The aging of the population is the most dominant demographic feature of our century. In our western world chronic diseases like stroke, cancer, rheumatism and cardiovascular diseases are the symptoms of 'old age'. The amount of subjects with health status are rear will increase more than the overall population. However, we expect compensation for the negative effect of aging, especially in subjects with chronic diseases and severe health problems. We studied multiple morbidity, low functional status, frequent attendance to the physician, high drug use, and in particular stroke. Stroke is a severe disease in terms of mortality, morbidity, longterm disability and handicaps. Up to this moment, specific stroke therapies are not available; preventing stroke is an effective strategy. We studied the role of habitual sweet intake in stroke onset. Because the Department of General Practice of the University of Groningen is engaged in stroke research, we could use prospectively collected population-based data of the Groningen Longitudinal Aging Study (GLAS).

The main objectives of this study are to examine the association between multiple chronic diseases and (1) functional status, (2) adaptive mechanisms, (3) the most affected or frail elderly, (4) frequent attendance, (5) drug use, and to examine the effect of habitual sweet snack intake in predicting stroke (6). In this book, we used the data from two studies: the 1993 and 1995 Achtkarspelen studies of the Groningen Hypertension Service on the MOS SF-36 to define functional status in the elderly (≥60 years). The following 13 chronic diseases have been selected: chronic bronchitis, pulmonary diseases other than bronchitis, stroke, low back pain, rheumatism or arthritic complaints, cancer, diseases of the nervous system, leg ulcer, thyroid diseases, kidney diseases, hypertension, diabetes mellitus, and heart attack. Besides, we used the 4-year follow-up GLAS study on predicting stroke onset in the elderly (≥57 years). An overview of all above noted topics is presented in Chapter 1, the Introduction.

Chapter 2 describes the association between thirteen chronic diseases and functional status, and the impact of each chronic disease, among the 1995 Achtkarspelen population consisting of 2420 subjects, of 60 years and older. Functional status, measured by the MOS SF-36, a valid and reliable instrument with 36 items, deteriorated as the number of chronic diseases increased, independently of age and sex; physical functioning deteriorated more than mental health status. We concluded that functional status in the elderly was mainly affected by multiple morbidity. Patients suffering from back pain, rheumatism and other lung diseases were affected most.

The results of a survey on the impact of thirteen chronic diseases on functional status in the youngest old and oldest old, i.e. under and over 80 years of age, are presented in the next chapter. The association of chronic diseases was studied in two age categories, varying from 60 to 80 years and more than 80 years. The effect on functional status was studied in different age groups, such as under 80 years, patients with stroke, and patients with diabetes. In patients with diabetes, the effect was strongly associated with functional status.

In Chapter 3, we studied participants, living in the city of Groningen, in 1993 and 1995. The results of a survey on the impact of chronic diseases on functional status and more than 3.5 years later were presented. The results of the survey were as follows: chronic diseases had a strong effect on functional status in the elderly. Chronic diseases were categorized into four groups: under-70-year-old, 70-79-year-old, and 80-year-old and over. The results of the survey showed that chronic diseases were strongly affected in patients with diabetes mellitus, and the impact of diabetes mellitus on functional status was stronger in patients with diabetes mellitus. In patients with diabetes mellitus, the effect of chronic diseases was strongly associated with functional status and more than 5 years later.

Chapter 5 reported on the impact of various patient characteristics on functional status and more than 3.5 years later. The results of the survey were as follows: chronic diseases had a strong effect on functional status in the elderly. Chronic diseases were categorized into four groups: under-70-year-old, 70-79-year-old, and 80-year-old and over. The results of the survey showed that chronic diseases were strongly affected in patients with diabetes mellitus, and the impact of diabetes mellitus on functional status was stronger in patients with diabetes mellitus. In patients with diabetes mellitus, the effect of chronic diseases was strongly associated with functional status and more than 5 years later.

