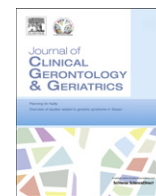


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## Review article

## Overview of studies related to geriatric syndrome in Taiwan

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## ABSTRACT

Geriatric syndrome has become one of the most important concepts in modern geriatric medicine. With the baby boomer generation in Taiwan are becoming old, it is important to gain a better understanding what have been done related to geriatric syndromes in Taiwan. Thus, the aim of the study is to overview the studies related to geriatric syndromes in Taiwan during the past two decades. Three English databases (Medline, PubMed, and PsycInfo) and two Chinese databases (Chinese Periodical Index and Chinese Journal Resources) were used to search for original studies related to geriatric syndrome with older Taiwanese participants. Studies published during the time period from January 1989 to February 2009 were included. A total of 255 studies were found. The number of published studies increased during the past decade (14 studies in 2001, 34 studies in 2004, and 51 studies during 2008–February 2009). There were 142 studies (55.7%) related to geriatric syndromes. Most of them were related with functional decline, disability, and fall (54 articles) and about cognitive function declines, dementia, delirium, and depression (49 articles). Furthermore, after reviewing 79 studies, which had reported risk/protective factors, six possible shared risk/protective factors were found: sex, education, age, daily living function, self-rated health, and chronic disease. It is encouraging to find out that studies related to geriatric syndromes are growing in number with expanding diversity in Taiwan. However, more studies are needed, especially those designed with a more comprehensive view of health and functioning about older people, to improve the understanding of geriatric syndromes in Taiwan.

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## 1. Introduction

Physical aging is the result of degeneration of multiple organ systems. However, most functional degeneration caused by aging is regarded as a normal biological process, which requires no treatment in disease-oriented medical system. As the aging population continues to escalate, preventing older people from disability has been identified as one of the best strategies for achieving healthy aging. Clinical manifestations of aging have accordingly been elevated to the status of symptom/syndromes that demands treatment, leading to the emergence of the concept called “geriatric syndrome.”

With the increasing attention in the fields of clinical practices, academic researches, and medical education in recent years, “geriatric syndrome” has been adopted as an umbrella term encompassing health problems highly prevalent in the elderly. The

major commonness of these health problems is that instead of a single etiology or pathology, virtually all these syndromes of older adults are caused by multiple diseases and/or multiple risk factors. Some scholars proposed geriatric syndromes might include health problems that concerning hearing, eyesight, dental/oral conditions, frailty, delirium, depression, insomnia, sleep disturbance, dizziness, falls, lower extremity problems, malnutrition, dementia, impaired cognition, language disorders, incontinence, pressure ulcers, and pain.<sup>1</sup> However, a geriatric textbook had proposed a similar, but somewhat different, list of geriatric syndromes.<sup>2</sup> Therefore, the definition and “list” of geriatric syndrome has remained a task marked with controversies.

Generally, the medical definition of “syndrome” refers to the aggregation of signs, symptoms, and manifestations that constitute the characteristics of an entity in nosology. Comparing to the term “disease,” which is usually free from ambiguity, “syndrome” is characterized by unknown etiology and/or pathogenesis. “Geriatric syndrome” should be treated as a special type of syndrome, denoting a nosological entity affecting the health of the elderly, presented by a major sign, symptom, or clinical manifestation. A geriatric syndrome usually involves multiple risk

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factors and multiple organ systems, and reporting unique features of common health problems in older people. Geriatric syndromes can therefore be understood as elderly health problems caused by multiple etiological factors via interacting pathogenetic pathways.<sup>3</sup>

