that more accurate risk assessment tools can be developed in the future to assess the risk of pressure ulcers and to prevent the occurrence of pressure ulcers in a more timely manner through more effective nursing.

In summary, continuous care interventions can be promoted for elderly patients with high-risk pressure ulcers outside the hospital, which can reduce the incidence of pressure ulcers, negative emotions, related complications and treatment costs, and improve the effective utilization of medical resources. In the future, continuous care guidelines and training plans can be developed for elderly patients with high-risk pressure ulcers, so as to improve the understanding and application ability of health care providers and nurses on intervention measures.

CONFLICT OF INTEREST

The authors have no potential conflicts of interest to report relevant to this article.

AUTHOR CONTRIBUTIONS

CH and FY designed the study and performed the experiments, FY collected the data, LL analyzed the data, CH prepared the manuscript. All authors read and approved the final manuscript.

FUNDING

This work was supported by 1."Wuxi Taihu Talent Plan" High-level Talents in Medical and Health (2020); 2.Major scientific research project of Wuxi Municipal Health Commission (Z202108); 3. Shanghai Key Laboratory of Peripheral Nerve and Microsurgery (20DZ2270200) NHC Key Laboratory of Hand Reconstruction (Fudan University).

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