

The pattern of hospital-community-home (HCH) nursing in tracheostomy patients with severe traumatic brain injury: is it feasible?

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Abstract

Background: Tracheostomy is very common in patients with severe traumatic brain injury (TBI), and long-term nursing care are needed for those patients. We aimed to evaluate the effects of hospital-community-home (HCH) nursing in those patients.

Methods: Tracheostomy patients with severe TBI needing long-term care were included. All patients underwent two months long follow-up. Glasgow coma score (GCS), Karnofsky, Self-Anxiety Scale (SAS) (SAS) and Barthel assessment at the discharge and two months after discharge were evaluated. The tracheostomy related complications were recorded and compared.

Results: A total of 60 patients were included. There weren't significant differences between two groups in the GCS, Karnofsky, SAS and Barthel index at discharge (all $p > 0.05$), the GCS, Karnofsky and Barthel index was all significantly increased after two months follow-up for two groups (all $p < 0.05$), and the GCS, Karnofsky and Barthel index at two months follow-up in HCH group was significantly higher than that of control group (all $p < 0.05$), but the SAS at two months follow-up in HCH group was significantly less than that of control group ($p = 0.009$). The incidence of block of artificial tracheal cannula and readmission in HCH group were significant less than that of control group (all $p < 0.05$).

Conclusion: HCH nursing care is feasible in tracheostomy patients with severe TBI, future studies are needed to further evaluate the role of HCH nursing care.

Background

Severe traumatic brain injury (TBI) refers to severe injuries of the central nervous system such as skull fracture, brain contusion and laceration, and intracranial hematoma caused by various reasons[1]. It's been reported that the incidence of STBI ranks first in the all types of trauma, accounting for 9% to 21% of trauma in all parts of the body, and the mortality is as high as 50%[2, 3]. In recent years, with the improvement of trauma treatment and the development of intensive care medicine, the mortality of STBI has declined, but the quality of life and daily living ability of surviving TBI patients have declined significantly[4]. Therefore, it is necessary to carry out long-term nursing care and health education for such patients to promote their quality of life.

Tracheotomy is one of the important emergency treatments in patients with severe TBI. According to previous reports, the incidence of complications of tracheotomy ranges from 5% to 57.9%[5, 6], the tracheotomy-related complications seriously affecting the prognosis of patients and even life-threatening[7]. As many countries developing into aging society, the incidence of cerebrovascular diseases has increased year by year, and the number of patients with long-term tracheostomy has increased accordingly[8]. The tracheotomy needs long-term nursing care, and the most important rehabilitation place for most patients with craniocerebral injury is at home[9]. However, there are many problems in the home care of severe TBI patients with long-term tracheostomy. Home care is part of a comprehensive health service system and is an extended service for inpatients, that is, patients receive

care and rest in a familiar home environment[10]. However, due to various factors such as the duration of visits and the difficulty of conducting on-site guidance during telephone follow-up, the traditional home care model is difficult to be fully effective[11, 12]. Therefore, it is necessary to explore new nursing models to improve the prognosis of these patients.

In 2013, the government of China has encouraged the development of medical consortium[13]. Medical consortium refers to a consortium of interests and responsibilities formed by the integration of resources of different types of medical and health institutions, generally including tertiary hospitals, secondary hospitals and community health service institutions[14, 15]. The establishment of the medical consortium provides a guarantee for the integration of regional medical resources[16]. However, the effects of medical consortium on the patients with tracheostomy remains unclear. Is it feasible and economical? What's the best evidence for the operation of medical consortium? Based on this background, we aimed to identify the effects of hospital-community-home (HCH) nursing in tracheostomy patients with severe TBI, to provide insights into the nursing care of tracheostomy patients with severe TBI.

Methods

Ethical consideration

Our study has been certified and approved by the medical ethics committee of the affiliated Suzhou science & technology town hospital of Nanjing medical university (200824), and all the included patients agreed to participant and signed the written informed consents.

Patients

Tracheostomy patients with severe TBI from January 2018 to December 2019 treated in our hospital were identified. The patients recruited from January 2018 to December 2018 underwent the traditional nursing care, while the patients recruited from January 2019 to December 2019 underwent HCH nursing care. The inclusion criteria for patients were: ☐ The diagnosis meet the clinical diagnostic criteria[17, 18] for severe TBI upon admission; ☐ Patients accepted the tracheostomy treatment during hospitalization, and the tracheotomy ostomy was not closed when discharge; ☐ Patients were willing to participate in this study and signed the informed consent. And we asked the patients' relatives for agreement if the TBI patients suffer from cognitive issues. The exclusion criteria for patients were: ☐The patients did not have primary caregivers (the relatives of the patient or their spouses who were responsible for taking care of the patient's food, clothing, living and medical-related issues); ☐Patients weren't willing to participate in this study and did not sign the informed consent.

