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I-Chun Chen

May-Lien Liu

Cheng-Hsiu Lin

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Analysis of Hospitalization-Related Factors among Nursing Home Residents: A Preliminary Report

I-Chun Chen, May-Lien Liu,¹ Cheng-Hsiu Lin²

Department of Physical Medicine and Rehabilitation, Ton-Yen General Hospital, Hsinchu;

¹Chong-Te Nursing Home, Hsinchu;

²Department of Psychiatry, Catholic Mercy Hospital, Hsinchu.

There are increasing numbers of elderly people spending the last years of their lives in a nursing home (NH) or other long-term care institution, mostly because of physical and/or mental disabilities. NH residents may have a variety of acute illnesses; hospitalization is an important treatment option for the frail NH resident owing to the insufficient resources of NHs. The purpose of this study is to investigate the cause of hospitalization, and to analyze the correlation between the NH residents' characteristics and hospitalization.

Residents staying in the participating NH for more than one year were recruited into this study, and from September 2003 to September 2006 there were 48 subjects enrolled. After thorough chart review by the same investigator, the number of chronic diseases, hospitalization episodes and length of stay, initial symptoms and final diagnoses at discharge of recruited residents were defined and recorded.

There were 84 episodes of hospitalization in total in the study period. The most frequent symptoms were fever and/or chills (50%, 42 cases out of all those hospitalized), dyspnea or shortness of breath (16 cases, 19% out of all those hospitalized), and coffee ground vomit or tarry stools (10 cases, 12% out of all those hospitalized). The most frequent diagnoses were genitourinary tract infections (54%, 45 cases out of all those hospitalized), lung infections and/or chronic lung disease (19 cases, 23% out of all those hospitalized), and upper gastrointestinal tract bleeding and/or gastro-esophageal reflux disease (10 cases, 12% out of all those hospitalized). The residents' Mini Mental State Examination (MMSE) and Barthel index score were found to be significantly and negatively correlated with hospitalization.

Although limiting factors, including the small size of the case sample, limited geographic area and focusing on only a single NH, existed in this study, it was concluded that the mentality and activities of daily living functions of the NH residents were strong indicators of hospitalization. Early prevention of predisposing acute illness in the NH may reduce the need for hospitalization for many patients. Moreover, a rehabilitation program for reconditioning residents should be used continuously, even if the residents' functional status has declined greatly. (Tw J Phys Med Rehabil 2007; 35(2): 83 - 90)

Key words: nursing home, hospitalization

INTRODUCTION

The percentage of the population over 65 years of age is growing, with the largest increase in those over 85 years. Elderly people often suffer from one or more chronic diseases that make them more vulnerable to a decline in health and functional status, hospitalization, and even death. There are increasing numbers of elderly people spending the last years of their lives in a nursing home (NH) or other long-term care institution, mostly because of physical and/or mental disabilities,^[1,2] which will considerably increase the economic and care burden to their families over a long period of time. NH facilities provide professional long-term nursing care, including vital sign monitoring, routine medication distribution, chest care/sputum expectoration, wound care, cleaning of foley tubes, feeding tubes, and tracheostomy tubes, and assistance for the dependent residents in activities of daily living. In addition, regular physicians' rounds and individual service of rehabilitation programs are available.

NH residents may have a variety of medical conditions during the long-term care period, some of which are solved and treated at clinics. However, NH residents tend to be older than community-dwelling patients and they have more comorbidities, which may result in acute episodes of illness.^[3-5] Owing to NH resources and capabilities, e.g. a lack of technological apparatus such as X-rays, laboratory examination on site and intravenous therapy,^[6-9] hospitalization is an important treatment option for the frail NH resident for making differential diagnosis, treating underlying acute or chronic illness, alleviating symptoms, and maintaining and restoring function.^[9]

In previous reports, the course of hospitalization of the NH patient tends to be longer and more complicated. The NH patients usually have a longer duration of hospitalization and a higher mortality rate associated with hospitalization.^[4,10,11] These patients often have more medical conditions at baseline, and are also more likely to have underlying functional and cognitive impairment when compared with their community-dwelling counterparts. They are at greater risk of complications during their hospitalization and are vulnerable to the development of new medical problems unrelated to their admission diagnosis.^[10] Besides, hospitalization is costly and

distressing to the residents, disrupting their usual routines, aggravating their delirium and leaving them vulnerable to iatrogenic events (such as restraints and pressure sores), which may be more prevalent amongst frail older people in acute-care settings than amongst those in long-term care settings.^[12,13]

