Distribution and types of multiple chronic conditions in Korea

Young-Ho Jung, Sukja Ko

Distribution and types of multiple chronic conditions in Korea

Contents

List of Tables

List of Picture

Chapter 1

Introduction

1 Introduction 《

With the progress of population aging, development of medical technology, increase in life expectancy, changes in life habits, etc., the prevalence of chronic conditions is rising and their burden on individuals and society is growing rapidly(WHO, 2011)[1]. According to a report from OECD (2010), chronic diseases are the main causes for disabilities and deaths throughout the world, as 60% of the global population is estimated to die from chronic diseases.

Recently, the concern over prevalence and management of multiple chronic conditions, along with the increase in chronic conditions, is rising (Lenhert et al., 2011). Results from various studies indicate that prevalence of multiple chronic conditions occurs in more than 65% of the elderly aged 65 years or older (Lenhert et al., 2011). In Korea, 68.7% of people in their 50s have at least one chronic disease, and the ratio grows to 83.7% and 91.3% among those in their 60s and 70s, respectively (Young-Ho Jung et al., 2011)[2]. Among patients who have multiple chronic conditions, those in their 50s have an average of

---

1) WHO, Noncommunicable Diseases - Country Profiles 2011, WHO, 2011
2) Young-Ho Jung et al., A Report on the Korea Health Panel Survey, Korea Institute for Health and Social Affairs (KIHASA) and the National Health Insurance Service, 2011.

two chronic conditions, whereas those in their 60s have an average of three conditions and those in their 70s have an average of 3.5 chronic conditions (Young-Ho Jung, 2012)[3].

We can see that the ratios of people who have chronic conditions and multiple chronic conditions rise as they get older, and thus, management of chronic diseases is one of the key policy issues in today's society where population aging is swiftly occurring. However, there has been insufficient research on multiple chronic conditions compared to that on chronic conditions in general. Therefore, it is necessary to facilitate research on and policy attention to multiple chronic conditions. Based on this necessity, the study attempts to promote the understanding of multiple chronic conditions by analyzing the types and distribution of these conditions among the elderly patients who have multiple chronic conditions. Following chapter 1, which provides the introduction, chapter 2 presents the classification of chronic diseases and the concept of multiple chronic conditions. Chapter 3 deals with the distribution of comorbidity of major chronic conditions and use of medical care; in more concrete terms, analysis was made on the comorbidity of hypertension and heart disease, comorbidity of diabetes and heart disease, and comorbidity of hypertension and diabetes. In chapter 4, types and constitution of multiple

---

3) Young-Ho Jung, 「Issues of Healthcare Delivery System」, presented at the policy forum held by the Korean Association of Health Economics and Policy and KIHASA, Oct. 6, 2012.

chronic diseases among the elderly aged 65 or older and their risks were analyzed. In the study, the Health Insurance Review and Assessment Service's patient sample for 2011 was used for the analysis of multiple chronic conditions, and logistic regression was applied for the risk analysis. The final chapter provides the discussion and conclusion of the study.

Chapter 2
Classification of chronic conditions and concept of multiple chronic conditions

2

Classification of chronic conditions and concept of multiple chronic conditions 《

A. Classification of chronic conditions

Chronic conditions are conditions that are difficult to recover from completely or which persist for a considerable amount of time. To examine the types and distribution of multiple chronic conditions of the elderly in Korea, the authors classified the scope of chronic conditions and concept of multiple chronic conditions as follows. First, the scope of chronic conditions was presented including the total of 46 groups suggested by Bussche et al. (2011)[4] so that the comparison between the results of this study and German experience can be made. Bussche et al. (2011) proposed 46 disease groups after selecting chronic diseases with 1% or higher prevalence rate among a population aged 65 or more using German claim data and classifying disease groups based on ICD-10 classification through expert consultation. In the case of dementia, for example, ICD-10 codes of F00-F03, F05.1, G30, G31 and R54 are linked together under the condition of dementia.

---

4) van den Bussche et al. Which chronic diseases and disease combinations are specific to multimorbidity in the elderly? Results of a claims data based cross-sectional study in Germany. BMC Public Health 2011;11:101.

〈Table 1〉 Classification of chronic diseases

No.	Chronic disease	ICD-10 codes
1	Hypertension	I10-I15
2	Lipid metabolism disorders	E78
3	Chronic low back pain	M40-M45, M47, M48.0-M48.2, M48,5-M48.9, M50-M54
4	Severe vision reduction	H17-H18, H25-H28, H31, H33, H34.1-H34.2, H34.8-H34.9, H35-H36, H40, H43, H47, H54
5	Osteoarthrosis	M15-M19
6	Diabetes mellitus	E10-E14
7	Chronic ischemic heart disease	I20, I21, I25
8	Thyroid dysfunction	E01-305, E06.1-E06.3, E06.5, E06.9, E07
9	Cardiac arrhythmias	I44-I45, I46.0, I46.9, I47-I48, I49.1-I49.9
10	Obesity	E66
11	Purine/pyrimidine metabolism disorders/Gout	E79, M10
12	Prostatic hyperplasia	N40
13	Lower limbvaricosis	I83, I87.2
14	Liver disease	K70, K71.3-K71.5, K71.7, K72.7, K73-K74, K76
15	Depression	F32-F33
16	Asthma/COPD	J40-J45, J47
17	Noninflammatory gynecological problems	N81, N84-N90, N93, N95
18	Atheriosclerosis/peripheral arterial occlusive disease	I65-I66, I67.2, I70, I73.9
19	Osteoporosis	M80-M82
20	Renal insufficiency	N18-N19
21	Cerebral ischemia/Chronic stroke	I60-I64, I69, G45
22	Cardiac insufficiency	I50
23	Severe hearing loss	H90, H91.0, H91.1, H91.3, H91.8, H91.9
24	Chronic cholecystitis/Gallstones	K80, K81.1
25	Somatoform disorders	F45

〈Table 1〉 Classification of chronic conditions (continued)

No.	Chronic disease	ICD-10 codes
26	Hemorrhoids	I84
27	Intestinal diverticulosis	K57
28	Rheumatoid arthritis/Chronic polyarthritis	M05-M06, M79.0
29	Cardiac valve disorders	I34-I37
30	Neuropathies	G50-G64
31	Dizziness	H81-H82, R42
32	Dementia	F00-F03, F05.1, G30, G31, R54
33	Urinary incontinence	N39.3-N39.4, R32
34	Urinary tract calculi	N20
35	Anemia	D50-D53, D55-D58, D59.0-D59.2, D59.4-D59.9, D60.0, D60.8, D60.9, D61, D63-D65
36	Anxiety	F40-F41
37	Psoriasis	L40
38	Migraine/chronic headache	G43-G44
39	Parkinson's disease	G20-G22
40	Cancers	C00-C14, C15-C26, C30-C39, C40-C41, C43-C44, C45-C49, C50, C51-C58, C60-C63, C64-C68, C69- C72, C73-C75, C81-C96, C76-C80, C97, D00-D09, D37-D48
41	Allergies	H01.1, J30, L23, L27.2, L56.4, K52.2, K90.0, T78.1, T78.4, T88.7
42	Chronic gastritis/GERD	K21, K25.4-K25.9, K26.4-K26.9, K27.4-K27.9, K28.4-K28.9, K29.2-K29.9
43	Sexual dysfunction	F52, N48,4
44	Insomnia	G47, F51
45	Tobacco abuse	F17
46	Hypotension	I95

Note: ICD = International Classification of Diseases (10th edition)

B. Concept of multiple chronic conditions

While comorbidity is defined as "any distinct clinical entity that has coexisted or that may occur during the clinical course of a patient who has the index disease under study (Feinstein, 1979)," multimorbidity is described as occurrence of multiple chronic or acute diseases within one person (van den Akker et al., 2001).

[Figure 1] Distinction between comorbidity and multimorbidity
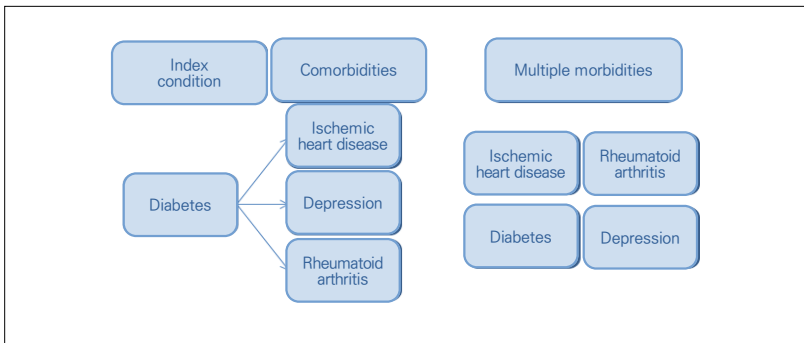
Source: Guthrie et al, 2011

Chapter 3

Distribution of comorbidity of major chronic conditions and use of medical care

A. Comorbidity of hypertension and heart disease

B. Comorbidity of diabetes and heart disease

C. Distribution of hypertension and diabetes

3 Distribution of comorbidity ≪ of major chronic conditions and use of medical care

Comorbidity is a complex pathological condition in which a patient has two or more diseases at the same time, and it can not only have negative influence on health but also have an impact bigger than those of individual diseases combined. Co-occurrence of these diseases may take place accidentally or due to a certain association between diseases.

〈Table 2〉 Risk factors in ischemic heart diseases, diabetes and hypertension

Disease	Non-modifiable risk factors	Modifiable risk factors
Diabetes	Age, genetic factors, pregnancy, low birth-weight infant	Overweight, obesity, nutritional imbalance, insulin imbalance, physical inactivity
Ischemic heart disease	Age, genetic factors, family history	Overweight, obesity, nutritional imbalance, insulin imbalance, physical inactivity, smoking, hypertension, diabetes, liver disorder, arteriosclerosis, excessive drinking
Hypertension	Age, genetic factors	Overweight, obesity, nutritional imbalance, physical inactivity, smoking, excessive drinking

Heart disease is one of the key causes of death in Korea, and hypertension is one of the major risk factors for the occurrence of heart disease. Diabetes is increasing with the advancement

of population aging, and it causes complications including heart disease and cerebral infarction.

In this part of the study, we will examine the distribution of chronic diseases with a focus on diabetes and hypertension, which are known as key risk factors of heart disease. Mortality of Korean people due to diabetes is about 30 per 100,000 people, which is 2 to 3 times higher than the OECD average rate (OECD, 2012)[5]. Also, according to health insurance data[6], medical expenses arising due to hypertension and diabetes take the No. 1 and No. 2 positions, respectively, in overall health insurance expenditure. In relation to this, the study aims to provide the basis for the design of health policies and development of strategies for the prevention and management of diseases.

