Empirical classification of shoulder complaints
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Summary

Numerous attempts have been made in the past to develop diagnostic categories for patients with shoulder complaints. In Chapter 1 a brief overview is presented of various classifications that exist. They range from very simple classifications into two or three groups to a complex system of classification with detailed instruction for clinicians how to exactly locate the pathological anatomic structure in the shoulder joint. Most diagnostic classifications are based on personal insights and experiences of the authors, while a sound empirical foundation in general is lacking.

The question that is explored in this thesis is whether patients that present their general practitioner with shoulder complaints can be categorized empirically, based on findings from medical history taking and/or physical examination, in such a way that general practitioners based on this classification can choose an adequate treatment.

In Chapter 2 an attempt was made to determine whether a classification of shoulder complaints in general practice can be made using a hierarchical cluster analysis. One hundred and one patients with shoulder complaints were evaluated upon inclusion (week 0) and after 2 weeks. Eleven variables of the medical history and 19 variables of the physical examination were used for the analysis. The analysis of week 0 and week 2 revealed three stable clusters: one cluster containing almost half of the patients who hardly had limitations in the range of scapulohumeral mobility (ROM), one cluster containing a small number of patients with a short history of complaints and a limitation of scapulohumeral mobility in all directions, and a third cluster containing the remainder of the patients. The degree of limitation in ROM decreased after 2 weeks. Comparison of the patients in the clusters of week 0 and week 2 revealed a shift of patients between the clusters, although the number of patients in the clusters remains almost constant.

It is concluded that three stable clusters could be identified, which questions the suitability of more detailed classifications for the diagnosis of patients with shoulder complaints in general practice.
In Chapter 3 the aim of the study was to determine if a classification of shoulder complaints in general practice can be made from variables of medical history and physical examination by means of a non-metric multidimensional scaling and to investigate the reproducibility of results from the hierarchical cluster analysis that was performed in chapter 2.

Ninety-eight consecutive patients presenting shoulder complaints in general practice were examined upon inclusion and after two weeks of treatment. All patients were treated with an NSAID during the first two weeks of treatment. Eleven variables of the medical history and 19 variables of the physical examination were used in the analysis. At inclusion as well after two weeks a one-dimensional configuration can be used to represent the shoulder complaints. The results of the cluster analysis are consistent with the results of the non-metric multidimensional scaling. The degree of limitation in ROM and the degree of pain felt by the patients together determine the position of the patients on the dimension.

In Chapter 4 a study is reported which aim was to determine whether the classification of shoulder complaints in general practice made from variables of medical history and physical examination with non-metric multidimensional scaling, reported in chapter 3, can be reproduced by analysing another dataset provide by De Jongh. He performed a hierarchical cluster analysis and found two main clusters of patients. One group of patients with limitations in the range of motions and one group without limitations in the motions but nevertheless experiencing pain. Each of these clusters were according to De Jongh divided in three and four smaller clusters respectively. Ninety-eight consecutive patients presenting shoulder complaints from 15 general practices in and around Rotterdam, The Netherlands were inclucde in the study. Sixteen variables of the medical history and 20 variables of the physical examination were used in a non-metric multidimensional scaling analysis. The analysis of the data shows that a one-dimensional configuration can be used to represent the shoulder complaints. The results are in agreement with the results of the non-metric multidimensional scaling of patients with shoulder complaints reported in Chapter 3. Two main clusters found in the hierarchical cluster analysis by De Jongh were consistent with the results of the non-metric
multidimensional scaling. The degree of limitation in ROM and the degree of pain felt by the patients together determine the position of the patients on the dimension.

In Chapter 5 a classification of patients with shoulder complaints based on their physical examination was constructed using non-metric multidimensional scaling from the data of two independent observers. The inter-observer reliability was investigated and it was also explored to what extent the setting in which the patients were recruited, and which demographic and clinical characteristics are related to the classification. Data from 132 patients with shoulder complaints recruited in various health care settings in the Netherlands were examined. Two observers independently performed a physical examination of the cervical spine and shoulder joint. A non-metric multidimensional scaling procedure was performed for each observer separately. The inter-observer reliability of both observers was computed by correlating the scores on the corresponding dimensions. Differences between setting, demographic and clinical characteristics and the resulting dimensions were investigated.