“Geriatric syndromes” have been identified as a new and special field of geriatric medicine and also have become an important aspect in modern medicine. Treatments based on clinical manifestations of geriatric syndromes can be helpful even in the absence of a clear etiology or a diagnosis.<sup>4</sup> After a comprehensive review of researches on five geriatric syndromes, including incontinence, falls, pressure ulcers, delirium, and functional decline, researchers have identified four major shared risk factors of geriatric syndromes namely age, cognitive impairment, functional impairment, and impaired mobility.<sup>4</sup> Frailty is the common end product of these geriatric syndromes, and it can also intensify these shared risk factors and geriatric syndromes. Without proper and effective intervention, frailty can lead to unwanted results, such as disability, dependence, reliance on long-term care, and even death.<sup>4</sup> Any endeavors to define geriatric syndrome need to highlight the fact that “most health problems occurring during the human aging process can actually be prevented and treated.” For example, with the only exception of age, three of the four risk factors mentioned above are both preventable and treatable. Moreover, when discussing geriatric syndrome, one should be constantly be reminded that the most crucial health issues for the elderly lies in “maintaining good physical and mental function.”

As promulgated by World Health Organization in 2001, the International Classification of Functioning, Disability, and Health<sup>5</sup> emphasized that while evaluating health status, we should switch our focus from diseases to the “components of health,” and proposed a comprehensive model including eight body functions and structure, such as “mental function” and “sensory function and pain,” for instance. To initiate a comprehensive understanding of the overall health status of older people in Taiwan, the present study adopted the “functional health” approach while reviewing studies related to geriatric syndromes.

Based on the points presented above, the present study summarized that any health problem that is being considered as a “geriatric syndrome” should be (1) age related; (2) with functional decline; (3) multisystem involved; (4) with complex etiology, (5) poor outcome; (6) but however treatable. However, what are the health problems that should be included as geriatric syndrome is still open to debate. Adopted from Inouye et al.,<sup>4</sup> Hazzard,<sup>2</sup> and other scholars’ suggestion,<sup>1</sup> the present study focused on the following health problems: pressure, ulcer, incontinence, falls, functional decline, delirium, frailty, insomnia, depression, impaired cognitive function, and malnutrition. As Inouye et al.<sup>4</sup> proposed, identifying related risk factors for these health problems might lead a way to understanding geriatric syndromes better. Thus, by searching, reviewing, and analyzing studies (in both Chinese and English) focus on the health problems that is being considered as geriatric syndromes published during the past 20 years in Taiwan, the study aims at exploring what had been done in Taiwan and identifying related risk factors to facilitate and enrich further studies on geriatric syndrome in Taiwan and strives to propose the directions for future research endeavors.

## 2. Methods

### 2.1. Locating published studies

Focusing on studies related to geriatric syndrome, the study launched a comprehensive search for original articles that studied

older Taiwanese adults and published during the past 20 years (from 1989 to February 2009) in both Chinese and English journals. The study used the MEDLINE, PubMed, and PsycInfo databases to search for English articles. For Chinese articles, the two databases used are the National Central Library Index to Chinese Periodical Literature and the Database of Abstracts for Chinese Periodical Papers maintained by the Science and Technology Policy Research and Information Center of the National Applied Research Laboratories.

In terms of the searching strategies, the study used the following criteria and key words for English databases: (1) studies about Taiwanese: “Taiwan”; (2) studies focused on elderly group: “aged,” “old,” and “elderly,” or used the classification codes of “gerontology” and “geriatrics” offered by the database; (3) studies related to geriatric syndromes, including: “geriatric syndrome,” “pressure ulcer,” “incontinence,” “falls,” “functional decline,” “delirium,” “dizziness,” “frailty,” “insomnia,” “mobility,” “cognitive function,” “intellectual function,” “intelligence,” “memory,” “cognitive abilities,” “life satisfaction,” “well-being,” “activities of daily living,” “malnutrition,” “anemia,” and “disability”; and (4) original studies. Studies that fit all four criteria were included. For searching published articles in Chinese, the study first located candidate articles with the search terms (in Chinese) of: “older people,” “the elderly,” and “senior citizens.” Abstracts of these candidate articles were then reviewed to pinpoint articles that met the following three criteria: (1) research subjects are older Taiwanese; (2) subject matters are related to geriatric syndromes; and (3) original studies.