Data used for the study is the Health Insurance Review and Assessment Service's patient sample for 2011. The patient sample consisted of 1,112,364 outpatients at medical or health institutions.

---

5) OECD, Health Care Quality Review: Korea, OECD 2012.
6) Health Insurance Review and Assessment Service, press release, Dec. 29, 2011.

[Figure 2] Composition of analysis data

| Patient sample (2011) |
| 6,999,999 |

| Inpatients | Outpatients | Others |
| 109,457 | 6,880,455 | 60 |

| Medical/health institutions |
| 5,551,543 |

| Number of outpatients[1] |
| 1,112,364 |

| Hypertension patients | Diabetes patients |
| 86,139 | 34,305 |

| Ischemic heart disease patients |
| 6,913 |
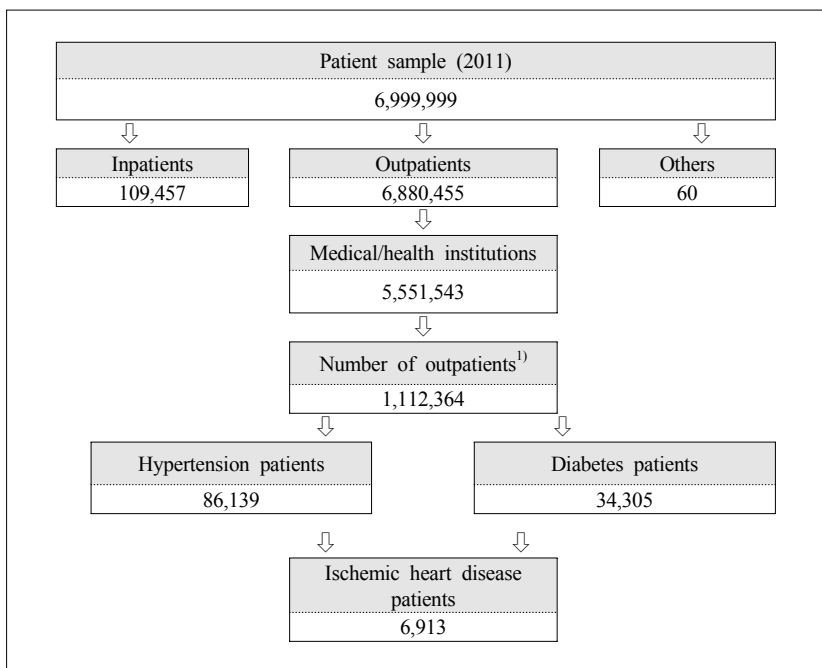
Note: 1) Patients of all ages excluding 47 patients whose ages were unknown

A. Comorbidity of hypertension and heart disease

The results of a survey of patients of hypertension and heart disease who had outpatient visits once or more in 2011 showed that there were a total of 86,139 hypertension patients, 6,913 heart disease patients, and 3,457 who had both hypertension and heart disease. About 4.01% of hypertension patients had heart disease, while 50.00% of heart disease patients suffered from hypertension.

[Figure 3] Comorbidity of hypertension and heart disease (n=89,595 patients of all ages)

Hypertension
n=86,139

n=
3,457

Heart
disease
n=
6,913

(All ages)	Hypertension	Heart disease
	86,139	6,913
Hypertension + heart disease comorbidity	3,457	3,457
%	4.01	50.00
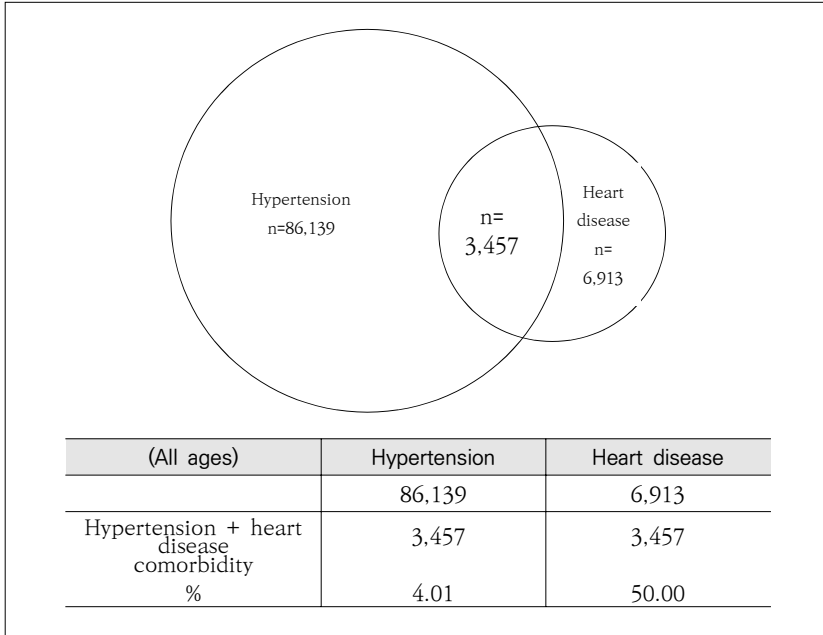
Regarding comorbidity of heart disease and hypertension in terms of gender and age, the prevalence rate is higher for men among people less than 70 years of age whereas it appears higher for women among those 70 years of age or older. Prevalence among men grows until the age of 70 and it starts to drop when they reach their 70s, while in women's case, their prevalence continues to rise as they grow older. Meanwhile, the results of analysis of the odds ratio of comorbidity show that men have higher risk than women, as expected, and that people aged 65 years or more have higher risk than those in lower age groups.

[Figure 4] Ratio of hypertension patients among heart disease patients in different age groups (30 and above)
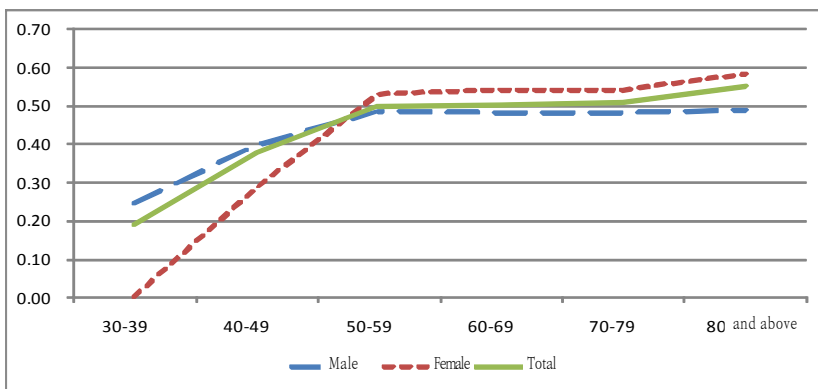
⟨Table 3⟩ Comorbidity of heart disease and hypertension by age (30 and above)

Classification		Hypertension		Heart disease		Comorbidity	
		(No. of persons)	(%)	(명)	(%)	(No. of persons)	(%)
Male	30~39	567	1.31	41	1.02	10	0.52
	40~49	4,842	11.19	266	6.60	106	5.54
	50~59	12,688	29.33	961	23.85	465	24.31
	60~69	12,898	29.81	1,315	32.64	634	33.14
	70~79	8,724	20.17	1,021	25.34	491	25.67
	80 and above	3,542	8.19	425	10.55	207	10.82
Female	30~39	146	0.34	12	0.42	0	0.00
	40~49	1,971	4.64	63	2.22	18	1.17
	50~59	8,640	20.32	386	13.61	205	13.29
	60~69	11,425	26.88	695	24.51	377	24.45
	70~79	11,139	26.20	852	30.04	460	29.83
	80 and above	9,189	21.62	828	29.20	482	31.26
Subtotal	30~39	713	0.83	53	0.77	10	0.87
	40~49	6,813	7.94	329	4.79	124	8.04
	50~59	21,328	24.87	1,347	19.62	670	24.89
	60~69	24,323	28.36	2,010	29.28	1,011	28.36
	70~79	19,863	23.16	1,873	27.28	951	23.14
	80 and above	12,731	14.84	1,253	18.25	689	14.70
Total	Male	43,261	100.00	4,029	100.00	1,913	100.00
	Female	42,510	100.00	2,836	100.00	1,542	100.00
	Total	85,771	100.00	6,865	100.00	3,455	100.00

Note: Based on the numbers of main and sub sick patients who had one or more outpatient visits

〈Table 4〉 Odds ratio of comorbidity of ischemic heart disease and hypertension

Comorbidity		Odds ratio	SE	p-value
Ischemic heart disease	Male vs. female	1.320	0.018	〈.0001
Hypertension	65 and above vs. below 65	1.564	0.018	〈.0001

B. Comorbidity of diabetes and heart disease

Among the diabetes and heart disease patients who made outpatient visits once or more in 2011, there were 34,648 diabetes patients and 6.913 heart disease patients, and the percentage of those who had both diabetes and heart disease was 1.50%. In addition, 7.54% of heart disease patients also appeared to have diabetes.