Nursing care

For control group, we conducted the routine discharge follow-up process. We conducted telephone return visits within 1 week to ask patients about the diet, urine, sputum, consciousness, and physical activity

after discharge from the hospital. In response to the problems encountered by patients in care, the nurses conducted home visits within 2 weeks to provide guidance on on-site care issues. During the follow-up in the outpatient clinic two months after discharge, the nurse evaluated the patient's current situation and guided the nursing care accordingly.

For HCH group, the nursing care were:

The establishment of the medical consortium Under the support of the hospital medical consortium, a group of five hospital nurses and five community nurses were identified to establish a medical consortium, and the team leader was the head nurse of neurosurgery department of our hospital. The community nursing staff trained in the department of neurosurgery for one month to master the knowledge and nursing skills of severe TBI, and understood the family visit content, and passed the assessment of the head nurse. And we used software WeChat(a popular software for social interaction in China) to facilitate the understanding of the situations of patients and their families and to strengthen the information exchange between nurses.

Preparation before discharge Community nurses went to ward before patient's discharge to meet with patient and related family members, and the hospital nurses, and got WeChat with each other to enhance the relationship between community nurses, patients and their families to build a sense of trust. On the day before discharge, the hospital recorded on the patient's characteristics such as age, diagnosis, self-care ability, contact information et al. And the records were transferred to the community health service institution. And we instructed the caregiver to record the relevant information such as sputum, urine etc. every day.

Follow-up The community nurse conducted home visits to the patient's place of residence in the first week after the patient's discharge from the hospital, the nurse guided the nursing care hand-in-hand, and the nurses recorded the identified problem. And we conducted group discussions on the results of the visit. Hospital nurses and community nurses conducted the second home visit two weeks after discharge. According to the home record, more attentions were payed to the problems found by previous home visit, and we conducted on-site education and guidance. The community nurse visited the patient's home 4 and 6 weeks after the patient was discharged. And the patient followed up in the outpatient clinic of our hospital 2 months after discharge.

Outcome assessment

All the patients underwent Glasgow coma score (GCS), Karnofsky, Self-Anxiety Scale (SAS) and Barthel assessment at the discharge and two months after discharge. The GCS[19] included three aspects: open eye response, language response and limb movement. We used Karnofsky to assess the functional status of patients[20], with 100 being normal and 0 being death. The total Cronbach's α coefficient of scale was 0.935, and the coefficients of sub-contents ranged from 0.70 to 0.844[21]. The higher the score, the better the health. In addition, we use the SAS to evaluate the negative emotions of the primary caregivers of the patients[22]. The higher the score of SAS, the more serious the anxiety. The Cronbach's α

coefficient was 0.822, and the test-retest reliability was 0.715[23]. Furthermore, we used Barthel Index to evaluate the self-care ability of patients[24]. The content of the Barthel Index included eating, bathing, grooming, dressing, et al ten items, each item scored 0-15 points, and the total score were 100 points. The higher of the score, the better of self-care ability. The Cronbach's α coefficient was 0.916[25].

Furthermore, the tracheostomy related complications including subcutaneous emphysema, pulmonary infection, incision infection, block of artificial tracheal cannula were diagnosed by two experienced staff worked in our hospital, all the specimen analysis were conducted in the laboratory of our hospital, the diagnosis criteria of pulmonary infection and incision infection were in comply with related guidelines[26-28]. And the incidence of readmission was also recorded.

Statistical analysis

SPSS 23.0 software was used for relevant data analysis in this study. The continuous data was expressed as mean \pm standard deviation, the comparison between groups was conducted by t test. And the binary data was expressed by rate (%), and the chi-square test was used for groups comparisons. The comparative test level of this study was $\alpha=0.05$, and $P<0.05$ was considered statistically significant.

Results

The characteristics of included patients

A total of 75 patients suffering from TBI were identified firstly, and 12 patients refused to take part under the concern that our intervention may lead to extra medical expense. And 63 patients were included firstly, and we lost follow-up for three patients, finally a total of 60 patients were included, with 30 patients in each group. As presented in Table 1, there were not significant differences between two groups on the gender, age, GCS at admission, cases of hypertension, diabetes and hyperlipidemia, duration of ventilation, duration of ICU stay, length of hospital stay (all $p>0.05$).

The GCS evaluation

As Table 2 presented, there weren't significant differences between two groups in the GCS at discharge($p=0.124$), the GCS was all significantly increased after two months follow-up for two groups (all $p<0.05$), and the GCS at two months follow-up in HCH group was significantly higher than that of control group($p=0.032$).