To minimize the probability of missing qualified articles, after the initial searches were completed, an e-mail was sent to the corresponding author of each selected article to solicit any related articles that were formally published but overlooked in our preliminary searches.

### 2.2. Categorization of selected articles

Qualified articles were categorized into the following four groups based on the research topic: (1) Gerontology; (2) Geriatric Syndrome; (3) Geriatric Care; and (4) Geriatric Policy and Education. The “Gerontology” category collects researches on the physical, psychological, and social aspects of aging and can further be divided into studies on (1) biomarker; (2) social activities, emotion/emotional reaction, and communication; (3) longevity and mortality; (4) quality of life; and (5) gender-related issues. The “Geriatric Syndrome” category, as previously stated, should be approached with the overall state of elderly health in mind, and thus can be classified by the following systems and functions: (1) geriatric syndromes related to the muscular-skeletal system, such as impaired mobility, disability, functional limitations, and falls; (2) geriatric syndromes associated with the psychoneuro system, such as cognitive impairment, dementia, depression, and delirium; (3) geriatric syndromes concerning nutrition and body composition, notably malnutrition, metabolic malfunction, and obesity; and (4) other geriatric syndromes, such as incontinence, pain, and insomnia.

Studies on nursing and caring the elderly and those on the elderly under special nursing contexts are grouped in the category of “Geriatric Care” incorporating the subcategories of: (1) disease prevention; (2) comprehensive geriatric Assessment; (3) long-term care/home care; (4) palliative care; and (5) physical exercise and rehabilitation. Finally, in the category of “Geriatric Policy and Education” are studies concerning (1) policies for promoting elderly health and the integrative care model and (2) education and training programs for geriatric professionals.

**Table 1**  
Categorization of studies related to geriatric syndrome in Taiwan

Categorization of studies	Published	
	n	%
<b>A. Gerontology</b>	74	29.0
1. Biomarker	4	1.6
2. Elder communication/ social activity/emotional reaction	34	13.3
3. Longevity/ mortality	5	2.0
4. Quality of life	25	9.8
5. Gender issue	6	2.4
<b>B. Geriatric syndrome</b>	142	55.7
1. Frailty/mobility/disability/fall	54	21.2
2. Cognitive/depression/dementia/delirium	49	19.2
3. Nutrition/metabolic syndrome/obesity (Body composition)	17	6.7
4. Other geriatric syndrome (incontinence, vision, sleep, pain, dysphagia, others)	22	8.6
<b>C. Geriatric care</b>	35	13.7
1. Disease prevention	1	0.4
2. Comprehensive geriatric assessment	5	2.0
3. Home care/ long-term care	17	6.7
4. Palliative care	1	0.4
5. Physical exercise/rehabilitation	11	4.3
<b>D. Geriatric policy and education</b>	4	1.6
1. Health promotion/integrated care model	4	1.6
2. Geriatric education training	0	0.0
<b>Total</b>	255	100

**3. Results**

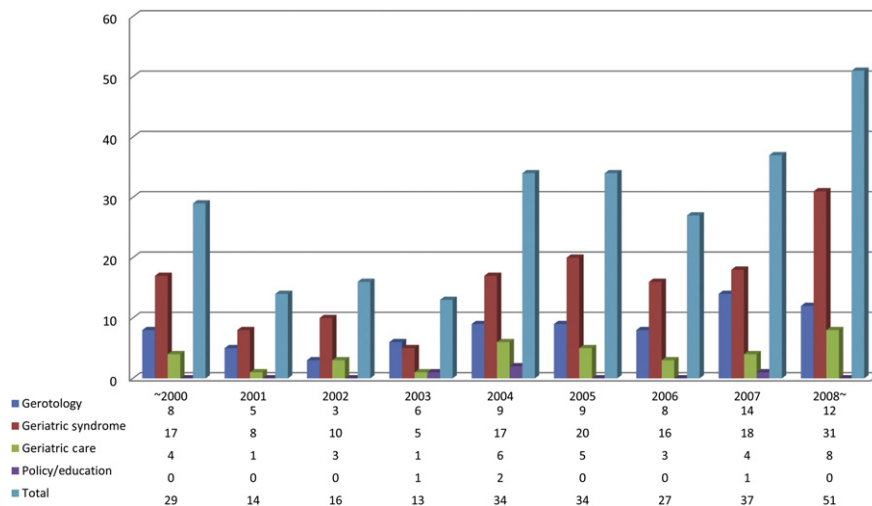
*3.1. Results from search/categorization of studies*