Chapter 6 described the association between chronic diseases and functional status in the elderly. The results of the survey were as follows: chronic diseases had a strong effect on functional status in the elderly. Chronic diseases were categorized into four groups: under-70-year-old, 70-79-year-old, and 80-year-old and over. The results of the survey showed that chronic diseases were strongly affected in patients with diabetes mellitus, and the impact of diabetes mellitus on functional status was stronger in patients with diabetes mellitus. In patients with diabetes mellitus, the effect of chronic diseases was strongly associated with functional status and more than 5 years later.
Summary

The demographic feature of our stroke, cancer, rheumatism 'old age'. The amount of than the overall population. effect of aging, especially in problems. We studied multiple to the physician, high drug disease in terms of mortality, this moment, specific stroke effective strategy. We studied Because the Department of is engaged in stroke research, based data of the Groningen

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thirteen chronic diseases and disease, among the 1995 subjects, of 60 years and older. A valid and reliable instrument chronic diseases increased, deteriorated more than mental as in the elderly was mainly from back pain, rheumatism chronic diseases on functional and over 80 years of age, are presented in Chapter 3. The survey assessed the 1993 Achtkarspelen population, consisting of 2773 subjects, 60 years and older. The severity of the chronic diseases was recorded by means of Cohen’s effect sizes on the MOS SF-36, in two age categories, under and over the age of 80. We found a co-morbidity varying from 64-92%. We concluded that co-morbidity had a strong negative effect on functioning. Health perception significantly differed in patients of different age categories with one single chronic disease. Under 80 years of age, patients with stroke, lung diseases, and nervous system diseases were most affected. Over 80 years of age, patients with back pain predominated in severity. In patients with nervous system diseases, diabetes, and stroke, mental functioning was strongly affected.

In Chapter 4, the results of the 2-year follow-up study are presented. Participants, living in Achtkarspelen, were those who reported both in 1993 and 1995. The results are based on 1552 subjects (age ≥60-79). The 2-year health changes were calculated by Cohen’s effect sizes on the MOS SF-36 in two age categories, over and under 70 years. Health changes were small in the total population studied; most chronic diseases showed little improvement in those under-70-year-old. We concluded that functional status in elderly people hardly changed in two years time. But patients over 70 years suffering from one or more chronic diseases showed moderate to high changes in functional status. Under 70 years, a slight 'improvement' appeared in patients with some diseases. Patients suffering from stroke, thyroid diseases, cancer, and lung diseases were mostly affected.

Chapter 5 reports the association between reported frequency of attendance and various patients’ characteristics (age, sex, socioeconomic status), multiple morbidity, type of chronic disease and functional status measured by the MOS SF-36. The results are based on the 1995 Achtkarspelen study. Subjects were asked how often they consulted a GP and/or specialist, for the disease. Higher contact frequency was significantly associated with increasing co-morbidity, and mainly associated with a distinct deterioration of functional status as well. Only in stroke and leg ulcer, did we find a tendency towards a 'better' functional status and more contacts. Of the frequent attenders who contacted their physician more than 5 times a year, nearly half of the patients suffered from leg ulcer; approximately a quarter suffered from diabetes, cancer or kidney diseases. We concluded that the type of chronic diseases and co-morbidity determined reported frequent attendance, and not age or sex. Most of the elderly patients with a chronic disease were in a worse condition as they consulted their physician more often.
In Chapter 6 we addressed self-reported drug use to investigate the impact of polypharmacy in the 1995 Achtkarspelen study. Overall polypharmacy (>2 drugs) was reported by almost 40% of the respondents and extensive polypharmacy (>5 drugs) by 4%. Drug use increased significantly with advancing age. The more polypharmacy increased, the more the functional status, measured by the MOS SF-36, deteriorated significantly. Extensive polypharmacy (>5 drugs) varied from 4% to 20% for the various chronic diseases, scoring highest in patients with kidney diseases, heart attack and other lung diseases. Patients who consulted their physician more often, used considerably more drugs. We concluded that extensive polypharmacy occurs under the following (independent) conditions: increasing (co) morbidity, increasing age, frequent attendance and in subjects with lower SES.

Chapter 7 deals with the impact of multiple morbidity on self-reported drug use and on the Chronic Disease Score in the 1995 Achtkarspelen study. In seven diseases the same disease-specific medication classes were reported as the drug used most both for chronic diseases with and without co-morbidity. However, in patients with back pain, rheumatism, leg ulcer and kidney diseases the cardiovascular system drugs ranked first, only in patients with diseases of the nervous system were the nervous system drugs reported dominantly. We concluded that in chronic diseases with a specific drug therapy the drug used most was determined by the chronic disease itself and not by co-morbidity. The Chronic Disease Score -measure for health outcome- defined only diseasespecific medication classes for each chronic disease. Our study showed a remarkable role for the remaining non-disease-specific medication classes, significantly dominated by and strongly related to cardiovascular co-morbidity.