As a result of the potential harmfulness of hospitalization, it is important for clinical physicians and associated co-workers to realize the leading causes and related risk factors of hospitalization among NH residents. Although several previous studies have addressed the issue of transferring from NH to an acute-care setting, some of these studies focused on selected groups of residents or specific medical conditions or diseases,^[12,14-18] some studies stressed the related facility performance factors to hospitalization,^[7,9] and some studies did not examine the acute event that precipitated hospitalization.^[3,19,20] Therefore, the purpose of this study is to provide a global and detailed investigation of the incidence of initial acute symptoms and final diagnoses of hospitalization, and to analyze the correlation between NH long-term residents' characteristics, hospitalization episodes and duration of hospitalization.

MATERIALS AND METHODS

Facility and staffing

In this study, a survey was performed in a qualified, skilled NH, the Chong-Teh Nursing Home in Hsinchu County, which was established in September 2003. There are about 100 beds available to serve those people who need transient or prolonged professional nursing care and supervision. The staff include physicians, nurses, physical therapists, a pharmacologist, trained caregivers, dietitians and social workers, who execute their tasks in specific and professional fields.

Residents' evaluations

The clients who were sent to the NH were examined by the physicians to evaluate their past medical history, current physical and functional conditions, and to adjust medication as required; simultaneously, specific rehabilitation programs were arranged depending on individual needs. The residents' mentality was assessed by Mini

Mental State Examination (MMSE) and activities of daily living function was measured by Barthel Index at admission by the trained nursing staff. After admission to the NH, monthly reassessments were carried out.

Subjects and hospitalization episodes

Residents staying in the NH for more than one year were recruited into this study; those who left the NH to go to other institutions, those who were sent back home during the residential period and those who died were excluded. From September 2003 to September 2006, there were 48 subjects enrolled in this study. During the residential time, residents who suffered from progressive and aggravating episodes of acute illness were transferred to the hospitals nearby depending on their habit of seeking medial services or their family's requests. These cases were hospitalized or treated conservatively at the clinics then returned to the NH based on the medical doctors' judgments. As for the hospitalization information, a detailed summary including illness history, medical procedures and final diagnoses was requested when the patients were discharged, and all the information was included in the residents' charts in the NH. After thorough chart review by the same investigator, the number of chronic diseases, hospitalization episodes, length of stay, initial symptoms and final diagnosis at discharge of recruited residents were defined and recorded. The chronic diseases included chronic lung diseases, diabetes mellitus (DM), cerebral vascular accidents (CVA), hypertension, heart diseases and cancers.

Data analysis

The correlation between patients' conditions, including duration of stay at the NH, age, number of chronic diseases, initial and latest mentality score by MMSE, Barthel index scores, hospitalization episodes and duration of hospitalization, were measured and explored by logistic regression. Values of $p < 0.05$ were considered to represent a statistically significant difference.

RESULTS

The mean age of these 48 residents was 78.35 ± 9.16 years, with a range of 42 to 94 years old. There were 30 male and 18 female subjects. The average duration of

residing in the NH of all subjects was 21.48 ± 6.46 months, with a range of 12 to 34 months. There were a total of 84 episodes of hospitalization in the study period; there were 15 residents who were not hospitalized during their stay. There were 2 residents who were hospitalized 7 times during their stay (21 to 25 months). Figure 1 shows the initial symptoms or complaints leading to later hospitalization. The residents probably had more than one complaint or symptom for each episode of acute illness. The most frequent symptom was fever and/or chills, which accounted for 50% (42 cases) of all causes of hospitalization. Other complaints in sequence were dyspnea or shortness of breath (16 cases, 19% of all) and coffee ground vomit and/or tarry stools (10 cases, 12% of all). There were other infrequent symptoms or complaints, such as hematuria, poor control of blood sugar, constipation, bloody stools and urine frequency, which are not listed in Figure 1.

Figure 2 shows the final diagnoses of hospitalization. There might be more than one diagnosis for each episode of hospitalization. The most frequent diagnosis was genitourinary tract infection, which accounted for 54% (45 cases) of all hospitalizations. Other diagnoses in sequence were lung infections and/or chronic lung diseases with acute exacerbation (19 cases, 23% of all), and upper gastrointestinal tract bleeding and/or gastroesophageal reflux diseases (10 cases, 12% of all). There were other rare diagnoses recorded, such as recurrent stroke, peripheral occlusive artery diseases, colitis, hepatic encephalopathy, lung cancer, pleural effusion, hernia, acute myocardial infarction, gouty arthritis, hyponatremia, atrial fibrillation, and deep vein thrombosis, which are not listed in Figure 2.

