Summary

The basis of this thesis was the clinical question: what is the influence of psychological symptoms on clinical outcome after shoulder surgery? With the improved ability to diagnose shoulder pathology more correctly and with clinical guidelines, good clinical outcome can be obtained after shoulder surgery in the majority of patients. However, worse clinical results can be observed in a small group of patients after shoulder surgery, despite making the right diagnosis and the application of appropriate surgical therapy. Other factors could be associated with inferior clinical outcome after shoulder surgery. Psychological symptoms are often present before shoulder surgery and might be associated with worse clinical results after shoulder surgery. Therefore, in this thesis we studied the association between psychological symptoms and clinical outcome after shoulder surgery.

Study 1

In order to perform research in this field, we needed a validated self-reported psychological questionnaire that was able to identify common and clinical relevant psychological disorders in patients with shoulder complaints. In literature, a validated psychological questionnaire that could identify symptoms of depression, anxiety and somatisation in patients with shoulder complaints was not available. On our shoulder unit we used a psychological questionnaire that was developed in primary care: the Four-Dimensional Symptom Questionnaire (4DSQ). The 4DSQ is a 50-item self-report inventory that is able to identify four dimensions of common psychological symptoms: distress, depression, anxiety and somatisation. The distress scale measures people’s most general, most basic response to stress of any kind, be it work or family demands, psychosocial difficulties or life events. The depression and anxiety scales measure specific symptoms of depressive and anxiety disorders, severe enough to warrant specific treatment. The somatisation scale measures symptoms associated with somatic stress. We performed a validation study of the 4DSQ in orthopedic patients scheduled for shoulder surgery and used general practice patients as control group. We observed that
the 4DSQ in orthopedic shoulder patients measures the same psychological constructs as in general practice patients and can therefore be used in orthopedic practice to measure psychological symptoms in patients with shoulder complaints. The shoulder patients tended to score higher on the somatisation scale, resulting in a new cut-off point on the 4DSQ for somatisation.

Study 2

In a large longitudinal cohort study we studied the association of preoperative and postoperative psychological symptoms with functional outcome after shoulder surgery. A group of 315 patients was observed before and 12 months after surgery, outcome measures were the change of Disabilities of the Arm, Shoulder and Hand (DASH) score and the perceived improvement of pain and function measured with anchor questions. The treatment team was not informed about the psychological symptoms identified. Before shoulder surgery, distress was identified in 20% of the patients, depression in 7%, anxiety in 13% and somatisation in 15%. Symptoms of psychological disorders were encountered in all the various shoulder diagnoses. Preoperative symptoms of distress, depression, anxiety and somatisation were not associated with worse clinical outcome 12 months after shoulder surgery. Preoperative symptoms of psychological disorders persisted after surgery in 56% of patients. In addition, 10% of patients without symptoms of psychological disorders before surgery developed new psychological symptoms. Postoperative symptoms of psychological disorders and perceived improvement of pain and function 12 months after shoulder surgery were strongly associated with worse clinical outcome. As a consequence of the findings in this study, we suggest that patients with symptoms of psychological disorders before surgery should not be excluded from shoulder surgery. Most patients with psychological symptoms before surgery benefit from shoulder surgery, especially when psychological symptoms disappear after surgery. Postoperative symptoms of psychological disorders were strong predictors of a worse clinical outcome. In order to interpret clinical outcome after shoulder surgery, the influence of psychological symptoms on the clinical outcome should be taken into account.
Study 3

The relationship between psychological disorders and chronic shoulder pain and disability has not been clarified. Psychological disorders might be a consequence of chronic shoulder pain and disability, but it is also possible that chronic pain and disability reflect an underlying psychological disorder. We further analyzed the change in psychological symptoms after shoulder surgery in a subsequent study.

In a study population of 176 patients, preoperative symptoms of distress, depression, anxiety and somatisation disappeared in 40% of patients after shoulder surgery. Improvement of shoulder pain and function after surgery was associated with a decrease of symptoms of distress, depression, anxiety and somatisation. However, the association found was very small and most likely not relevant in clinical practice.