The study had identified a total of 255 studies targeted on older Taiwanese, related to geriatric syndromes, and published during the period from 1989 to February 2009 (see Table 1, and please refer to “Selected papers on geriatric syndrome studies in Taiwan: Abstract collection” published by Taiwan Association of Gerontology and Geriatrics in 2009). Of the 255 selected articles, 142 (55.7%) focus on health problems that is being considered as geriatric syndromes. Breakdown of these 142 articles reads as follows: 54 studied on frailty, functional limitations, impaired mobility, disability, and falls; 49 on cognitive impairment, dementia, depression, and delirium; 17 on malnutrition, metabolic syndrome, and obesity; and 22 on other geriatric syndromes (ex, incontinence, pain, insomnia and sleep disturbance, vision problem, dysphagia,

and oral problems). For gerontology-related researches, 74 articles were found, including 4 related to biomarkers, 34 associated with elderly social activities, emotion/emotional reaction and communication, 5 on longevity and mortality, 25 about quality of life, and 6 on gender-related issues. The category of “geriatric care” incorporates 35 articles with 1 studies related to disease prevention, 5 on comprehensive geriatric assessment, 17 on long-term/home care, 1 on palliative care, and 11 associated with physical exercise and rehabilitation. In the category of geriatric policy and education, only four articles were located, and all of them were policy related. No empirical study on geriatric education or training had been found. We did find articles and chapters about geriatric education and training. For instance, Chen<sup>6</sup> had written a chapter in textbook to discuss about challenges and perspectives of elderly care in Taiwan. However, these kinds of articles did not fit the inclusion criterion of “original studies” and thus were not included (Table 1).

By the year of publication, the earliest article identified by the study is the epidemiological study on dementia in Taiwan’s elderly population by Yip et al<sup>7</sup> dated 1992. The number of articles published per year during the period from 1995 to 1998 were less than 3; the number then went up slightly to 8 in 1999; and continued the growth to more than 10 per year during the period from 2000 to 2003. By 2004, the number of selected articles registered an impressive increase to 34. In 2008, more than 50 articles related to geriatric syndrome were published. Please refer Fig. 1 for detailed information about the growth in the number of articles related to geriatric syndrome in Taiwan.

Further categorization in Fig. 2 was initiated to obtain an understanding of the academic and professional backgrounds of the authors for the selected articles. Authors with a background in nursing took the lead to publish 100 articles, followed respectively by those with a background in medicine (61 articles), public health (43 articles), sociology (13 articles), nutrition (12 articles), and those in other fields, such as health care management, psychology, physical therapy, economics, biometrics, journalism, and sports and recreation management (less than 10 articles in each field). Cross-references between the author’s background and research topic indicated that authors specializing in nursing (21 articles) and public health (20 articles) together present most articles in the category of “gerontology.” Of the 142 articles in the “geriatric syndromes” category, 55 are from authors with a background in nursing, 42 in medicine, 19 in public health, and 11 in nutrition. Most articles on geriatric care were published by authors with