[Figure 5] Comorbidity of heart disease and diabetes(n=41,040 patients of all ages)
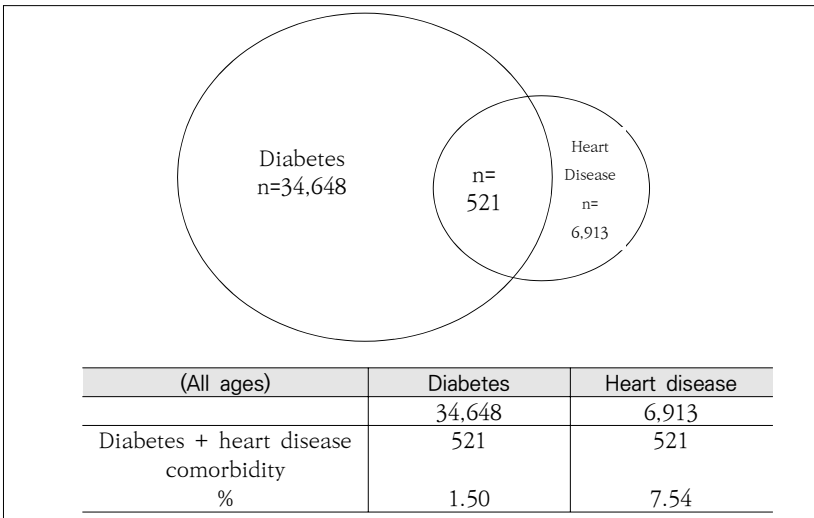
(All ages)	Diabetes	Heart disease
	34,648	6,913
Diabetes + heart disease comorbidity	521	521
%	1.50	7.54

〔Figure 6〕 Ratio of diabetes patients among heart disease patients in different age groups (30 and above)

(Unit: %)
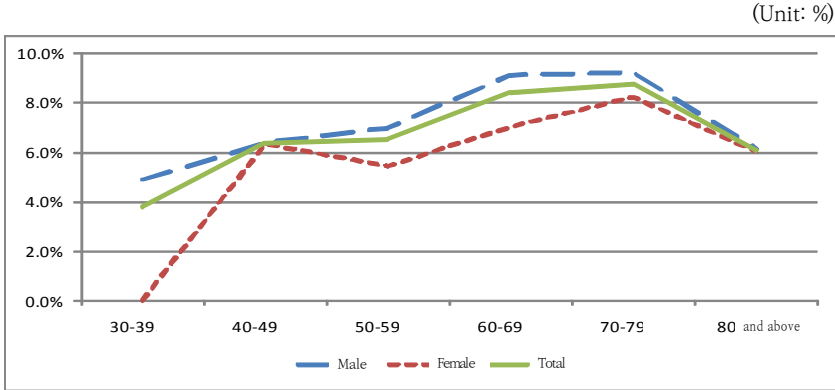
⟨Table 5⟩ Comorbidity of heart disease and diabetes by age (30 and above)

Classification		Diabetes		Heart disease		Comorbidity	
		(No. of persons)	(%)	(No. of persons)	(%)	(No. of persons)	(%)
Male	30~39	296	1.50	41	1.02	2	0.61
	40~49	2,184	11.09	266	6.60	17	5.21
	50~59	5,898	29.96	961	23.85	67	20.55
	60~69	5,989	30.42	1,315	32.64	120	36.81
	70~79	3,993	20.28	1,021	25.34	94	28.83
	80 and above	1,329	6.75	425	10.55	26	7.98
Female	30~39	125	0.86	12	0.42	0	0.00
	40~49	871	5.96	63	2.22	4	2.06
	50~59	2,622	17.94	386	13.61	21	10.82
	60~69	3,846	26.31	695	24.51	49	25.26
	70~79	4,376	29.94	852	30.04	70	36.08
	80 and above	2,776	18.99	828	29.20	50	25.77
Subtotal	30~39	421	1.23	53	0.77	2	0.38
	40~49	3,055	8.91	329	4.79	21	4.04
	50~59	8,520	24.84	1,347	19.62	88	16.92
	60~69	9,835	28.67	2,010	29.28	169	32.50
	70~79	8,369	24.40	1,873	27.28	164	31.54
	80 and above	4,105	11.97	1,253	18.25	76	14.62
Total	Male	19,689	100.00	4,029	100.00	326	100.00
	Female	14,616	100.00	2,836	100.00	194	100.00
	Total	34,305	100.00	6,865	100.00	520	100.00

Note: Based on the numbers of main and sub sick patients who had one or more outpatient visits

When the comorbidity of heart disease and diabetes is examined in terms of gender and age, men appear to have higher risk (odds ratio = 1.365) than women, as expected, and people 65 years of age and above also have a higher odds ratio (1.513) compared to younger age groups. Among men, those in their 60s have the highest prevalence rate of 36.81%, whereas women's prevalence rate is the highest at 36.08% when they are in their 70s.

〈Table 6〉 Odds ratio of comorbidity of ischemic heart disease and diabetes

Comorbidity		Odds ratio	SE	p-value
Ischemic heart disease	Male vs. female	1.365	0.047	0.001
Diabetes	65 and above vs. below 65	1.513	0.045	<.0001

C. Distribution of hypertension and diabetes

A total of 106,341 patients had hypertension or diabetes, with 86,193 of them having hypertension and 34,648 having diabetes. There were 14,447 patients who had both hypertension and diabetes. Among hypertension patients, 16.77% also had diabetes, and 41.69% of diabetes patients also had hypertension.

Concerning the comorbidity of hypertension and diabetes, prevalence rate for men was the highest at 32.49% in their 60s, while prevalence for women was the highest at 32.86% in their 70s. The odds ratio of comorbidity showed that men as com-

pared to women and those 65 years of age or older as compared to younger age groups had more risk, at 1.222 and 1.406, respectively.

[Figure 7] Comorbidity of heart disease and diabetes (n=106,341 patients of all ages)

(All ages)	Hypertension	Diabetes
	86,139	34,648
Hypertension + diabetes comorbidity	14,446	14,446
%	16.77	41.69
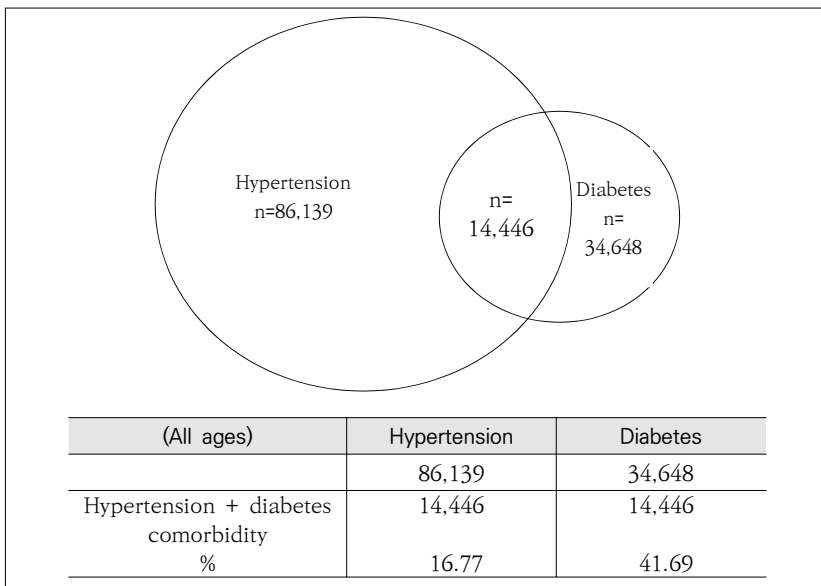
〔Figure 8〕 Ratio of hypertension patients and diabetes patients in different age groups

〈Ratio of hypertension patients among diabetes patients〉

〈Ratio of diabetes patients among hypertension patients〉
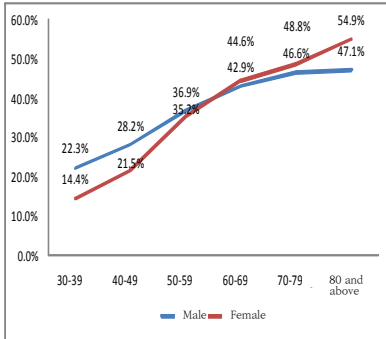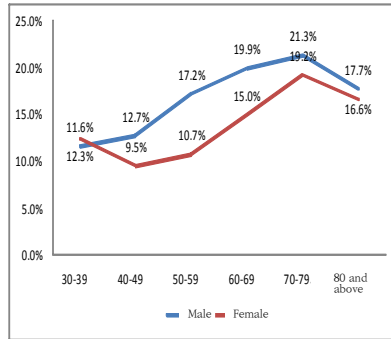
〈Table 7〉 Comorbidity of hypertension and diabetes by age (30 and above)

Classification		Hypertension		Diabetes		Comorbidity	
		(No. of persons)	(%)	(No. of persons)	(%)	(No. of persons)	(%)
Male	30~39	567	1.31	296	1.50	66	0.83
	40~49	4,842	11.19	2,184	11.09	615	7.77
	50~59	12,688	29.33	5,898	29.96	2,177	27.50
	60~69	12,898	29.81	5,989	30.42	2,572	32.49
	70~79	8,724	20.17	3,993	20.28	1,860	23.50
	80 and above	3,542	8.19	1,329	6.75	626	7.91
Female	30~39	146	0.34	125	0.86	18	0.28
	40~49	1,971	4.64	871	5.96	187	2.88
	50~59	8,640	20.32	2,622	17.94	922	14.18
	60~69	11,425	26.88	3,846	26.31	1,714	26.37
	70~79	11,139	26.20	4,376	29.94	2,136	32.86
	80 and above	9,189	21.62	2,776	18.99	1,524	23.44
Subtotal	30~39	713	0.83	421	1.23	84	0.58
	40~49	6,813	7.94	3,055	8.91	802	5.56
	50~59	21,328	24.87	8,520	24.84	3,099	21.50
	60~69	24,323	28.36	9,835	28.67	4,286	29.73
	70~79	19,863	23.16	8,369	24.40	3,996	27.72
	80 and above	12,731	14.84	4,105	11.97	2,150	14.91

Classification		Hypertension		Diabetes		Comorbidity	
		(No. of persons)	(%)	(No. of persons)	(%)	(No. of persons)	(%)
Total	Male	43,261	100.00	19,689	100.00	7,916	100.00
	Female	42,510	100.00	14616	100.00	6,501	100.00
	Total	85,771	100.00	34305	100.00	14,417	100.00

Note: Based on the numbers of main and sub sick patients who had one or more outpatient visits

〈Table 8〉 Odds ratio of comorbidity of hypertension and diabetes

Comorbidity		Odds ratio	SE	p-value
Hypertension	Male vs. female	1.222	118.160	〈.0001
Diabetes	65 and above vs. below 65	1.406	337.902	〈.0001

Chapter 4
Types of multiple chronic conditions of the elderly

4 Types of multiple chronic conditions of the elderly

The study utilized the Health Insurance Review and Assessment Service's patient sample for 2011 to examine the composition of multiple chronic conditions among the elderly aged 65 or older. The patient sample data is developed through stratified sampling of all patients who used medical services for one year according to gender and age groups, and we used the data that consisted of a 3 percent sample of all medical service users.

Of all the medical service usage data, 5,551,543 outpatient visits were made to medical and health institutions, and among them, 155,380 patients were 65 years of age or older.