Karnofsky score evaluation

As Table 3 showed, there weren't significant differences between two groups in the Karnofsky score at discharge($p=0.116$), the Karnofsky score was all significantly increased after two months follow-up for two groups (all $p<0.05$), and the Karnofsky score at two months follow-up in HCH group was significantly higher than that of control group($p=0.033$).

SAS evaluation

As Table 4 indicated, there weren't significant differences between two groups in the SAS at discharge($p=0.232$), the SAS was all significantly reduced after two months follow-up for two groups (all $p<0.05$), and the SAS at two months follow-up in HCH group was significantly less than that of control group($p=0.009$).

Barthel evaluation

As Table 5 indicated, there weren't significant differences between two groups in the Barthel index at discharge($p=0.165$), the Barthel index was all significantly increased after two months follow-up for two groups (all $p<0.05$), and the Barthel index at two months follow-up in HCH group was significantly higher than that of control group($p=0.014$).

The complications

As Table 6 presented, there were not significant difference on the incidence of subcutaneous emphysema, pulmonary infection and incision infection of tracheotomy (all $p>0.05$). But the incidence of block of artificial tracheal cannula and readmission in HCH group were significant less than that of control group (all $p<0.05$).

Discussion

After severe TBI, the patient's intracranial pressure may increase, and the resulting coma lead to respiratory dysfunction , which seriously threatens the life and health of patients[29]. Tracheotomy for patients with TBI can effectively relieve the obstruction of the respiratory tract[30]. However, after tracheostomy, the patient's respiratory tract will be directly connected with the outside environment, and the probability of lung infection can increase significantly[31]. Therefore, it is very important to give effective care to patients with tracheostomy. The home care services in China are still in the initial stage. It's been reported that the construction of home service models should be diversified, and more attention should be paid to home care for chronic diseases[32]. The results of this study have confirmed that the HCH nursing care is effective in the tracheostomy patients with severe TBI, which can improve the care and activity level of patients and related primary caregivers, reduce the anxiety of caregivers and decrease the incidence of block of artificial tracheal cannula and readmission. The pattern of HCH nursing care can be promoted in the clinical settings.

Studies have shown that the readmission of TBI patients in the first three years after injury is more than 20%[33, 34]. Nearly 77% of severe TBI patients can be prevented from being hospitalized again with regards to accidental detubation and infection[35]. Unplanned readmission lead to a slow recovery of patients and a significant increase in medical expenses[36]. Continual care is part of the overall care and extension of in-patient care. It can enable discharged patients to receive continuous health care services, and reduce the rate of readmission and health service costs, which has good social and economic

benefits[37]. TBI caregivers are affected by their own cultural background and ability of information receiving[38]. Most of them lack professional rehabilitation knowledge and skills, which can easily lead to the over stress and seriously affect the quality of life of patients[39]. Therefore, how to improve the quality of home care for TBI patients, improve their quality of life and reduce complications to reduce economic and psychological burden has become an important research topic.

Providing caregivers and patients with information about nursing care is a cost-effective measure to promote service utilization[40]. Family visits can make information exchange between patients and nurses, the nurses can provide patients with on-site targeted medical care support in a timely manner, which is helpful to the establishment of correct nursing care behavior. The reported survey[41] has found that the need for continuous nursing of patients with moderate and severe TBI ranked first, and home visiting is welcomed by all the respondents. But at present, because the family visits are affected by geographic location and human resources, the coverage of home-based nursing care is very limited[42]. In addition, the domestic community nursing service is relatively lacking in China, and the cooperative communication mechanisms between hospital and community are not perfect, and it cannot provide effective home care for patients, the patients' medical care service needs have not been met[43]. The main reason why HCH is effective is that by integrating hospital, community and home environmental resources, patients and their families can visually present the patient's condition and nursing skills to medical staff at home, so that the nurses can have a more comprehensive picture of the patient's condition. And they can promptly inform patients and their families of errors in home nursing care and correct them in time, thereby significantly reducing the incidence of complications and adverse events, and also reducing the serious complications related to tracheotomy and the risk of readmission. At the same time, HCH nursing care can use WeChat video services to share with the patients and their family members the videos on nursing care such as suction and dressing related to tracheotomy, etc. So that the patients and their families can learn the correct nursing care and reduce the stress level. In addition, the HCH nursing model helps patients to express their inner doubts, and nurses can tell them the correct way to deal with negative emotions, to enhance patients' confidence in TBI treatment and improve psychological emotions of patients and caregivers.

At present, the medical consortium has been promoted by the national health department in China[44]. The establishment of the medical consortium promotes the integration of regional human resources[45]. We have developed HCH nursing care model to link the hospital, community and family three by integrating the hospital's advantages in diagnosis and treatment, and the community's advantages in location and service and long-term home care. The HCH model has been gradually applied to the management of chronic diseases such as hypertension and diabetes with good results. Previous study[46] has found that the medical consortium has enhanced the self-care ability and psycho-social function of patients with rectal cancer after discharge. And it's been reported that HCH nursing care model enabled patients with wound to obtain economic, safe and effective continuous specialty care, and it effectively reduced the readmission of wound stoma patients[47].

