

Factors influencing self-care in outpatients with external fixation in China

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Abstract

Objective: This study was performed to investigate factors influencing self-care agency in outpatients with external fixation support.

Methods: Using a cross-sectional study approach, 110 outpatients with external fixation from a single Chinese hospital were evaluated from May 2018 to October 2018. Consecutive sampling was performed, and variables included demographic data, health knowledge regarding external fixation, and self-care skills. Open and closed survey questions were used.

Results: The mean self-care agency score was 101.70 ± 20.14 , with 36 (35.3%) outpatients scoring high. Demographic variables did not significantly influence the self-care level. However, health knowledge was significantly correlated with self-care skills, indicating that knowledgeable outpatients were more likely to be better at self-care.

Conclusions: Outpatients with external fixation support need higher levels of health knowledge. The level of self-care agency in the present study was in the moderate range. Outpatients with external fixation support with higher health knowledge are more likely to have higher self-care skills.

Keywords

China, bone fracture, external fixation, self-care agency, health knowledge, outpatients

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Introduction

External fixation is performed to stabilize fractures and involves immobilization of the bone via pins attached to an external metal frame. This system balances the pressure distribution on the fracture surface and thus facilitates proper healing.¹ External fixator systems are currently the gold standard for treating open fractures because of their soft tissue coverage and stable internal fixation. Accordingly, their use has increased worldwide, including in China.² However, external fixation has several complications, including its considerable impact on outpatients' lives and relationships.³ Importantly, external fixation poses challenges to the nursing care of these patients. Nurses are responsible for designing plans that educate patients and relatives regarding pin-site care, thus enabling self-care of external fixation systems. However, few studies are available on self-care in outpatients with external fixation. The present study was therefore performed to investigate factors that influence the degree of self-care agency in such patients.

Background

External fixation is a technology that usually involves the insertion of rods (pins) directly into the bone and then affixing those pins to an outer fixed frame. External fixation is simple, safe, and rapidly implemented, and it provides more stability than gypsum powder (plaster) fixation. Therefore, the use of external fixation is more effective than the use of plaster to facilitate full recovery from fractures. As a result, external fixation is now widely used in the clinical treatment of limb fractures.⁴ However, without effective nursing care, the treatment can cause debilitating complications such as pin loosening, pin-site infection, superficial pressure sores, osteomyelitis, and fracture misalignment.

The most common complication is pin-site infection, which is preventable through postoperative daily disinfection and examination of local seepage.⁵ These infections may harm major blood vessels and nerves, necessitating close observation of the post-surgical peripheral skin color, temperature, and nerve injury to ensure the absence of abnormalities. Other complications include fracture re-displacement due to loose fixation as well as local ulcer formation caused by oppressed skin and the healing process. To prevent these issues, the appropriate positioning should be maintained through timely postsurgical correction of the external fixation and limb axis locations. Additionally, the patient should be regularly checked for loose screws and any joint deformation. External fixation can also have negative effects on physical, emotional, and social well-being in patients,⁶ although the extent of indirect mental health concerns is debated.⁷ In any case, the complexity of postoperative care means that upon discharge from the hospital, outpatients require education on self-care to successfully manage their recovery at home.⁸

With the continuous advancement of external fixation since the 1920s, several nursing care methods have emerged,⁹ including individual exercise plans, pin-site wound care, psychosocial care, and early recognition of compartment syndrome. A few studies have been performed in an attempt to determine how various care methods have influenced patient recovery. In China, for example, higher self-care levels were found to be associated with more knowledge of self-care and shorter hospitalization times.¹⁰ Additionally, systematic nursing care of patients with external fixation increased patients' self-care awareness and decreased complications.¹¹ Certain aspects of self-care appear particularly feasible; for instance, most outpatients can perform pin-site care independently on discharge from the hospital, although older

children and teenagers may have difficulty without assistance.¹² Despite these promising beginnings, we still know little about self-care agency (i.e., the ability of individuals to promote their own physical and mental well-being) in outpatients with external fixation devices.