[Figure 9] Composition of analysis data
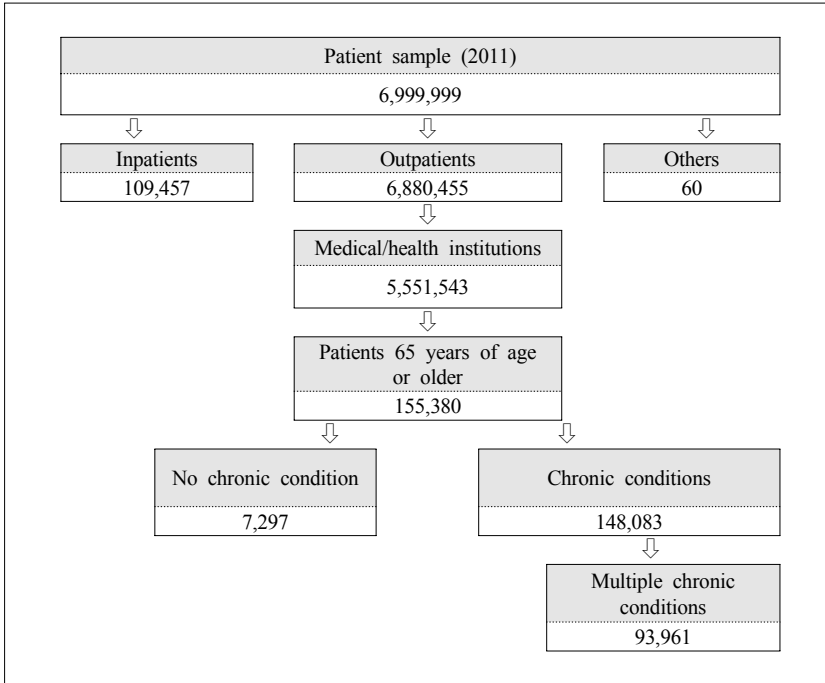
A. Distribution of chronic conditions among the elderly 65 years of age or older

Concerning the distribution of chronic conditions among the elderly 65 years of age or older, only 4.7% had no chronic condition while 14.1% had one chronic condition, 20.7% had two chronic conditions and 60.5% had three or more chronic conditions.

The average age of the target patients included in the analysis was 73.4 (72.5 for men and 74.0 for women). In the case of

patients who had three or more chronic conditions, the average number of chronic conditions for men was 4.5 and the average number for women was 4.7.

⟨Table 9⟩ Demographic features of patients 65 years of age or older

Classification		No. of chronic diseases				Total	p-value
		None	1	2	3 or more		
No. of target patients	(No.)	7,297	21,920	32,202	93,961	155,380	
	(%)	4.7	14.1	20.7	60.5	100.0	
Average age	Male	71.7	71.9	72.2	72.8	72.5	<.000
	(sd)	5.9	6.0	5.8	5.7	5.8	
	Female	74.3	74.4	74.5	73.7	74.0	<.000
	(sd)	7.8	7.5	7.1	6.1	6.6	
	Total	72.9	73.2	73.5	73.4	73.4	<.000
	(sd)	7.0	6.9	6.7	6.0	6.3	
Average number of chronic diseases	Male				4.5	3.1	
	(sd)				1.7	2.1	
	Female				4.7	3.5	
	(sd)				1.7	2.1	
	Total				4.6	3.3	
	(sd)				1.7	2.1	

Note: sd= standard deviation

〔Figure 10〕 Distribution of prevalence of chronic diseases in patients 65 years of age or older

(Unit: %)
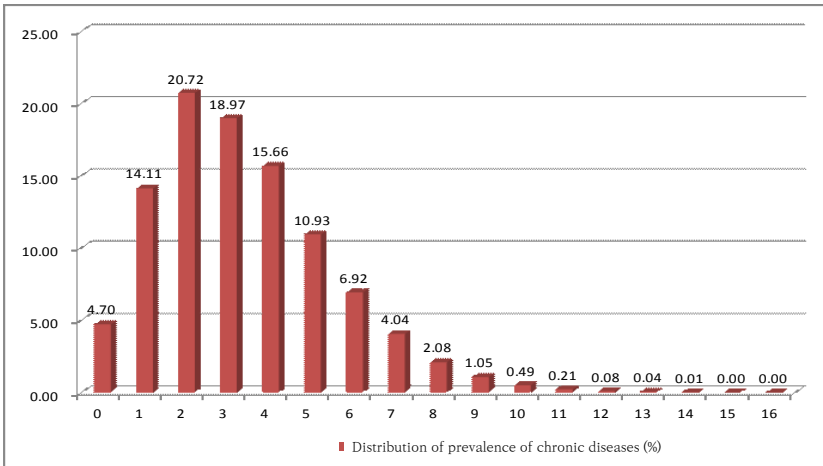
With regard to the average number of chronic diseases held by patients of different age groups, people between 65 and 69 had an average of 3.15 chronic diseases, while those between 70 and 74 had 3.47 diseases, those between 75 and 80 had 3.61 diseases, and those 85 years old or above had 2.82 diseases. This indicates that the increase in the number of chronic diseases slows down somewhat after the age of 85.

〈Table 10〉Average number of chronic diseases in different age groups

Classification	Male		Female		Total	
	Average	SD	Average	SD	Average	SD
65~69	2.83	1.94	3.41	2.06	3.15	2.02
70~74	3.15	2.04	3.71	2.13	3.47	2.11
75~80	3.40	2.15	3.74	2.12	3.61	2.14
85 and above	3.06	2.09	2.74	1.78	2.82	1.88
Total	3.10	2.05	3.51	2.08	3.34	2.08

Note: SD = standard deviation

〈Table 11〉 Distribution of prevalence of 46 chronic diseases among the elderly 65 years of age or older

No.	Disease	Male		Female		Total	
		Prevalence rate(%)	Rank	Prevalence rate(%)	Rank	Prevalence rate(%)	Rank
1	Hypertension	44.34	1	51.86	1	48.84	1
42	Chronic gastritis/GERD	36.04	2	40.17	3	38.51	2
3	Chronic low back pain	28.23	3	41.17	2	35.96	3
5	Arthrosis	15.58	8	31.62	4	25.16	4
41	Allergies	23.85	4	21.32	5	22.34	5
6	Diabetes	20.26	5	19.27	6	19.67	6
4	Severe vision reduction	16.20	7	18.57	7	17.61	7
16	Asthma/ COPD	15.29	9	13.14	10	14.00	8
2	Lipid metabolism disorders	10.69	10	14.63	9	13.05	9
19	Osteoporosis	2.11	25	15.22	8	9.95	10
21	Cerebral ischemia/chronic stroke	8.08	12	7.34	12	7.63	11
12	Prostatic hyperplasia	18.71	6	-	44	7.52	12
31	Dizziness	6.00	14	8.24	11	7.34	13
7	Chronic ischemic heart disease	8.15	11	6.76	13	7.32	14
18	Atheriosclerosis/peripheral arterial occlusive disease	5.85	15	5.99	14	5.93	15
30	Neuropathies	4.67	16	5.47	15	5.15	16
40	Cancers	6.84	13	3.25	22	4.69	17
44	Insomnia	4.33	17	4.76	17	4.59	18
36	Anxiety	3.36	19	4.84	16	4.24	19
32	Dementia	3.00	20	4.69	18	4.01	20
15	Depression	2.66	21	4.00	19	3.46	21
14	Liver disease	3.96	18	2.62	24	3.16	22
38	Migraine/chronic headache	2.24	23	3.54	20	3.02	23
8	Thyroid dysfunction	1.38	29	3.28	21	2.52	24
9	Cardiac arrhythmias	2.41	22	2.02	26	2.18	25
17	Noninflammatory gynecological	-	46	2.82	23	1.68	26

No.	Disease	Male		Female		Total	
		Prevalence rate(%)	Rank	Prevalence rate(%)	Rank	Prevalence rate(%)	Rank
	problems						
22	Cardiac insufficiency	1.31	30	1.90	27	1.66	28
28	Rheumatoid arthritis/ chronic polyarthritis	1.08	33	2.05	25	1.66	27
35	Anemia	1.53	27	1.61	29	1.58	29
23	Severe hearing loss	1.57	26	1.54	30	1.55	30
25	Somatoform disorders	1.10	32	1.62	28	1.41	31
39	Parkinson's disease	1.02	34	1.21	31	1.13	32
11	Purine/pyrimidine metabolism disorders/gout	2.11	24	0.25	39	1.00	33
20	Renal insufficiency	1.42	28	0.70	34	0.99	34
26	Hemorrhoids	1.15	31	0.71	33	0.89	35
33	Urinary incontinence	0.28	39	0.99	32	0.71	36
13	Lower limb varicosis	0.50	38	0.57	35	0.54	37
24	Chronic cholecystitis/gallstones	0.57	35	0.43	36	0.49	38
34	Urinary tract calculi	0.54	36	0.25	40	0.37	40
37	Psoriasis	0.53	37	0.26	38	0.37	39
29	Cardiac valve disorders	0.24	40	0.32	37	0.29	41
46	Hypotension	0.15	42	0.05	41	0.09	42
43	Sexual dysfunction	0.17	41	-	45	0.07	43
27	Intestinal diverticulosis	0.06	43	0.05	42	0.06	44
10	Obesity	0.01	44	0.01	43	0.01	45

〈Table 12〉 Outpatient service usage for 46 chronic diseases among the elderly aged 65 or older (2011)

No.	Disease	Male		Female		Total	
		(%)	Rank	(%)	Rank	(%)	Rank
3	Chronic low back pain	15.50	1	17.09	1	19.50	1
1	Hypertension	15.06	2	13.29	2	15.73	2
5	Arthrosis	6.72	5	9.87	4	11.03	3
42	Chronic gastritis/GERD	10.30	3	11.15	3	10.35	4
6	Diabetes	7.90	4	5.37	6	7.21	5
41	Allergies	5.58	6	5.55	5	4.54	6
4	Severe vision reduction	3.94	9	2.71	8	3.86	7
16	Asthma/COPD	4.17	8	2.67	9	3.37	8
2	Lipid metabolism disorders	2.43	10	3.59	7	2.91	9
19	Osteoporosis	0.50	25	2.55	10	2.44	10
12	Prostatic hyperplasia	5.24	7	–	46	1.95	11
21	Cerebral ischemia/chronic stroke	2.21	11	1.10	17	1.89	12
7	Chronic ischemic heart disease	1.94	13	1.04	18	1.64	13
31	Dizziness	1.31	16	1.30	12	1.46	14
18	Atheriosclerosis/peripheral arterial occlusive disease	1.43	15	1.12	16	1.34	15
30	Neuropathies	1.28	17	1.23	13	1.30	16
40	Cancers	2.06	12	1.13	15	1.25	17
44	Insomnia	1.23	18	1.02	20	1.13	18
20	Renal insufficiency	1.45	14	0.75	22	0.98	19
32	Dementia	0.73	22	0.53	26	0.94	20
36	Anxiety	0.80	20	0.99	21	0.92	21
15	Depression	0.74	21	1.03	19	0.90	22
14	Liver disease	0.81	19	0.59	24	0.56	23
38	Migraine/chronic headache	0.45	26	0.75	23	0.55	24
8	Thyroid dysfunction	0.28	30	1.16	14	0.51	25
9	Cardiac arrhythmias	0.53	24	0.29	29	0.45	26
28	Rheumatoid arthritis/chronic polyarthritis	0.30	28	0.59	25	0.43	27
35	Anemia	0.42	27	0.43	27	0.37	28
22	Cardiac insufficiency	0.28	31	0.24	30	0.37	29
25	Somatoform disorders	0.26	33	0.33	28	0.31	30
39	Parkinson's disease	0.29	29	0.17	33	0.30	31
17	Noninflammatory gynecological problems	–	46	1.56	11	0.29	32
11	Purine/pyrimidine metabolism disorders/ gout	0.63	23	0.05	39	0.27	33
23	Severe hearing loss	0.27	32	0.20	32	0.24	34