The 4-year follow-up GLAS study is the base of Chapter 8. We assessed the effect of habitual intake of sweet snacks on stroke incidence in subjects aged 57 and over. Three categories of habitual intake of sweets between meals were defined at baseline in 1993: no intake, 1-5 intakes per week, and 6 or more intakes per week. In a cohort of 3642 subjects at baseline, free of stroke, cardiovascular diseases and diabetes, there was a total of 90 incident strokes. There was a significant age- and sex-adjusted increase of relative risk with advancing habitual intake of sweets: more than two times in the second category, up to three times in the third category. Adjustment for possible confounders at baseline, as habitual intake of fat snacks, fat/cholesterol intake, cellulose intake, physical activity, cigarette smoking, alcohol intake, and prevalence of hypertension, did not change the results. We concluded that in subjects older than 57 years, higher habitual intakes of sweets are independently associated with increasing stroke incidence.

The main conclusion is that both drug use and stroke risk are affected by the number of co-morbid chronic diseases. Furthermore, we determined that more co-morbidity was associated with a more co-morbid chronic disease component of the Chronic Disease Score, which is a functional status measure. We found that people up to 75 years old who consulted their physician more often, used considerably more drugs, and had an extensive polypharmacy. We concluded that extensive polypharmacy occurs under the following (independent) conditions: increasing (co) morbidity, increasing age, frequent attendance and in subjects with lower SES.

We suggest the inclusion of chronic disease patients as health visitors: both for chronic diseases with and without co-morbidity. We found that people up to 75 years old who consulted their physician more often, used considerably more drugs, and had an extensive polypharmacy. We concluded that extensive polypharmacy occurs under the following (independent) conditions: increasing (co) morbidity, increasing age, frequent attendance and in subjects with lower SES.

Finally, last but not least, the health visitor can determine the best intervention strategy for each disease, which might prevent stroke, haemorrhagic and ischaemic.
The main conclusions are formulated in Chapter 9, the General discussion. The main conclusions are that the reported functional status was independently affected by the presence and the type of disease alone and hardly by age or sex. Furthermore, the presence of cardiovascular co-morbidity independently determined the largest deterioration of functional status. A deteriorating functional status was demonstrably and independently related to the presence of more co-morbidity, and lower socioeconomic status. The functional status was definitely poor in patients suffering from kidney diseases, lung diseases, nervous system diseases, stroke, rheumatism and back pain. However, physical component of the functional status deteriorated most during the ageing process in people up to 85 years. From then on the mental component deteriorated most. We found that the type of chronic diseases and co-morbidity determined frequent attendance, and not age or sex. Most of the elderly patients suffering from a chronic disease were in a worse physical and mental condition if they consulted their physician more often. There was a demonstrably and independently worse functional status with more cardiovascular co-morbidity, more frequent attendance, and more drug use as well. In subjects free of stroke, cardiovascular diseases and diabetes, we found that higher habitual intakes of sweets were independently associated with increasing stroke incidence.

We suggest the following recommendations for GPs, public health nurses, and health visitors: be aware of all patients suffering from two or more chronic diseases, with five or more physician contacts during a year, and patients who use three or more drugs. Furthermore, attention for patients suffering from kidney diseases, lung diseases, nervous system diseases, stroke, rheumatism, and back pain. Regarding stroke prevention: all elderly should revise their eating habits with regard to eating sweet snacks, in order to reduce the risk of stroke.

We suggest the following recommendations for further studies: longterm studies, non-respondents studies, choice for depressive symptoms in questionnaires, more chronic diseases, and open questions. The Chronic Disease Score should take into account the extent and type of drug use, which is induced by (cardiovascular) co-morbidity. Further studies of sweet consumption in younger subjects, which might prevent stroke morbidity is recommended. It is advisable to distinguish haemorrhagic and ischemic stroke, or mortality rates.

Finally, last but not least, Chapter 12, the Appendix gives an overview of main outcome for each disease, as reported in the previous Chapters 2-7, for readers who are interested in results about each single chronic disease.