The self-care agency of outpatients with other diseases is affected by patient age, sex, sociocultural status, educational level, and marital status.^{13–15} Among outpatients undergoing peritoneal dialysis, self-care ability scores differ significantly according to sex, marital status, occupation, and housing conditions.¹³ Similarly, outpatients with heart failure in poor financial situations often have lower self-care ability.¹⁴ We currently have very little understanding regarding how such demographic factors affect levels of self-care agency and, relatedly, knowledge of self-care. Therefore, the present study was performed to evaluate the relationships among demographics, health knowledge, and self-care agency in Chinese outpatients with external fixation. Specifically, we asked the following questions: (1) What is the level of health knowledge in Chinese outpatients with external fixation? (2) What is their level of self-care? (3) What relationships exist among demographics, health knowledge, and self-care agency in these patients?

Materials and methods

Study design

A cross-sectional design was adopted to analyze self-care agency and its associated factors in outpatients with external fixation support, using questionnaires for data collection.

Participants

The study enrolled outpatients with external fixation at a hospital in Harbin from

May to October 2018, China. The inclusion criteria were voluntary participation and the ability to answer questions clearly. The exclusion criteria were an age of <18 years, illiteracy, communication disabilities, mental/cognitive impairments, and the need for complete care by family members.

Data collection

The study was conducted in The Second Affiliated Hospital of Harbin Medical University using convenience sampling to survey outpatients with external fixation. Online questionnaires were distributed to patients through a professional survey platform. The clinicians determined the data collection periods for each patient. The experimenters called the patients at their homes to request completion of the questionnaire before the external fixation device was removed, generally within 1 month following discharge.

Survey design

The survey included three questionnaires. The first (designed by the researchers) focused on demographic data (sex, age, marital status, education level, monthly income, occupation, cause of injury, comorbidities, and physical activity).

The second questionnaire, also developed by the researchers, examined health-related knowledge of external fixation. The 20 questions asked outpatients to rate how well they understood various aspects of the procedure (e.g., cause of needle-crossing seepage, infection, and active bleeding), with a score ranging from 0 (“do not understand”) to 3 (“completely understand”). The total score was calculated by summing all scores; higher scores indicated more knowledge. The test was validated in other outpatients with external fixation, resulting

in a Cronbach's alpha reliability coefficient of 0.76.

The third questionnaire was the Exercise of Self-Care Agency (ESCA) scale, first developed by Kearney and Fleischer.¹⁶ We used an adapted version of the Chinese translation that had been previously tested.¹⁷ The scale includes four dimensions: self-concept (items 1–8), self-nursing responsibility (items 9–14), self-care skills (items 15–26), and health knowledge level (items 27–43). Eleven items are reverse-scored. Each statement is rated from 4 (“like very much”) to 0 (“do not like”), with higher scores indicating better self-care agency (high, 0–57 points; moderate, 58–115 points; and low, 116–172 points). In the present study, Cronbach's alpha was 0.82 for the total scale and 0.79, 0.60, 0.61, and 0.84 for self-concept, self-nursing responsibility, self-care skills, and health knowledge level, respectively.

Data analysis

Data were analyzed using SPSS 21.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics (frequency, percentage, mean, and standard deviation) were used to address Research Questions 1 and 2 (What is the level of health knowledge and self-care agency?). Pearson's correlation was applied to examine the relationship between health knowledge and self-care agency. A stepwise multiple regression analysis was used to test the influence of demographic variables and health knowledge on self-care agency. Multicollinearity among the predictor variables was assessed using tolerances and variance inflation factors.

Ethical considerations

All procedures were approved by the Ethics Committee of Harbin Medical University (HRBYKD-A16). All patients provided written informed consent prior to the

study; they were informed that participation was completely voluntary and that withdrawal from the study was possible at any time.

Results

In total, 110 outpatients were enrolled in the study, and the response rate to the questionnaires was 92.7% ($n=102$). The patients' ages ranged from 24 to 78 years (mean, 42.6 ± 15.8 years). Most were female (71.6%) and married (73.5%). Most patients had an education level of junior high school or lower (64.7%), and most had a monthly income of ≤ 150 US dollars (36.3%). Most patients' injuries were caused by an accident (53.9%), 91.2% of patients had no self-reported comorbidity, and 56.9% of participants engaged in light physical activity (Table 1).