Table 1 displays the Spearman's correlation coefficients of residents' characteristics and hospitalization episodes /length of stay. We found a significant and negative correlation between residents' mentality (MMSE) scores and hospitalization. Also, a significant and negative correlation between residents' Barthel index scores and hospitalization was noted ($p < 0.05$). This reveals that the better the subjects showed in the mental and activities of daily living functions, the less episodes of hospitalization they had. However, the residents' duration of stay in the NH and number of chronic diseases did not seem to be associated with hospitalization. In addition, it was found

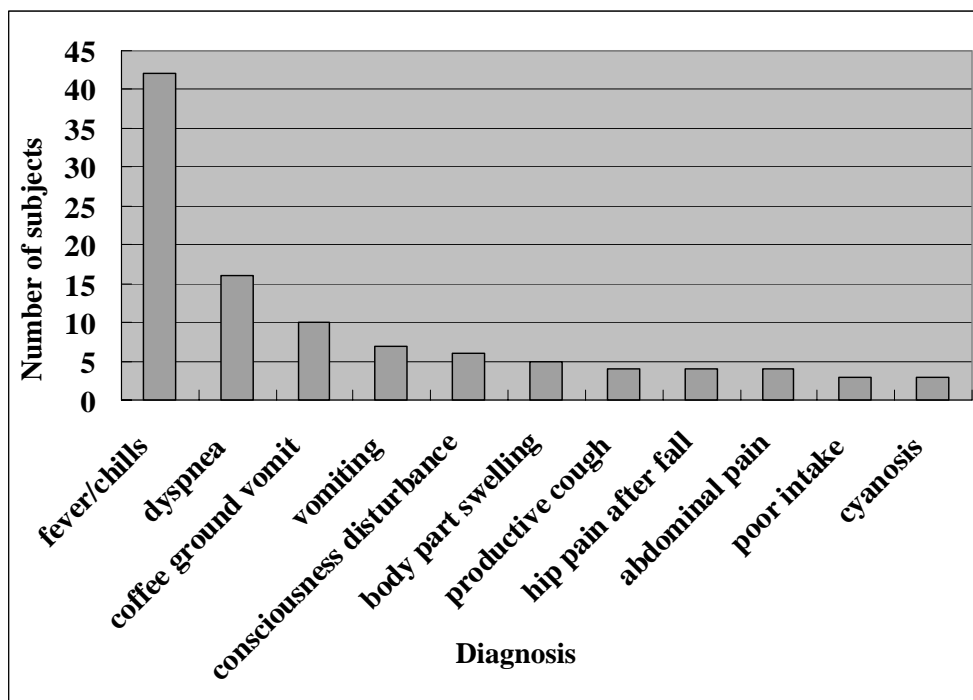


Figure 1. The symptoms or complaints resulting in hospitalization (n=84)