Study 4

One of the disabilitating complications after shoulder surgery is postoperative frozen shoulder. In a large cohort of 505 patients we studied the incidence and prognostic factors for secondary frozen shoulder after elective shoulder surgery. A prediction model was developed to study risk factors for postoperative frozen shoulder after shoulder surgery. Frozen shoulder was identified in 11% of the patients after shoulder surgery and was more common in females (15%) than in males (8%). A prediction model based on 4 variables (diabetes mellitus, specialized shoulder physiotherapy, arthroscopic surgery and DASH score) discriminated reasonably well with an AUC of 0.712. Secondary frozen shoulder was not more frequently encountered in patients with symptoms of psychological disorders before surgery.

Study 5

Several shoulder scores are available to evaluate general shoulder function, pain and disability, ranging from objective clinician-based measurements to more subjective self-reported measurements. Psychological symptoms might
influence the shoulder scores, leading to worse outcome scores. In 500 consecutive patients scheduled for shoulder surgery in a five year period, we prospectively collected the pre-operative DASH score, Constant-Murley score, and 4DSQ score. Multivariable models showed that symptoms of psychological disorders significantly contribute to explaining the variance in the pre-operative functional outcomes, especially for the DASH score. An increasing number of psychological disorders was significantly associated with worse Constant-Murley and DASH scores. Clinicians should be aware of the influence of symptoms of psychological disorders on these outcome instruments when making decisions regarding treatment priorities or interpreting treatment outcomes.

**Study 6**

The minimal clinically important difference (MCID) is defined as the smallest measured change score that patients perceive to be important. We noticed in the previous studies that symptoms of psychological disorders significantly influence the magnitude of the DASH scores. It is unknown if psychological symptoms influence the magnitude of the MCID of the DASH score. In order to interpret the DASH change score after treatment of shoulder symptoms in patients with and without symptoms of psychological disorders, it seems important to assess if the MCID is different in patients with symptoms of psychological disorders compared to patients without symptoms of psychological disorders. We observed that symptoms of psychological disorders had no influence on the MCID of the DASH score in patients who underwent shoulder surgery. For both patient groups, the MCID was the same.

**Study 7**

Not only symptoms of psychological disorders are associated with functional outcome after orthopedic surgery, patient expectations before surgery are also reported to correlate with clinical results after several orthopedic operations. There is currently no patient expectations survey available for
patients undergoing shoulder surgery that is validated, reliable and easy to use in daily practice. Therefore, we decided to develop the Patients Expectations of Shoulder Surgery (PESS) survey. Six items were included in the PESS survey: ‘pain relief’, ‘improved range of motion’, ‘improved ability to perform daily activities’, ‘improved ability to perform work’, ‘improved ability to participate in recreational activities and sports’ and ‘stop shoulder from dislocating’. Three of these six expectations were significantly associated with clinical outcome after shoulder surgery: ‘relief of pain’, ‘improved ability to perform daily activities’ and ‘no more dislocation’. Content validity was assessed by a patient panel of shoulder patients scheduled for shoulder surgery. Test-re-test reliability was high with a Intraclass Correlation Coefficients (ICCs) between 0.52 and 0.92. The PESS survey is a valid and reliable survey that can be used in future clinical research and in daily orthopedic practice. We believe that the preoperative evaluation of patient expectations should be a standard procedure before shoulder surgery.

Clinical relevance of findings of this thesis

In most patients with an adequate diagnosis, an appropriate surgical technique and rehabilitation program, shoulder surgery resulted in a significant reduction of pain and disability. Preoperative symptoms of psychological disorders were not associated with worse clinical outcome after shoulder surgery. As a consequence of the findings in this study, we suggest that patients with an indication for shoulder surgery and symptoms of psychological disorders should not be excluded from surgery. Most patients with symptoms of psychological disorders before surgery benefit from shoulder surgery, especially when psychological symptoms disappear after surgery.

Preoperative symptoms of distress, depression, anxiety and somatisation improved after shoulder surgery, however in 56% of patients symptoms of psychological disorders persisted after shoulder surgery. If symptoms of psychological disorders were present 12 months after surgery, functional outcome and patient perceived improvement of pain and function after surgery were worse. In clinical practice, the 4DSQ questionnaire could be used to identify psychological symptoms in patients who are not satisfied with the
results after shoulder surgery and the DASH score did not improve. Symptoms of psychological disorders could be a reason why patients report persistent shoulder complaints. Treatment of symptoms of psychological disorders might positively influence the perception of shoulder pain and function after surgery.