In terms of external fixation-related knowledge, patients were least knowledgeable regarding the cause of needle-crossing seepage, infection, and active bleeding (mean score of 1.87 ± 0.77) (Table 2). The mean score for knowledge of the timing, cause, manifestation, and resolution of strephopodia and drooping was 1.99 ± 0.80 (Table 2). The patients' understanding of the cause of fixed steel needles becoming loose or twisted was highest at 2.02 ± 0.89 (Table 2).

The mean total ESCA score was 101.70 ± 20.14 , with 66 (64.7%) outpatients ranking below the high category of self-care agency, while 36 (35.3%) had high total scores (Table 3). The mean subscale scores for self-concept, self-nursing responsibility, self-care skills, and health knowledge level were 20.12 ± 4.99 , 13.83 ± 3.83 , 29.32 ± 5.50 , and 38.43 ± 8.83 , respectively (Table 3). Health knowledge and self-care skills were significantly correlated ($r=0.231$, $p=0.019$) (Table 4). Stepwise multiple regressions showed no factors

Table 1. Demographics and participant characteristics (n = 102).

Variable	Number (n)	Percentage (%)
Total	102	100
Sex		
Female	73	71.6
Male	29	28.4
Marital status		
Single	21	20.6
Married	75	73.5
Divorced or widowed	6	5.9
Education level		
Junior high school or lower	66	64.7
Senior high school	22	21.6
Technical secondary school or college	14	13.7
Monthly income		
≤150 US dollars	37	36.3
151–300 US dollars	18	17.6
301–450 US dollars	27	26.5
≥451 US dollars	20	19.6
Cause of injury		
Accident	55	53.9
Fall	14	13.7
Mechanical injury	14	13.7
Other	19	18.7
Self-reported comorbidity		
Yes	9	8.8
No	93	91.2
Physical activity		
Light	58	56.9
Moderate	12	11.7
Vigorous	32	31.4

significantly influencing outpatient self-care agency.

Discussion

Health knowledge regarding external fixation

We found that in general, patients were not knowledgeable about complications related to external fixation, with only one-third of

participants answering “completely understand” to the three relevant items. These results are inconsistent with research performed in studies outside China,^{4,5} which showed that such treatment causes debilitating complications such as pin loosening, pin-site infection, superficial pressure sores, and similar complications. Patients showed the least understanding about the cause of needle-crossing seepage, infection, and active bleeding. Overall, outpatients had reasonable levels of health knowledge regarding external fixation after receiving education in the hospital. Clearly, however, current education efforts must be expanded to include more information on causes, manifestation, and resolution of complications such as strephexopodia, muscle atrophy, and joint stiffness. Specifically, patients should be informed on needle-infection control and steps to prevent complications. These similar experiences probably explain the lack of health education on external fixation.

Self-care agency

Two-thirds of outpatients had a total mean ESCA score below the “high” category, but scores in each of the four subscales were higher than in other studies. For instance, a study using the ESCA scale among individuals of advanced age in rest homes found that the self-care agency scores were higher than their mean but lower than those in our study.¹⁸ Another study using the ESCA scale among older adults reported scores lower than in our outpatients.¹⁹ Notably, most outpatients in the present study were younger than the advanced-age patients with chronic diseases in other research. These younger patients may have found it easier to gain self-care knowledge, master self-care skills, and develop healthy behaviors. Additionally, patients may be more motivated to engage in self-care because external fixation is a very visible

Table 2. Scores for health knowledge regarding external fixation (n = 102).