No.	Disease	Male		Female		Total	
		(%)	Rank	(%)	Rank	(%)	Rank
26	Hemorrhoids	0.20	34	0.21	31	0.15	35
33	Urinary incontinence	0.06	39	0.16	34	0.13	36
13	Lower limb varicosis	0.10	37	0.15	35	0.11	37
37	Psoriasis	0.15	35	0.08	36	0.09	38
24	Chronic cholecystitis/gallstones	0.11	36	0.07	37	0.08	39
34	Urinary tract calculi	0.09	38	0.06	38	0.06	40
29	Cardiac valve disorders	0.05	40	0.05	40	0.06	41
46	Hypotension	0.03	41	0.01	41	0.02	42
27	Intestinal diverticulosis	0.01	43	0.01	42	0.01	43
43	Sexual dysfunction	0.02	42	0.00	44	0.01	44
10	Obesity	0.00	44	0.01	43	0.00	45

Concerning the average yearly medical expenses (excluding uninsured medical fees) arising from outpatient service use by the elderly aged 65 or above according to the numbers of chronic diseases that patients have, those who didn't have any chronic disease spent 50,201 won on outpatient services, and the amount of their out-of-pocket payment excluding un-insured fees was about 14,225 won.

Meanwhile, the out-of-pocket payment for outpatient care in the case of those who had one chronic disease was 22,025 won per year, and the out-of-pocket payment in the case of those with three or more chronic diseases was 71,945 won. About 60% of the elderly aged 65 or above have three or more chronic diseases, and they were shown to pay an average of 322,462 won in medical expenses per year, among which they paid 71,945 won in out-of-pocket payment.

〈Table 13〉 Average annual outpatient medical expenses according to the number of chronic diseases (65 and above)

No. of chronic diseases	No. of patients		Total medical expenses	Out-of-pocket payment
	(No. of persons)	(%)	Average annual expenses (Korean won)	Average annual expenses (Korean won)
None	7,297	4.7	50,201	14,225
1	21,920	14.1	97,266	22,025
2	32,202	20.7	147,005	32,025
3 or more	93,961	60.5	322,462	71,945
Total	155,380	100.0	241,544	53,919

Note: Based on the number of patients who had at least one outpatient visit
Medical expenses and out-of-pocket payment exclude uninsured medical fees.

〈Table 14〉 Average annual outpatient medical expenses for 46 chronic diseases among the elderly aged 65 or older (2011)

No.	Disease	No. of patients	Total medical expenses		Out-of-pocket payment	
			(won)	Rank	(won)	Rank
20	Renal insufficiency	1,533	2,470,012	1	283,101	1
46	Hypotension	140	1,339,942	2	176,350	2
34	Urinary tract calculi	570	590,712	5	173,223	3
35	Anemia	2,455	852,411	3	127,866	4
27	Intestinal diverticulosis	86	384,176	12	118,475	5
24	Chronic cholecystitis/gallstones	762	386,501	11	113,795	6
15	Depression	5,380	440,663	8	112,367	7
8	Thyroid dysfunction	3,911	362,810	19	98,029	8
40	Cancers	7,291	716,708	4	93,422	9
30	Neuropathies	8,003	420,341	9	90,612	10
36	Anxiety	6,593	363,125	18	89,913	11
43	Sexual dysfunction	104	408,536	10	89,846	12
39	Parkinson's disease	1,759	452,856	7	87,938	13
25	Somatoform disorders	2,194	352,370	22	87,918	14
44	Insomnia	7,127	377,109	13	87,166	15
14	Liver disease	4,906	368,133	16	86,906	16
29	Cardiac valve disorders	449	309,067	37	86,082	17
9	Cardiac arrhythmias	3,384	307,438	38	86,028	18
10	Obesity	15	489,523	6	85,913	19

No.	Disease	No. of patients	Total medical expenses		Out-of-pocket payment	
			(won)	Rank	(won)	Rank
17	Noninflammatory gynecological problems	2,618	336,499	26	85,540	20
26	Hemorrhoids	1,382	374,906	15	84,616	21
32	Dementia	6,233	327,937	29	84,179	22
28	Rheumatoid arthritis/ chronic polyarthritis	2,577	366,570	17	81,072	23
33	Urinary incontinence	1,099	351,340	23	80,849	24
7	Chronic ischemic heart disease	11,375	323,995	32	80,808	25
13	Lower limb varicosis	838	356,535	21	79,159	26
38	Migraine/chronic headache	4,690	336,024	27	78,757	27
21	Chronic ischemia/chronic stroke	11,861	301,870	40	78,354	28
23	Severe hearing loss	2,408	337,463	25	78,056	29
12	Prostatic hyperplasia	11,691	356,583	20	77,307	30
11	Purine/pyrimidine metabolism disorder/gout	1,555	376,526	14	77,228	31
4	Severe vision reduction	27,370	346,330	24	76,430	32
31	Dizziness	11,402	325,169	30	75,084	33
19	Osteoporosis	15,453	319,310	35	74,319	34
5	Osteoarthritis	39,100	329,038	28	72,648	35
37	Psoriasis	569	320,858	33	72,511	36
6	Diabetes	30,562	320,334	34	71,953	37
3	Chronic low back pain	55,880	324,514	31	71,574	38
2	Lipid metabolism disorders	20,271	284,956	43	71,421	39
22	Cardiac insufficiency	2,580	295,122	41	71,044	40
16	Asthma/COPD	21,760	311,092	36	68,793	41
42	Chronic gastritis/GERD	59,839	302,799	39	68,145	42
18	Atheriosclerosis/peripheral arterial occlusive disease	9,218	281,404	44	65,831	43
41	Allergies	34,708	290,735	42	63,708	44
1	Hypertension	75,880	250,209	45	55,914	45

B. Types and distribution of multiple chronic conditions among the elderly aged 65 or older

Based on the research result that it is more valid to define multimorbidity as the co-occurrence of three or more chronic conditions in one elderly patient in the case of outpatients rather than the co-occurrence of two or more chronic conditions (Van den Akker et al. 2001)[7], the study defined multimorbid patients as those who have three or more chronic conditions.

As seen in the above, when multimorbid patients are defined as those who have three or more chronic conditions, 60.5% of the elderly aged 65 or older can be classified as multimorbid patients. In the figure presented below, it is shown that the average number of chronic conditions of the elderly who belong to the multimorbidity group grows as they grow older, excluding a few age groups.

---

7) Van den Akker et al., Problems in determining occurrence rates of multimorbidity. J Clin Epidemiol 2001:54:675-679.

〔Figure 11〕 Average number of chronic conditions in multimorbidity group and non-multimorbidity group
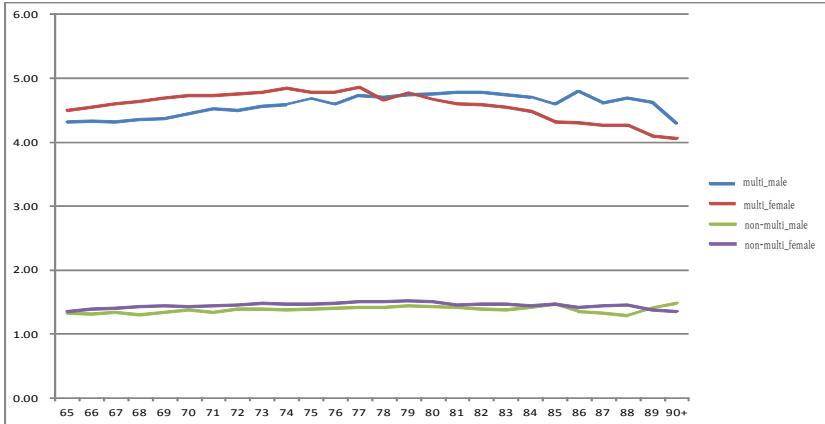
Note: Multimorbidiy refers to patients who have three or more chronic conditions.

The table below shows 46 multiple chronic conditions listed in three-disease combinations according to the order of prevalence, excluding gastritis, allergies, severe vision reduction, dizziness, headache, anemia, obesity, hearing loss, psoriasis and anxiety, which occur as a result of old age-related dysfunctions or symptoms.

With regard to the multiple chronic disease combinations of multimorbid patients, the combination of hypertension, chronic low back pain and arthrosis has the highest percentage at 19.00% among all multimorbid patients, followed by the combination of hypertension, chronic low back pain and diabetes at 5.94% and the combination of hypertension, arthrosis and diabetes at 3.02%.

〈Table 15〉 Combinations of multiple chronic conditions among multimorbid patients (65 and above)

Rank	Combination type			Prevalence (%)
1	Hypertension	Chronic low back pain	Arthrosis	19.00
2	Hypertension	Chronic low back pain	Diabetes	5.94
3	Hypertension	Arthrosis	Diabetes	3.02
4	Hypertension	Chronic low back pain	Asthma/COPD	2.96
5	Hypertension	Chronic low back pain	Lipid metabolism disorders	2.76
6	Chronic low back pain	Arthrosis	Diabetes	2.68
7	Chronic low back pain	Arthrosis	Asthma/COPD	2.31
8	Chronic low back pain	Arthrosis	Osteoporosis	2.10
9	Hypertension	Diabetes	Lipid metabolism disorders	1.58
10	Hypertension	Arthrosis	Lipid metabolism disorders	1.57
11	Hypertension	Diabetes	Asthma/COPD	1.55
12	Hypertension	Arthrosis	Asthma/COPD	1.36
13	Chronic low back pain	Arthrosis	Lipid metabolism disorders	1.24
14	Hypertension	Chronic low back pain	Stroke	1.12
15	Hypertension	Chronic low back pain	Ischemic heart disease	1.11
Total	2,497 persons			50.30
No. of multimorbid patients	64,630 persons[1]			

Note: 1) Common chronic conditions with the highest prevalence, such as gastritis, allergies, severe vision loss, dizziness, headache, anemia, severe hearing loss, psoriasis, anxiety, obesity and smoking, were excluded from chronic conditions here.