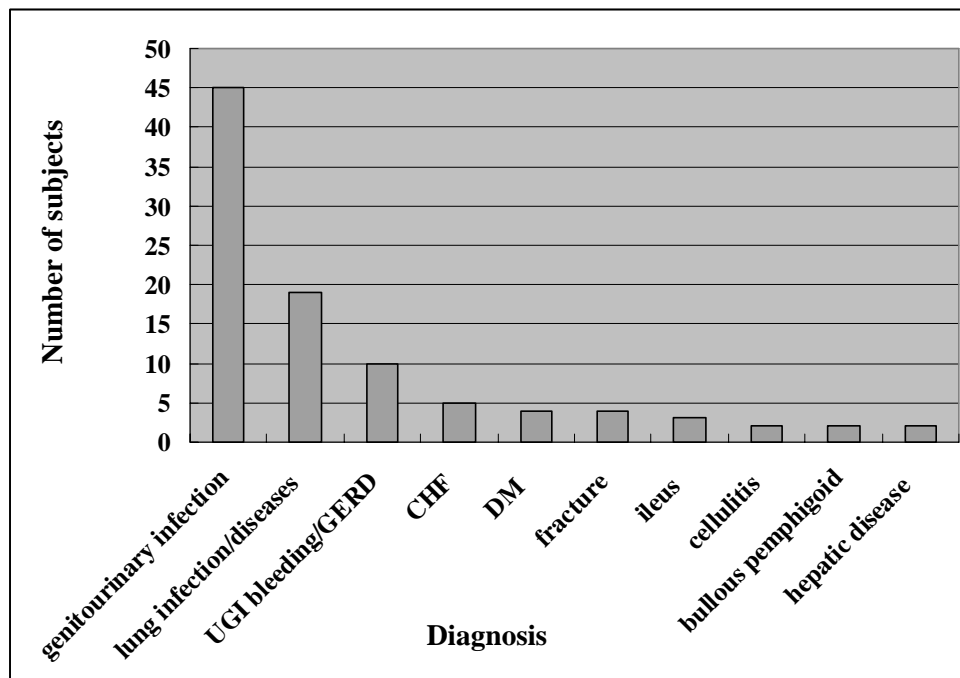


Figure 2. The final diagnoses of hospitalization (n=84)

Abbreviations: UGI: upper gastrointestinal, GERD: gastro-esophageal reflux disease, CHF: congestive heart failure, DM: diabetes mellitus.

Table 1. Correlation between Residents' Characteristics and Hospitalization

	Duration	Age	Chronic disease	MMSE1	MMSE2	BI1	BI2	Hospitalization episode
Age	0.160	/	/	/	/	/	/	/
Chronic disease	0.099	-0.123	/	/	/	/	/	/
MMSE1	0.089	-0.310*	0.002	/	/	/	/	/
MMSE2	0.133	-0.310*	0.009	0.821**	/	/	/	/
BI1	0.211	-0.212	-0.123	0.744**	0.664**	/	/	/
BI2	0.100	-0.116	-0.136	0.747**	0.884**	0.707**	/	/
Hospitalization episode	0.131	0.320*	0.071	-0.380*	-0.451**	-0.413**	-0.419**	/
Hospitalization length of stay	0.060	0.314*	0.070	-0.292	-0.420**	-0.371*	-0.350*	0.952**

Data was represented with Spearman's correlation coefficient, *: $p < 0.05$, **: $p < 0.01$

Abbreviations: MMSE1: subjects' Mini Mental State Examination scores at admission to the nursing home, MMSE2: subjects' recent Mini Mental State Examination scores, BI1: Barthel Index 1: subjects' Barthel index scores at admission to the nursing home, BI2: Barthel Index 2: subjects' recent Barthel index scores

that patients' mentality scores were positively associated with their Barthel index scores.

DISCUSSION

The mentality and activities of daily living function scores of NH residents were strong indicators of hospitalization. The poorer the residents' mentality and activities of daily living functions were, the higher the risk of hospitalization they had. Fried's^[3] investigation determined the relationship between characteristics of older, long-term stay NH patients and hospitalization, and the author found that severe functional impairment and worsening activities of daily living self-performance were associated with hospitalization. In our study, there were some residents who suffered from a major brain insult (e.g. a large infarction or a massive intracranial hemorrhage) or had a severe deconditioning status due to other major diseases before they were admitted to the NH. They usually had multiple disabilities in mental and physical functions. In this group of severely mentally deficient residents, as we expected, the prevalence and severity of comorbidity increased because they were usually more likely to be bedbound and apathetic; they often could not describe symptoms and complaints adequately.^[14] It is

well known that immobility is associated with many complications and the effects of immobility are rarely confined to only one body system. For example, in the cardiopulmonary system, the adverse effects include orthostatic hypotension, reduction of cardiopulmonary functional capacity, mechanical resistance of breathing and hypostatic pneumonia. As for the genitourinary system, urinary stasis, stones and urinary infections are reported to be the adverse effects of immobility.^[21] However, the residents' duration of stay in the NH and number of chronic diseases did not seem to be associated with hospitalization. We could not quantitate the severity of chronic diseases though this might be the main influence upon hospitalization. The subjects probably had a variety of chronic diseases e.g. a heart disease, a lung disease and a brain stroke. However, in cases of a minor degree of disease process, the subject would be in stable medical condition for the most part.