**Fig. 1.** Growth in the number of articles related to geriatric syndromes in Taiwanese elderly.

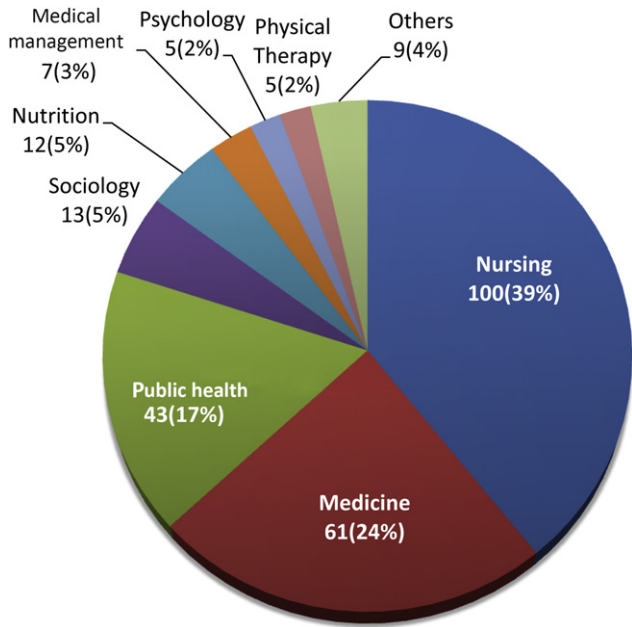


Fig. 2. Breakdown of articles related to geriatric syndromes in Taiwanese elderly by author's academic/professional background.

a background in nursing (23 articles). Please refer to Fig. 3 for detailed information.

3.2. Risk factors for six geriatric syndromes in Taiwan—a preliminary analysis

To gain a preliminary understanding of the shared risk factors for geriatric syndromes in Taiwan, the study reviewed the abstracts of all the 142 articles targeting health problems considered as geriatric syndromes and identified 79 articles as reported risk and/or protective factors. The articles were categorized by the health problems studied into “Depressive Symptoms/Depression” (17 articles), “Fall” (15 articles), “Functional Limitation” (15 articles), “Impaired Cognitive Function” (11 articles), “Sleep Disturbance” (7 articles), “Hip Fracture” (7 articles), “Malnutrition” (2 articles), “Urinary Incontinence” (2 articles), “Chronic Pain/Headache” (2 articles), and “Visual Problem” (1 article) (please see Table 2).

The study further summarized the shared factors of the six health problems that had been studied in at least seven articles. In terms of demographic variables, gender appeared as a related factor

shared by all six geriatric syndromes, education by five, and age by three. In terms of functional variables, “daily living functions” was identified as a related factor shared by five geriatric syndromes. Also to be noted is that “self-rated health” was present as a related share factors in four geriatric syndromes, and chronic disease appears as a related factors shared by five geriatric syndromes. However, no “psychosocial and “care-related” variable emerged as a significant shared factor. This may be because of the differences in conceptualizing and assessing each geriatric syndrome (Table 2).

4. Discussions

The quantity of geriatric syndrome studies in Taiwan has sustained a steady growth during the past 20 years; the last few years in particular have witnessed exponential growth in the number of articles published in this field. It is also highly invigorating to find the research themes and the academic/professional backgrounds of authors marked with expanding diversity. Although making its debut in Taiwan in the 1980s, gerontology/geriatric had not been able to establish itself as an independent specialty before 2000. The rapidly rising population of senior citizens in Taiwan, however, prompted local medical community to recognize the need to accord geriatric with a status matching the gravity of the country's aging problem. Implementation of the “Geriatrics Sub-Specialty Certification System” in 2001 and the “Geriatric Fellowship Training Program” in 2004 provided the much-needed stimulus for medical centers and medical schools in Taiwan to establish geriatrics departments. Increase in the number of geriatricians and allied medical specialists leads to corresponding growth in the number of researches on eldercare policies and geriatric education. In the recent International Association of Gerontology and Geriatrics World Congress held in Paris in July 2009, the Taiwan delegation presented 65 articles with 8 addressing policy- and education-related issues. In light of this encouraging trend, both the quantity and the quality of studies on geriatric syndromes in Taiwan can be expected to sustain a stable increase in the near future.