Combinations of multiple chronic disease in the top 15 ranks account for 50.30% of the overall multimorbidity combinations. Within the top 15 combinations, hypertension is included in 11 combinations, chronic low back pain in 10, arthrosis in 8 and diabetes in 5 combinations.

⟨Table 16⟩ Combinations of multiple chronic conditions among multimorbid patients by gender (65 and above)

Rank	Male			Prevalence (%)	Female			Prevalence (%)
	Combination type				Combination type			
1	Hypertension	Chronic low back pain	Arthrosis	10.73	Hypertension	Chronic low back pain	Arthrosis	23.46
2	Hypertension	Chronic low back pain	Diabetes	6.28	Hypertension	Chronic low back pain	Diabetes	5.76
3	Hypertension	Chronic low back pain	Asthma/ COPD	3.40	Hypertension	Arthrosis	Diabetes	3.34
4	Hypertension	Arthrosis	Diabetes	2.42	Chronic low back pain	Arthrosis	Diabetes	3.14
5	Hypertension	Diabetes	Asthma/ COPD	2.42	Hypertension	Chronic low back pain	Lipid metabolism disorders	3.08
6	Hypertension	Chronic low back pain	Lipid metabolism disorders	2.17	Chronic low back pain	Arthrosis	Osteoporosis	3.01
7	Hypertension	Diabetes	Lipid metabolism disorders	2.15	Hypertension	Chronic low back pain	Asthma/ COPD	2.72
8	Chronic low back pain	Arthrosis	Asthma/ COPD	2.05	Chronic low back pain	Arthrosis	Asthma/ COPD	2.44
9	Chronic low back pain	Arthrosis	Diabetes	1.83	Hypertension	Arthrosis	Lipid metabolism disorders	1.99
10	Hypertension	Chronic low back pain	Ischemic heart disease	1.28	Chronic low back pain	Arthrosisis	Lipid metabolism disorders	1.59

Rank	Male			Female		
	Combination type		Prevalence (%)	Combination type		Prevalence (%)
11	Hypertension	Chronic low back pain	Stroke	1.22	Hypertension	Arthrosis	Asthma/COPD	1.44
12	Hypertension	Arthrosis	Asthma/COPD	1.20	Hypertension	Diabetes	Lipid metabolism disorders	1.27
13	Hypertension	Chronic low back pain	Atheriosclerosis	1.13	Hypertension	Arthrosis	Osteoporosis	1.23
14	Hypertension	Diabetes	Stroke	1.12	Hypertension	Diabetes	Asthma/COPD	1.08
15	Hypertension	Diabetes	Ischemic heart disease	0.91	Hypertension	Chronic low back pain	Stroke	1.07
Total	9,135 persons		40.31	23,765 persons		56.62
No. of multi-morbid patients	22,657 persons			41,973 persons		

Note: Common chronic conditions that arise due to dysfunctions that come with age, such as gastritis, allergies, severe vision loss, dizziness, headache, anemia, severe hearing loss, psoriasis, anxiety, obesity and smoking, were excluded from chronic conditions here.

Combinations of three chronic conditions made after excluding chronic low back pain are presented in the table below. After excluding chronic low back pain, the combination of hypertension, arthrosis and diabetes took the highest percentage at 7.73% among multimorbid patients. The combined prevalence rates of top 15 combinations of chronic conditions reached 32.28% of all multimorbid patients.

〈Table 17〉 Combinations of multiple chronic conditions among multimorbid patients excluding low back pain (65 and above)

Rank	Combination type			Prevalence(%)
1	Hypertension	Arthrosis	Diabetes	7.73
2	Hypertension	Arthrosis	Asthma/COPD	3.88
3	Hypertension	Arthrosis	Lipid metabolism disorders	3.80
4	Hypertension	Arthrosis	Osteoporosis	2.74
5	Hypertension	Diabetes	Asthma/COPD	2.47
6	Hypertension	Diabetes	Lipid metabolism disorders	2.20
7	Hypertension	Asthma/COPD	Lipid metabolism disorders	1.27
8	Hypertension	Arthrosis	Atheriosclerosis	1.23
9	Hypertension	Arthrosis	Ischemic heart disease	1.13
10	Hypertension	Diabetes	Prostatic hyperplasia	1.12
11	Hypertension	Arthrosis	Stroke	1.10
12	Arthrosis	Diabetes	Lipid metabolism disorders	1.08
13	Hypertension	Diabetes	Stroke	0.92
14	Hypertension	Diabetes	Osteoporosis	0.88
15	Hypertension	Diabetes	Ischemic heart disease	0.83
Total	20,928 persons			32.38
No. of multimorbid patients	64,630 persons[1]			100.00

Note: 1) Common chronic conditions that arise due to dysfunctions that come with age such as gastritis, allergies, severe vision loss, dizziness, headache, anemia, severe hearing loss, psoriasis, anxiety, obesity and smoking, were excluded from chronic conditions here.

〈Table 18〉 Combinations of multiple chronic conditions among multimorbid patients excluding low back pain by gender (65 and above)

Rank	Male			Prevalence (%)	Female			Prevalence (%)
	Combination type				Combination type			
1	Hypertension	Arthrosis	Diabetes	5.30	Hypertension	Arthrosis	Diabetes	9.04
2	Hypertension	Diabetes	Asthma/COPD	3.55	Hypertension	Arthrosis	Lipid metabolism disorders	4.95
3	Hypertension	Diabetes	Prostatic hyperplasia	3.20	Hypertension	Arthrosis	Asthma/COPD	4.44
4	Hypertension	Arthrosis	Asthma/COPD	2.84	Hypertension	Arthrosis	Osteoporosis	4.00
5	Hypertension	Diabetes	Lipid metabolism disorders	2.66	Hypertension	Diabetes	Lipid metabolism disorders	1.96
6	Hypertension	Arthrosis	Lipid metabolism disorders	1.66	Hypertension	Diabetes	Asthma/COPD	1.88
7	Hypertension	Asthma/COPD	Lipid metabolism disorders	1.41	Hypertension	Arthrosis	Atheriosclerosis	1.36
8	Hypertension	Diabetes	Stroke	1.13	Arthrosis	Diabetes	Lipid metabolism disorders	1.29
9	Hypertension	Diabetes	Ischemic heart disease	1.00	Hypertension	Arthrosis	Ischemic heart disease	1.27
10	Hypertension	Asthma/COPD	Prostatic hyperplasia	1.00	Hypertension	Arthrosis	Stroke	1.24
11	Hypertension	Arthrosis	Atheriosclerosis	0.99	Hypertension	Diabetes	Osteoporosis	1.24
12	Hypertension	Asthma/COPD	Ischemic heart disease	0.99	Hypertension	Asthma//COPD	Lipid metabolism disorders	1.19
13	Hypertension	Arthrosis	Ischemic heart disease	0.87	Hypertension	Diabetes	Stroke	0.80
14	Hypertension	Arthrosis	Stroke	0.85	Hypertension	Asthma/COPD	Osteoporosis	0.76
15	Hypertension	Asthma/COPD	Stroke	0.80	Hypertension	Diabetes	Ischemic heart disease	0.74
Total	6,402 persons			28.25	15,182 persons			36.16

The following table shows the combinations of three chronic conditions after excluding both low back pain and hypertension. Among them, the combination with the highest prevalence rate was that of arthrosis, diabetes and lipid metabolism disorders, with 2.17% of multimorbid patients belonging to this combination group.

⟨Table 19⟩ Combinations of multiple chronic conditions among multimorbid patients excluding low back pain and hypertension

Rank	Combination type			Prevalence (%)
1	Arthrosis	Diabetes	Lipid metabolism disorders	2.17
2	Arthrosis	Diabetes	Asthma/COPD	1.68
3	Arthrosis	Diabetes	Osteoporosis	1.28
4	Arthrosis	Asthma/COPD	Ischemic heart disease	0.60
5	Arthrosis	Diabetes	Neuropathies	0.54
6	Arthrosis	Diabetes	Stroke	0.52
7	Arthrosis	Lipid metabolism disorders	Chronic ischemic heart disease	0.51
8	Arthrosis	Diabetes	Ischemic heart disease	0.50
9	Diabetes	Lipid metabolism disorders	Chronic stroke	0.49
10	Diabetes	Lipid metabolism disorders	Chronic ischemic heart disease	0.49
11	Arthrosis	Asthma/COPD	Stroke	0.47
12	Arthrosis	Asthma/COPD	Atheriosclerosis	0.46
13	Arthrosis	Asthma/COPD	Neuropathies	0.46
14	Arthrosis	Lipid metabolism disorders	Chronic stroke	0.43
15	Arthrosis	Diabetes	Atheriosclerosis	0.37
Total	7,090 persons			10.97
No. of multimorbid patients	64,630 persons[1]			100.00

Note: 1) Common chronic conditions that arise due to dysfunctions that come with age such as gastritis, allergies, severe vision loss, dizziness, headache, anemia, severe hearing loss, psoriasis, anxiety, obesity and smoking, were excluded from chronic conditions here.

〈Table 20〉 Combinations of multiple chronic conditions among multimorbid patients excluding low back pain and hypertension by gender

Rank	Male			Prevalence (%)	Female			Prevalence (%)
	Combination type				Combination type			
1	Arthrosis	Diabetes	Asthma/ COPD	1.39	Arthrosis	Diabetes	Lipid metabolism disorders	2.61
2	Arthrosis	Diabetes	Lipid metabolism disorders	1.34	Arthrosis	Diabetes	Osteoporo- sis	1.84
3	Arthrosis	Asthma/ COPD	Prostatic hyperplasia	0.90	Arthrosis	Diabetes	Asthma/ COPD	1.84
4	Diabetes	Lipid metabolism disorders	Chronic ischemic heart disease	0.79	Arthrosis	Asthma/ COPD	Ischemic heart disease	0.62
5	Diabetes	Asthma/ COPD	Prostatic hyperplasia	0.73	Arthrosis	Diabetes	Neuropa- thies	0.59
6	Diabetes	Lipid metabolism disorders	Chronic stroke	0.65	Arthrosis	Lipid metabolism disorders	Chronic ischemic heart disease	0.59
7	Arthrosis	Diabetes	Prostatic hyperplasia	0.60	Arthrosis	Lipid metabolism disorders	Chronic stroke	0.53
8	Diabetes	Asthma/ COPD	Ischemic heart disease	0.60	Arthrosis	Diabetes	Stroke	0.52
9	Arthrosis	Asthma/ COPD	Ischemic heart disease	0.57	Arthrosis	Asthma/ COPD	Atherio- sclerosis	0.52
10	Diabetes	Lipid metabolism disorders	Prostatic hyperplasia	0.55	Arthrosis	Diabetes	Ischemic heart disease	0.52
11	Diabetes	Asthma/ COPD	Stroke	0.55	Arthrosis	Osteoporo- sis	Chronic stroke	0.52
12	Arthrosis	Diabetes	Stroke	0.53	Arthrosis	Asthma/ COPD	Neuropa- thies	0.5
13	Arthrosis	Diabetes	Neuropath ies	0.45	Arthrosis	Asthma/ COPD	Stroke	0.5
14	Arthrosis	Diabetes	Ischemic heart disease	0.45	Arthrosis	Osteoporo- sis	Chronic ischemic heart disease	0.5
15	Arthrosis	Asthma/ COPD	Stroke	0.42	Arthrosis	Osteoporo- sis	Atheriosclerosis/periph eral arterial occlusive disease	0.49
Total	2,390			10.52	5,320			12.69

C. Analysis of the risks of multiple chronic conditions for the elderly

Logistic regression analysis was carried out on 155,380 people aged 65 or older to estimate their risks of getting multiple chronic conditions.