While residents in the NH suffered from uncontrolled infections with impending sepsis or other fatal illness, aggressive medical procedures including diagnostic technologies (e.g. image and laboratory examination) and treatment procedures (e.g. intravenous fluid and antibiotic therapy, ventilation support or surgery) were required immediately and urgently. It was necessary to

transfer the patients to hospital for further management due to the unavailability of medical resources in the NH. In our records, the most frequent problems contributing to hospitalization were genitourinary and pulmonary infections (Figure 2). In previous literature, Yoshikawa & Norman^[22] reviewed the diagnostic and therapeutic problems of NH residents with infections; they indicated that infection was the most frequent reason for patients to be transferred from NHs to an acute-care facility, and the most common infections that were acquired in NHs were urinary tract infections (cystitis, pyelonephritis), respiratory infections (pneumonia, bronchitis) and skin/soft tissue infections (infected pressure ulcers, cellulitis). Alsip & Harker^[23] pointed out that the most common etiologies of acute illness in NH residents were pneumonia (33% of episodes) and urinary tract infections (27%), and the authors disclosed that the significant risk factors for acute illness included anemia, mobility dependence and surveillance time in the NH. Boockvar and Lachs^[24] reported the hospitalization risk following admission to an academic NH and found the percentage with acute illness (commonly gastroenteritis, urinary tract infection and pneumonia) were paralleled with hospitalization.

Since hospitalization may be a source of complications and functional decline for many patients, early prevention of predisposing acute illness in the NH may reduce the need for hospitalization for many patients. To prevent genitourinary infections, interventions include adequate fluid intake, instituting a time to void program, use of upright position for voiding whenever possible, scrupulous avoidance of bladder contamination during instrumentation and acidification of the urine. In the prophylaxis of respiratory complications, chest care is emphasized in NH care all the time; physical therapy for mobilization, frequent and regular respiratory toileting, position change, postural drainage, chest percussion and oropharyngeal suctioning are imperative.^[21,25] In our experience, most patients will return to the NH following hospital discharge. Therefore, the NH physicians should be informed of the hospital course and changes in management. The patient should leave the hospital with a set of orders for the NH, including allergies, diet, medications, activity level, therapy, dressing changes, future laboratory tests and vital sign checks. Medications should be discontinued if they were used acutely and long-term

use is not necessary.^[1]

CONCLUSION

In summary, although factors including the small number of cases, limited geographic area and focusing on only a single NH existed in this study, it is important to reinforce the prophylaxis of predisposing life-threatening infections in genitourinary and respiratory systems for the high incidence of hospitalization regarding those residents whose mental, mobility and activities of daily living functions were impaired. Moreover, a rehabilitation program for reconditioning should be used continuously, even if the residents' functional status has declined greatly.

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護理之家住民住院之相關因素分析：初步報告

陳怡君 劉梅蓮¹ 林正修²

東元綜合醫院復健科 崇德護理之家¹ 耕莘醫院仁慈分院精神科²

越來越多老人因為疾病導致心智或是生理功能失能而住進護理之家或其他養護機構。由於護理之家的設備資源限制，住民在療養的過程中常因各種急症而需要轉院住院醫療，此一住院事件往往中斷住民的復健治療並可能造成進一步功能退化，本篇調查報告的主要的目的就是想要了解護理之家長期安養的住民最常因為何種急症住院，並且尋求住民之特性與住院事件之間的相關因素，以了解哪些因素是住院的高危險因子。

在新竹縣境的崇德護理之家，選定現仍存活、住超過一年且期間並未離開的住民，至 2006 年 9 月為止共有 48 位住民參與此一調查報告，經過同一位觀察者的病例回顧可以訂出住民特性：包括慢性疾病種類數、住院的次數、住院天數、住院的主訴症狀、出院的診斷。結果發現在統計期間共有 84 次的住院事件，最常住院的主訴症狀依序為：發燒/寒顫(佔 42 例、50%)、呼吸困難、呼吸短促(佔 16 例、19%)、咖啡渣狀消化嘔吐物或解黑便(佔 10 例、12%)；最常見的出院診斷依序為：尿路感染(佔 45 例、54%)、肺部感染或慢性肺疾惡化(佔 19 例、23%)、上消化道出血(佔 10 例、12%)；在相關性的分析上：住民的簡易心智量表(Mini Mental State Examination, MMSE)及巴氏量表(Barthel index)分數，和住院的次數間有負相關($P < 0.05$)，儘管因為收案個數較少、有地區性限制等因素，這個結果仍顯示住民的心智及自理生活功能指數較低者為住院的高危險群，因此針對這個問題除了加強預防急症的照護外，對於功能極差的住民仍須強調復健活動功能訓練的必需性。(台灣復健醫誌 2007；35(2)：83 - 90)

關鍵詞：護理之家(nursing home)，住院治療(hospitalization)