Several limitations must be considered in our study. Firstly, the HCH nursing care in this present study was limited to the discharged patients within the jurisdiction of the 5 community under our hospital, it is impossible to continue the care of all discharged patients. It is hoped that through the discussion of the effects of HCH model, the experience can be summarized and extended to other area, and a referral mechanism should be established to gradually achieve full coverage of continuing care. Secondly, GCS was selected over the GOS who is a better indicator of prognosis in these patients. The relation between GCS at admission and discharge is useful but GOS may have a better perform for following patients and evaluate the impact of interventions over prognosis, future study with GOS application may be more appropriate. Thirdly, the sample size was small in this present study, it is necessary to conduct future studies with larger sample size to provide evidence for the HCH nursing care.

Conclusions

In conclusion, we have found that HCH nursing care in tracheostomy patients with severe TBI is feasible and effective, it not only helps improve the ability and quality of life of patients and family caregivers, but also it is beneficial to reduce related complications and improve patient prognosis. However, limited by sample size and resources, lager-scale studies in the future are needed to further improve the HCH nursing care.

Declarations

Ethics approval and consent to participate

Our study has been certified and approved by the medical ethics committee of the affiliated Suzhou science & technology town hospital of Nanjing medical university (200824), and all the included patients agreed to participant and signed the written informed consents.

Consent for publication

Not applicable.

Availability of data and materials

All data generated or analyzed during this study are included in this published article.

Competing interests

The authors declare that they have no competing interests.

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design of the study and collection, analysis, and interpretation of data and in writing the manuscript.

Author contributions

X Y, H L designed research; X Y, J W, L Z, C N and M X conducted research; X Y, X M, X Z analyzed data; J W and Q C wrote the first draft of manuscript; H L had primary responsibility for final content. All authors read and approved the final manuscript.

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None.

Abbreviations

TBI: traumatic brain injury

GCS: Glasgow coma score

SAS: self-anxiety scale

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Tables

Table 1 The characteristics of included patients

Items	Control group(n=30)	HCH group(n=30)	t/c ²	p
Male/female	21/9	22/8	1.203	0.174
Age	59.23±7.79	60.16±8.83	9.176	0.079
GCS at admission	6.18±1.04	6.11±1.12	1.823	0.116
Hypertension	16[53.33%]	18[60%]	1.284	0.059
Diabetes	4[13.33%]	3[10%]	1.801	0.137
Hyperlipidemia	2[6.67%]	4[13.33%]	1.355	0.121
Duration of ventilation(days)	2.58±0.89	2.52±0.77	1.024	0.096
Duration of ICU stay(days)	4.73±1.14	4.66±1.35	1.118	0.074
Length of hospital stay(days)	6.55±2.12	6.64±2.09	1.207	0.103

Table 2 The GCS evaluation between two group

Items	Control group(n=30)	HCH group(n=30)	t	p
GCS at discharge	7.38±1.22	7.35±1.19	1.088	0.126
GCS at two months follow-up	9.81±2.04	13.17±2.11	1.171	0.082
t	1.124	1.650		
p	0.047	0.031		

Table 3 The Karnofsky score evaluation between two group

Items	Control group(n=30)	HCH group(n=30)	t	p
Karnofsky score at discharge	62.18±12.04	61.86±11.25	10.571	0.116
Karnofsky score at two months follow-up	80.83±13.07	93.22±14.46	11.273	0.033
t	9.134	10.081		
p	0.049	0.012		

Table 4 The SAS evaluation between two group

Items	Control group(n=30)	HCH group(n=30)	t	p
SAS at discharge	60.23±8.48	61.02±9.19	9.170	0.232
SAS at two months follow-up	53.93±7.28	42.13±7.72	7.113	0.009
t	9.804	8.118		
p	0.042	0.024		

Table 5 The Barthel score evaluation between two group

Items	Control group(n=30)	HCH group(n=30)	t	p
Barthel score at discharge	20.49±2.74	20.55±2.08	2.113	0.165
Barthel score at two months follow-up	46.13±6.42	63.98±7.30	6.201	0.014
t	4.294	5.801		
p	0.046	0.011		

Table 6 The incidence of tracheotomy-related complications at two months follow-up

Items	Control group(n=30)	HCH group(n=30)	c ²	p
Subcutaneous emphysema	2	0	0.847	0.114
Pulmonary infection	1	1	0.000	1.000
Incision infection of tracheotomy	3	1	1.031	0.085
Block of artificial tracheal cannula	6	2	1.208	0.042
Readmission	5	1	1.105	0.023

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