For both observers two dimensions (severity of complaints of the shoulder joint and severity of problems of the cervical spine) were sufficient to classify all patients. Agreement between the two observers was good to moderate. Patients with neck pain in history taking showed higher scores on both dimensions. It is concluded that despite moderate inter-observer agreement for each variable from physical examination found in previous studies, observers agree on the scores of the patients on the relevant dimensions.

In Chapter 6 an empirical classification of patients with shoulder complaints based on the restrictions of the mobility of the shoulder and neck was constructed using latent class analysis. The data of two previous conducted studies in which 201 and 198 patients resp. with shoulder complaints recruited in various health care settings in the Netherlands were included, were combined. The relationship between the results of the empirical classification and the setting in which the patients were recruited, demographic and clinical characteristics was investigated. Furthermore, it was investigated to what extent the classification results relate to the original diagnostic categories into
which the patients were classified. The results show that patients experiencing shoulder pain can be classified in a simple way into four categories, reflecting the distinction between problems of the shoulder and those of the neck, as well between those patients that show little restrictions in the motions of shoulder and neck and those that have restrictions in all motions.

Patients recruited from a clinic for rheumatology & rehabilitation and those from the orthopaedic clinic show relatively more problems concentrated around the mobility of the shoulder joint and less around the neck. Patients in the category with hardly any restrictions in the motions of shoulder and neck are on average younger than those in the other groups.

There appeared little agreement between the results of the latent class analysis and the classification of patients according to the original diagnostics categories. A simple classification rule was proposed with which almost all patients can be classified correctly.

In Chapter 7 the characteristics of the different methods of classification that were used in this thesis are discussed. The results found in the studies reported in the previous chapters are discussed and related. It is concluded that from the data from history taking and physical examination of patients with shoulder complaints only a simple classification can be made, and no conclusions can be drawn with respect to the location of the pathologic anatomic structure(s). The severity of the problems concentrated around the shoulder joint and those concentrated around the cervical spine can be determined, independently of each other. Since no more than three or four therapy options are available to general practitioners for the treatment of shoulder complaints it is concluded that there is no need for a more complex classification.
Samenvatting

In het verleden zijn vele pogingen ondernomen om diagnostische categorieën te ontwerpen voor patiënten met schouderklachten. In Hoofdstuk 1 van dit proefschrift wordt een kort overzicht gegeven van de verschillende classificaties die bestaan. Er zijn erg eenvoudige classificaties ontworpen bestaande uit twee of drie groepen patiënten, maar ook complexe systemen, inclusief gedetailleerde instructies voor de clinicus om de pathologische anatomische structuren exact te lokaliseren. Het merendeel van deze diagnostische classificaties zijn gebaseerd op persoonlijke inzichten en ervaringen van de betreffende auteurs, terwijl een gedegen empirische fundering over het algemeen ontbreekt.

De vraag, waarvoor in dit proefschrift naar een antwoord wordt gezocht, is of patiënten, die hun huisarts consulteren naar aanleiding van schouderklachten, op empirische wijze kunnen worden gecategoriseerd gebaseerd op gegevens uit de anamnese en het lichamelijk onderzoek. Dit op een zodanige manier dat de huisarts een adequate therapie kan kiezen op basis van deze classificatie.

In Hoofdstuk 2 wordt een poging ondernomen een classificatie van schouderklachten in de huisartspraktijk te ontwikkelen met behulp van hiërarchische clusteranalyse. Honderd en één patiënten met schouderklachten werden onderzocht bij het eerste bezoek aan de huisarts (week 0) en na twee weken. De analyse werd uitgevoerd op elf variabelen afkomstig uit de anamnese en 19 variabelen uit het lichamelijk onderzoek. Zowel de analyse gedaan op de gegevens van week 0 als die van week 2 lieten drie stabiele clusters zien: één cluster waarin bijna de helft van de patiënten, die nauwelijks enige beperking in de scapulohumerale bewegelijkheid vertonen, zijn ondergebracht, één cluster bestaande uit een gering aantal patiënten met acute klachten en beperkingen in het scapulohumerale gewricht in alle richtingen en een derde cluster waarin de overige patiënten ondergebracht werden. De ernst van de beperkingen in de bewegelijkheid verminderde na twee weken. Uit de vergelijking van de samenstelling van de clusters op week 0 en op week 2 blijkt dat er een verschuiving optreedt van