As revealed by the published articles, several geriatric syndromes, notably depression, fall, and functional limitation, have grasped the attention of most researchers. On the contrary, there were a few studies considering other geriatric syndromes, such as dizziness, pressure sores, or elder communication. Furthermore, in Taiwan, there has been virtually no empirical study on frailty, which is regarded as a potential common end product of geriatric syndromes. Extant studies tend to focus their research themes around one single type of geriatric syndrome, such as problems in physical functions, fall, or impaired cognition. Studies on

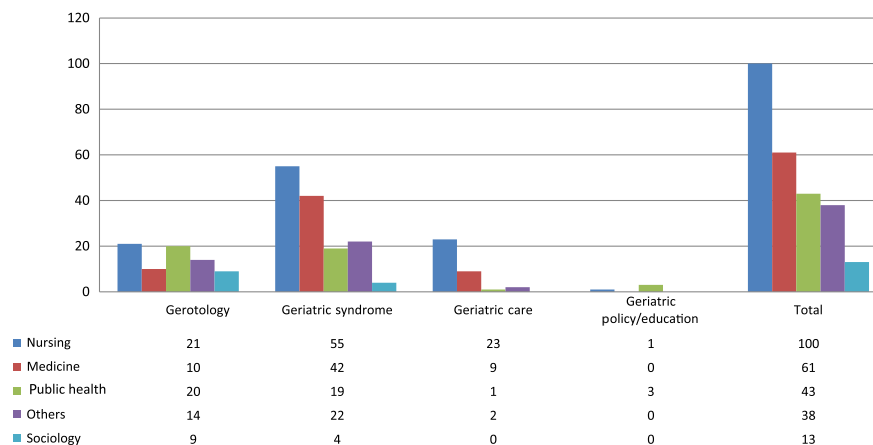


Fig. 3. Distribution of articles by category and author's background.

**Table 2**  
Related factors for geriatric syndromes in Taiwan

Geriatric syndrome	Related factors	Reference
Impaired cognitive function (including dementia)	Demographic variables	
	Age	7,8
	Gender	7,8
	Education	8
	Functional variables	
	Activities of daily living	9
	Psychosocial variables	
	Depression	8
	Feeling of knowing	10
	Verbal fluency	11
	Social participation	12
	Disease and health status	
	Delusion	13
	Health conditions	8
	Early-onset bipolar disorder	14
	Care-related variables	
	Informal care	15
	Others	
	Cholinesterase inhibitors	16
	Longest-held occupation	17
	Depressive symptoms/depression	Demographic variables
Gender		18,19
Marital status		20
Education		21
Perceived income		19,22,23
Functional variables		
Activities of daily living		23,24
Physical function		18,21
Cognitive function		18,22,25
Self-rated health		19–23,25–28
Psychosocial variables		
Suicidal thoughts		20
Self-efficacy		29
Social support/network		18,22,23,28,30
Life event		23
Biological variables		
Brain atrophy		31
White matter hyperintensity		31
Homocysteine levels (plasma)		32
Carotid intima-media thickness		33
Disease and health status		
Chronic diseases	24,28	
Headache	34	
Impaired swallowing	26	
Osteoarthritis	25	
Respiratory disease	22	
Stroke	30	
Care-related variables		
Living situation	18,19,21,22,26,27	
Medical resources	20	
Length of residency	28	
Sleep disturbance	Demographic variables	
	Gender	35,36
	Education	37,38
	Socioeconomic status	35
	Marital status	36,38
	Self-rated health	37,39
	Functional variables	
	Activities of daily living	40
	Psychosocial variables	
	Depression	40
	Perceived stress	36
	Social functioning	37
	Disease and health status	
	Chronic disease	35,39,40
	Physical symptoms	37,39
Sleep-related variables		
Napping	39,41	
Sleep habit	35	
Visual disability	Gender, age	42
	Corneal diseases, myopic or diabetic retinopathy	42
	Age-related macular degeneration	42