The risk of medical care beneficiaries to get multiple chronic conditions was 1.47 times higher than that of health insurance holders. This indicates that low-income groups are more vulnerable to multiple chronic diseases. In addition, men had higher risk of getting multiple chronic conditions than women, and the age group between 70 and 75 appeared to have higher risk than people 85 years of age or older.

The result of analysis of the odds ratio to determine the relationship between chronic conditions and multiple chronic conditions showed that people who had asthma/COPD had 16.7 times higher risk than those who did not. Asthma was followed by chronic low back pain, insomnia, depression, urinary tract calculi, urinary incontinence, hypotension, etc. in the order of risk. Comparison between men and women showed that they had similar overall risks, but in the case of gallstones (14.4) and prostatic hyperplasia (13.5), men had a higher odds ratio than women. Women were seen to have a higher odds ratio than men with regard to chronic conditions including asthma (18.2), urinary incontinence (16.6) and lower limb varicosis (15.3).

〈Table 21〉 Odds ratio of multiple chronic conditions among the elderly aged 65 or older

Classification	Odds ratio	SE	p-value
Male	0.848	0.009	⟨.0001
65~70	1.762	0.015	⟨.0001
70~75	1.826	0.015	⟨.0001
75~80	1.722	0.017	⟨.0001
80~85	1.410	0.021	0.0015
85 and above	1.000		
Medical care benefits	1.470	0.051	0.0002
Health insurance	1.000		
Asthma/COPD	16.686	0.015	⟨.0001
Chronic low back pain	15.803	0.011	⟨.0001
Insomnia	15.381	0.028	⟨.0001
Depression	15.363	0.033	⟨.0001
Urinary tract calculi	14.985	0.095	⟨.0001
Urinary incontinence	13.978	0.075	⟨.0001
Hypotension	13.959	0.204	⟨.0001
Prostatic hyperplasia	13.773	0.019	⟨.0001
Arthrosis	13.632	0.012	⟨.0001
Liver disease	13.307	0.029	⟨.0001
Neuropathies	13.178	0.028	⟨.0001
Chronic cholecystitis/gallstones	12.862	0.072	⟨.0001
Rheumatoid arthritis	12.137	0.045	⟨.0001
Thyroid dysfunction	11.193	0.033	⟨.0001
Osteoporosis	10.532	0.018	⟨.0001
Lower limb varicosis	10.222	0.078	⟨.0001
Ischemic heart disease	10.112	0.019	⟨.0001
Renal insufficiency	10.079	0.047	⟨.0001
Cancers	9.905	0.022	⟨.0001
Cardiac valve disorders	9.881	0.084	⟨.0001
Lipid metabolism disorders	9.758	0.014	⟨.0001
Atheriosclerosis/peripheral arterial occlusive disease	9.320	0.020	⟨.0001
Cardiac arrhythmias	8.938	0.033	⟨.0001
Diabetes	8.407	0.012	⟨.0001
Parkinson's disease	8.314	0.045	⟨.0001
Stroke	7.927	0.017	⟨.0001
Hypertension	7.685	0.009	⟨.0001
Cardiac insufficiency	7.093	0.037	⟨.0001
Dementia	6.338	0.023	⟨.0001

-2 Log L=208536.27
LR=111989.245

Note: Results of logistic regression analysis (n=155,380).

〈Table 22〉 Odds ratio of multiple chronic conditions among the elderly aged 65 or older by gender

	Male (Odds ratio)		Female (Odds ratio)
Hypotension	20.649	Asthma/COPD	18.156
Insomnia	16.098	Depression	17.308
Chronic low back pain	15.912	Urinary incontinence	16.562
Asthma/COPD	15.238	Chronic low back pain	15.770
Urinary tract calculi	14.877	Lower limb varicosis	15.323
Chronic cholecystitis/ gallstones	14.359	Urinary tract calculi	15.155
Arthrosis	13.957	Insomnia	14.881
Liver disease	13.815	Neuropathies	14.088
Prostatic hyperplasia	13.504	Arthrosis	13.564
Rheumatoid arthritis	13.408	Liver disease	12.636
Depression	12.409	Rheumatoid arthritis	11.617
Neuropathies	12.106	Chronic cholecystitis/ gallstones	11.415
Cardiac valve disordesrs	11.051	Thyroid dysfunction	11.390
Renal insufficiency	10.788	Osteoporosis	10.845
Cancers	10.679	Chronic ischemic heart disease	10.422
Thyroid dysfunction	10.425	Lipid metabolism disorders	10.046
Chronic ischemic heart disease	9.880	Cardiac arrhythmias	9.552
Parkinson's disease	9.288	Atheriosclerosis/peripheral arterial occlusive disease	9.521
Lipid metabolism disorders	9.287	Renal insufficiency	9.220
Atheriosclerosis/peripheral arterial occlusive disease	9.082	Cardiac valve disorders	9.179
Diabetes	8.699	Cancers	8.761
Cardiac arrhythmias	8.359	Chronic stroke	8.22
Osteoporosis	8.269	Diabetes	8.199
Chronic stroke	7.593	Hypertension	7.838
Hypertension	7.554	Parkinson's disease	7.766
Urinary incontinence	7.192	Cardiac insufficiency	7.457
Lower limb varicosis	7.045	Hypotension	7.265
Dementia	6.755	Dementia	6.260
Cardiac insufficiency	6.544		

Note: Results of logistic regression analysis

⟨Table 23⟩ Odds ratio of multiple chronic conditions among the elderly aged 65 or older by age

65~74	OR	75~84	OR	85 and above	OR
Asthma/COPD	16.99	Diabetes	19.11	Cardiac arrhythmias	62.25
Thyroid dysfunction	16.86	Arthrosis	17.66	Cancers	31.23
Atheriosclerosis/ peripheral arterial occlusive disease	15.64	Neuropathies	17.36	Renal insufficiency	23.51
Renal insufficiency	15.11	Renal insufficiency	16.25	Insomnia	22.91
Diabetes	14.39	Asthma/COPD	15.67	Chronic cholecystitis/ gallstones	22.31
Arthrosis	13.99	Atheriosclerosis/ peripheral arterial occlusive disease	15.01	Asthma/COPD	19.96
Cardiac valve disorders	13.25	Cardiac valve disorders	14.36	Chronic low back pain	19.75
Chronic stroke	13.16	Urinary tract calculi	14.01	Thyroid dysfunction	19.31
Neuropathies	12.40	Insomnia	13.90	Chronic stroke	19.16
Insomnia	12.32	Chronic stroke	13.84	Atheriosclerosis/ peripheral arterial occlusive disease	17.92
Cardiac arrhythmias	12.31	Chronic low back pain	13.51	Chronic ischemic heart disease	16.87
Cancers	11.75	Thyroid dysfunction	13.02	Lipid metabolism disorders	16.33
Urinary tract calculi	11.38	Cancers	12.91	Cardiac insufficiency	16.21
Chronic cholecystitis/ gallstones	10.43	Chronic cholecystitis/ gallstones	12.04	Cardiac valve disorders	15.02
Dementia	10.25	Lower limb varicosis	11.18	Neuropathies	14.46
Liver disease	10.01	Lipid metabolism disoders	11.10	Liver disease	12.99
Parkinson's disease	9.80	Dementia	10.94	Urinary incontinence	11.84
Cardiac insufficiency	9.39	Cardiac arrhythmias	10.88	Depression	11.69
Lower limb varicosis	9.35	Cardiac insufficiency	10.06	Dementia	11.66
Lipid metabolism disorders	9.34	Liver disease	10.06	Hypertension	11.64
Urinary incontinence	9.31	Parkinson's disease	9.82	Urinary tract calculi	11.53
Rheumatoid arthritis	9.08	Urinary incontinence	9.05	Parkinson's disease	11.20
Chronic low back pain	8.91	Rheumatoid arthritis	8.57	Rheumatoid arthritis	11.05
Prostatic hyperplasia	8.36	Chronic ischemic heart disease	8.43	Lower limb varicosis	10.58
Depression	7.51	Prostatic hyperplasia	8.41	Arthrosis	10.05
Chronic ischemic heart disease	7.48	Hypertension	8.16	Prostatic hyperplasia	9.99
Hypertension	7.26	Osteoporosis	8.10	Hypotension	8.94
Osteoporosis	6.76	Depression	8.06	Diabetes	7.55
Hypotension	6.54	Hypotension	5.94	Osteoporosis	7.03

Note: Results of logistic regression analysis

Chapter 5

Discussion and conclusion

5 Discussion and conclusion »

The distribution of multiple chronic conditions of the elderly aged 65 or older shows that only 4.7% of them had no chronic condition while 14.1% had one chronic condition, 20.7% had two chronic conditions, and 60.5% had three or more chronic conditions, suggesting that the elderly in general have considerable difficulties due to multiple chronic conditions. After the analysis of the risks of multiple chronic conditions according to socioeconomic background, it appeared that the low-income groups were more vulnerable to the risks of multiple chronic conditions. Concerning the combinations of three or more chronic conditions that occur frequently, the combination of hypertension, chronic low back pain and arthrosis was the most common among multimorbid patients at 19.0%, followed by the combination of hypertension, chronic low back pain and diabetes at 5.94% and the combination of hypertension, arthrosis and diabetes at 3.02%. Meanwhile, the top 15 multimorbidity combinations accounted for 50.30% of the overall combinations. Among the top 15 combinations, hypertension is included in 11 combinations, chronic low back pain in 10, arthrosis in 8 and diabetes in 5 combinations.