Items	Score Mean (SD)	Accuracy %
1. Cause of needle-crossing seepage, infection, and active bleeding	1.87 (0.77)	36.3
2. Time, cause, manifestation, and resolution of strephexopodia and drooping	1.99 (0.80)	29.4
3. Cause of fixed steel needles becoming loose or twisted	2.02 (0.89)	32.4
4. Time, cause, manifestation, and treatment of muscle atrophy	2.03 (0.78)	25.5
5. Cause of joint stiffness	2.09 (0.81)	25.5
6. Timing and cause of needle-crossing seepage	2.20 (0.80)	20.6
7. Techniques and methods of functional exercise when carrying external fixation	2.40 (0.76)	10.8
8. Requirements of environment when carrying external fixation	2.41 (0.74)	10.8
9. Self-psychology and ideology changes during the period of external fixation	2.46 (0.71)	8.8
10. Choosing the right disinfectant for cleaning and disinfection of external fixation	2.46 (0.74)	11.8
11. Name, effect, dosage, frequency, cycle, and administration of medicine within the scope of the doctor's advice	2.47 (0.77)	9.8
12. Current fracture healing stage	2.47 (0.78)	11.8
13. Matters requiring attention during activity with external fixation	2.48 (0.74)	10.8
14. Nutritional status when carrying external fixation	2.51 (0.76)	10.8
15. Correct diet in the early, middle, and late stages of fracture and its effect	2.52 (0.78)	9.8
16. Excretion condition and constipation handling when carrying external fixation	2.54 (0.77)	10.8
17. How to wear clothes, shoes, etc. with external fixation	2.54 (0.78)	10.8
18. List of and reasons for food prohibitions during external fixation	2.58 (0.79)	10.8
19. Sleep patterns when carrying external fixation	2.59 (0.79)	10.8
20. Necessity of quitting alcohol	2.76 (0.80)	10.8

SD, standard deviation.

Table 3. Total and subscale scores for the ESCA scale (n = 102).

ESCA subscales	Mean score (SD)	Minimum score	Maximum score
Self-concept	20.12 (4.99)	11.00	32.00
Self-nursing responsibility	13.83 (3.83)	4.00	24.00
Self-care skills	29.32 (5.50)	17.00	49.00
Health knowledge level	38.43 (8.83)	25.00	68.00
Total scores	101.70 (20.14)	70.00	162.00

ESCA, Exercise of Self-Care Agency; SD, standard deviation.

form of therapeutic restriction that can seriously affect daily life functioning.

Without effective care, patients have higher risks of surgical infection,

osteomyelitis, and fracture misalignment. Therefore, outpatient health knowledge and self-care ability are critical for recovery under external fixation. We advise clinical

Table 4. Correlation between health knowledge regarding external fixation support and self-care agency.

	Self-concept	Self-nursing responsibility	Self-care skills	Health knowledge level
Health knowledge regarding external fixation support	0.138, 0.167	0.096, 0.335	0.231, 0.019*	0.103, 0.303

* $p < 0.05$.

nurses to encourage patients to participate in plans that can improve their self-care ability and therefore quality of life.

Factors that influence self-care agency

The present study is the first to simultaneously assess outpatient health knowledge regarding external fixation and demographic factors associated with self-care agency. We identified a significant positive correlation between external fixation-related health knowledge and self-care skills. However, the stepwise multiple regression analysis showed that demographic factors influenced outpatient self-care agency. These results are inconsistent with research on outpatients with other conditions; such studies generally revealed an influence of demographic variables such as age, sex, cultural background, life experience, education level, and socioeconomic status.^{13–15} This between-study difference may be due to our convenience sample; a less diverse subject pool led to results that are correspondingly less representative. Furthermore, all of our outpatients had received satisfactory health education and guidance from nurses during hospitalization. Their similar experience probably explains the lack of any obvious differences in health knowledge.

Outpatients with external fixation support need higher levels of health knowledge. In the present study, the level of self-care agency was in the moderate range. Outpatients with external fixation support who have higher health knowledge are more likely to have higher self-care skills.

Study limitations and future research

The generalizability of our findings is limited by the use of a convenience sample (only patients with external fixation) from one hospital in China. Nevertheless, the findings of this study provide a springboard for research on self-care in patients with external fixation. Specifically, we recommend greater focus on exploring more culturally sensitive instruments for measuring self-care agency. Follow-up to the current study should involve a longitudinal approach that follows a more diverse sample; this will allow for better identification of the interactions among demographics, health knowledge, self-care agency, and quality of life.

Conclusions

Outpatients with external fixation require higher levels of health knowledge for appropriate self-care as indicated by the correlation between increased knowledge and improved self-care skills. The present study revealed moderate self-care agency in outpatients with external fixation.

Relevance to clinical practice

Because outpatients with greater health knowledge are more likely to have improved self-care and therefore better quality of life, clinical practice should aim to include programs that more effectively address outpatients' understanding of their treatments. Such programs would ideally encourage participation in self-nursing plans.

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Declaration of conflicting interest

The authors declare that there is no conflict of interest.

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