**Table 2 (continued)**

Geriatric syndrome	Related factors	Reference
Malnutrition	Demographic variables	
	Gender	43
	Functional status	43
	Disease and health status	
	Depressive symptoms	43
	Chronic disease	44
	Care-related variables	
	Medication	43
	Living situation	44
	Functional limitation (based on activities of daily living, instrumental activities of daily living, Barthel index, and other type of measures)	
	Demographic variables	
	Age	45–50
	Gender	48,50
	Education	45,51
	Socioeconomic status	45
	Self-rated health	50,52
	Cognitive function	48,53
	Psychological well being	54
	Disease and health status	
	Chronic diseases	46,48,50,53
	Nutritional status	48,55
Physical activity status	46,49	
Depressive symptoms	49,56	
Oral health status	48	
Risk of mortality	57	
Care-related variables		
Health care needs	46	
Care provider	46	
Care cost	58	
Exercise	47	
Others		
Longest-held occupation	45,59	
Length of stay in institute	48	
Fall	Demographic variables	
	Age	60,61
	Gender	62,63,64
	Education	63
	Self-rated health	65
	Functional variables	
	Activities of daily living	60,61
	Instrumental activities of daily living	66,67
	Up and go	66,68
	Balance	65
	Cognitive function	68
	Disease and health status	
	Chronic diseases	62,69
	Visual problems	62,63
	Fall in previous year	60,66
Injury after fall	60,64	
Health condition at discharge	70	
Anxiety disorder	61	
Cardiovascular disease	61	
Care-related variables		
Medication	61,69	
Tai Chi exercise	71,72	
(Fall in hospital) nursing care	73	
Living conditions	63	
Others		
Fear of falling	60,63,68	
Falling mechanism	64	
Duration of follow-up	74	
Hip fracture	Demographic Variables	
	Gender	75
	Functional variables	
	Activities of daily living	76
	Instrumental activities of daily living	76
	Walking ability	77,78
	Self-care ability	77,78
	Disease and health status	
	Chronic disease	78
	Independent before fracture	75,76

Table 2 (continued)

Geriatric syndrome	Related factors	Reference
	Care-related variables	
	Hip protector	79
	Emotional support	80
	Living conditions	81
	Others	
	Role performance	77
Urinary incontinence	Demographic variables	
	Age	82,83
	Gender	82,83
	Disease and health status	
	Diabetes	83
	Benign prostatic hyperplasia (men)	83
	Hyperlipidemia (women)	83
	Stress incontinence (women)	83
	Recurrent lower urinary tract infections (women)	83
	Overweight	83
Chronic pain	Gender, marital status, education, religious belief, self-rated health	84
Chronic headache	Analgesic overuse, history of migraine, depressive mood	85

comprehensive geriatric assessment remain rare. This may explain the absence of research striving to explore geriatric syndromes in a more comprehensive and integrative manner. The study accordingly recommends future studies on geriatric syndromes to take into consideration of the eight International Classification of Functioning, Disability, and Health body systems and functions, gathering and analyzing local data related to the four categories of gerontology, geriatric syndrome, geriatric care, and geriatric policy and education.

With the baby boomer generation in Taiwan marching into old age in 2010 and the birth rate on the wane, the ratio of elderly population is projected to keep escalating to 33% by 2050. Drafting and implementing appropriate health policies to meet the needs of a rapidly aging society is therefore a task of paramount importance and pressing emergency, and one of the key issues lies in how to translate the findings of empirical studies (or say “evidence”) into effective policies. Thus, the first things need to be done is to target the important problem and to look into what evidence we had. As one of the core problems in gerontology/geriatrics, geriatric syndromes require comprehensive assessment to diagnose and need careful management of a multidisciplinary geriatric team to prevent disability and to achieve healthy aging. The present study is a preliminary effort to understand more about geriatric syndrome in Taiwan. Because the “geriatric syndromes” is so complicated and cost a lot, we really need to put more effort in integrating the evidence we had, to design new studies on these bases, and to establish useful clinical guidelines for geriatric syndromes in Taiwan as a result.

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