If the current trend is maintained, the number of multi-morbid patients with two or more chronic conditions will also continue to grow. People who have multiple chronic conditions tend to have short duration of survival and are more likely to be hospitalized, with their quality of life declining. In addition, as they are prescribed with numerous complex medications, their management of medical doses is likely to be aggravated (Nobili et al., 2011)[8].

Disease management guidelines, clinical pathways for patients and clinical practice guidelines have been developed to manage and promote the health of chronic disease patients, but these guidelines are limited to individual diseases. This kind of approach can underestimate the psychosocial factors that affect patients' health, and it is necessary to develop multiple treatment systems to deal with interactions and side effects of different drugs and lack of long-term management. It is seen that the strategy for management of patient care, rather than diseases, should be developed in consideration of both physical and psychosocial conditions.

Therefore, more efforts have to be made to set the policy direction and develop the strategy for effective and appropriate management of chronic conditions. In relation to this, first, it is necessary to change the approach to the prevention and management of chronic conditions. There should be a shift from

---

8) Nobili et al. Multiple diseases and polyharm, Journal of Comorbidity, 2011.

the segmented chronic disease management model centered on individual diseases and suppliers to continuous, integrated and patient-centered wellness model to enable sustained prevention and management throughout the periods before the disease occurrence and during the retention and aggravation of the disease.

Second, proper functions and roles as well as networking of the central government and relevant institutions should be made for the management of chronic conditions, and the efforts for realignment of laws and regulations that link health services, welfare services and social services are required to provide wellness services to the socially disadvantaged groups in the local communities.

Third, the foundation for the generation of valid basis on the effects of chronic disease management programs should be established. To achieve this goal, institutional measures need to be taken to make health and medical data held by organizations such as the National Health Insurance Service and the Health Insurance Review and Assessment Service available for the management of chronic conditions.

Fourth, continued self-care by the patients is more important than anything. Efforts to develop effective programs that can induce change in individual behaviors and help maintain healthy life habits are required. While incentives should be provided to change personal behaviors, there is a limitation to

financial incentives. Also, various factors determine individual behaviors or health consciousness. Thus, it is necessary to facilitate efforts for the development of cost-effective programs and strategy through more in-depth analysis on diversified human behaviors.

It is time that we had a paradigm shift from the conventional approach in order to alleviate the burden of (multiple) chronic conditions, thereby contributing to the improvement of national public health and guaranteeing the sustainability of healthcare financing.

References

Source book for the Forum for the Reinforcement of the Functions of Public Health and Primary Care, June 17, 2013

Press release, National Health Insurance Service, December 29, 2011

Gwang-gi Kim et al., A Study for the Improvement of the Health Hazard Factor Management System: With the Focus on Alcohol, Smoking and Junk Food, Industry-University Cooperation Group of Inje Institute of Advanced Studies and Korea Health Promotion Foundation

Jeong-sun Kim et al., Epidemiology and Healthcare Management in Local Communities, Seoul National University Press, 1996

Jong-yeon Park et al., Management of Chronic Diseases by Insurance Holders: Mid- to Long-term Road Map (2008-2012), National Health Insurance Service, 2007

Ministry of Health and Welfare, 2nd Comprehensive Plan on Cardio-cerebrovascular Diseases (2011-2015), 2011

Chang-hyeon Seong, Plan for Reinforcement of Sustained Health Management of Chronic Disease Patients who Use Neighborhood Clinics, *Policy Trends*, Vol. 6, No.1, Health Insurance Review and Assessment Service, 2012

Yeong-seok Shin et al., Improving the Sustainability of Healthcare Delivery in Line with NHI Coverage Enhancement, Korea Institute for Health and Social Affairs (KIHASA), 2013

Seok-jun Yoon, Future Directions of Chronic Disease Management in South Korea, *Journal of the Korean Medical Association*, 55(5), 2012

Seok-jun Yoon, Source book for the Seminar for the Prevention of

Chronic Diseases and Development of Disease Management Model Based on Local Communities, Mar. 28, 2013

Gyeong-su Lee, Suggestions for the Design of Noncommunicable Disease Management Model in Korea, paper presented at the 1st Korea Noncommunicable Disease Forum, Oct. 2013

Ae-ju Lee and Sang-geon Lee, A Study on Perceived Value of Wine by Using Two-step Cluster Analysis, *Korean Journal of Tourism Research*, Vol. 27, No.2, pp393~411

Jae-ho Lee, Plan for Introduction of Attending Physician System, discussion paper for policy debate, 2009

Young-Ho Jung et al., A Report on the 2010 Korea Health Panel Survey, KIHASA and the National Health Insurance Service, 2011

Young-Ho Jung,「Issues of Healthcare Delivery System」, paper presented at the policy forum held by the Korean Association of Health Economics and Policy and KIHASA, Oct. 6, 2012.

Young-Ho Jung et al., A Study on the Health-friendly Fiscal Policy, KIHASA, 2011

Young-Ho Jung et al., Comparison of Life Time Distribution of Medical Costs of Obesity and Smoking and Analysis of Mid- to Long-term Effects Based on Health Improvement, KIHASA and the Healthcare Service Support Center, 2010

Young-Ho Jung et al., Socioeconomic Cost of Alcohol and Cost-effectiveness of Interventions to Reduce Alcohol-related Harm, KIHASA and the Korea Health Promotion Foundation, 2012

Young-Ho Jung, 「Issues of Healthcare Delivery System」, paper presented at the policy forum held by the Korean Association of Health Economics and Policy and KIHASA, Oct. 6, 2012.

Young-geon Ji, Physician Assistant System: In Relation to the Management of Chronic Diseases, 47th Symposium of Korean Academy of Health Policy and Management, 2011

Korea Centers for Disease Control and Prevention, 2011 White Paper on Disease Control

Korea Centers for Disease Control and Prevention, Korea Health Statistics, 2012

Young-sun Choi et al., Pilot Project on the Family Doctor System for Chronic Diseases, National Health Insurance Service, 2009

Korea Health Promotion Foundation, Tobacco Control Issue Report, 2013

KIHASA, Health and Welfare Policies in the MB Administration: Outcomes and Future Tasks, mimeo, 2012

Alliance for Health Reform, The Case for Prevention: Tales from the Field, *Alliance for Health Reform*, 2009. 9.

Barlow J, Bancroft G, Turner A, Self-management training for people with chronic disease: A shared learning experience. *Journal of Health Psychology 2005*; 10(6): 863-872

Barr VJ, Robinson S, Marin-Link B, Underhill L, Dotts A, Ravensdale D, et al. The expanded Chronic Care Model: an integration of concepts and strategies from population health promotion and the Chronic Care Model. Hosp Q 2003;7:73-82.

Buck and Frosini, "Clustering of unhealthy behaviours over time - Implications for policy and practice", The Kings Fund

Cohen, Neumann, Weinstein, Does Preventive Care Save Money? Healthy Economics and Presidential Candidates, *The New England Journal of Medicine(2008)*

Department of Health and Human Services (US). *HHS initiative on*

multiple chronic conditions, 2011.
http://www.hhs.gov/ash/initiatives/mcc/index.html

DeVol (2008), An unhealthy America : The Economic Burden of Chronic Disease

Diagnosis and Management of COPD in Primary Care. *Primary Care Respiratory Society*, UK www.pcrs-uk.org

Goetzel, Do Prevention Or Treatment Services Save Money? The Wrong Debate, *Health Affairs* 28.1, 2008.

Kamerow et al., *Desinging a High-Quality Package of Preventive Services*, Partnership for Prevention, 2008

Lalonde M., *A new perspective on the health of Canadians: A working document*, Government of Canada, 1974.

Lindsay S. How and why the motivation and skill to self-manage coronary heart disease are socially unequal. *Research in the Sociology of Health Care 2008*;26: 17-39

Long term conditions strategy and vision 2012-2017

Mattke S, Seid M, Sai M. Evidence for the effect of disease management: Is US$ 1 billion a year a good investment? *American Journal of Managed Care 2007*;13: 670-676.

National Clinical Guideline Centre. (2010) *Chronic obstructive pulmonary disease: management of chronic obstructive pulmonary disease in adults in primary and secondary care*. London: National Clinical Guideline Centre.

NHS Wales (2007), *Improving Health and the Management of Chronic Conditions in Wales: An Integrated Model and Framework for Action*

NHS, *Managing multi-morbidity in practice; what lessons can be learnt form the care of people with COPD and co-morbidities?*,

2013

Nobili et al. (2011) *Multiple diseases and polyharm Journal of Comorbidity*

Norusis MJ SPSS 12.0 *Statictical procedures compaion*, Upper Saddle River, NJ: Prentice-Hall. 2003

Papekh A. Goodman R. Gordon C et al. Managing Multiple Chronic Conditions: A Strategic Framework for Improving Health Outcomes and Quality of Life. *Public Health Reports* / July-August 2011 / Volume 126

Partnership for Prevention, *Guide to Smart Prevention Investments*, 2001.

Partnership for Prevention, U.S. *Could save 100,000 Lives a Year with Five Basic Preventive Services*, 2009, 2001.

PFCD and Partnership for prevention, *The Value of Prevention*, 2008.

Russell (2007), *Prevention's potential for slowing the growth of medical spending*

Shahady(2006), *Barriers to care in chronic diseases: How to bridge the treatment gap*, www.consultantlive.com

Trust for America's Health, *Prevention for a Healthier America*, 2008

van den Akker et al., Problems in determining occurrence rates of multimorbidity. *J Clin Epidemiol 2001*;54:675-679.

van den Bussche et al. Which chronic diseases and disease combinations are specific to multimorbidity in the elderly? Results of a claims data based cross-sectional study in Germany. *BMC Public Health 2011*;11:101.

Wagner EH. Chronic disease management: what will it take to improve care for chronic illness? *Eff Clin Pract 1998*;1:2-4.

Waterloo Wellington Local Health Integrated Network(WWLHIN),

Working Together for a Healthier Future: Integrated Health Service Plan 2010-2013

Woolf et al., *The Economic Argument for Disease Prevention: Distinguishing Between Value and Savings*, Partnership for Prevention, 2009

World Health Organization. *The Innovative Care for Chronic Conditions framework (ICCC)* [cited 2011 Mar 22].

WHO, *Noncommunicable Diseases - Country Profiles 2011*, WHO, 2011

OECD, *Health Care Quality Review: Korea*, OECD 2012

Woolf, Husten, Lewin et al., *The Economic Argument for Disease Prevention: Distinguishing Between Value and Savings*, Partnership for Prevention, 2009