THESIS SUMMARY

Studies enclosed in this thesis focused on the perioperative setting of obstructive sleep apnea (OSA) patients undergoing bariatric surgery. Special attention was paid on OSA screening and diagnosis, perioperative risks as well as clinical strategies to optimize perioperative care, and postoperative outcomes such as weight loss and improvement or cure of OSA. This chapter provides an overview of main findings.

In **chapter 2**, the true prevalence of OSA with respect to different severity levels was determined in patients undergoing bariatric surgery. Data on the number of upper airway collapses per hour during sleep i.e. the apnea-hypopnea index (AHI) were retrospectively collected from polysomnography (PSG) sleep studies that are considered the gold standard to diagnose OSA. Out of 1358 included patients in whom preoperative PSG were routinely performed, two-thirds suffered from OSA (AHI $\geq 5$/hour). One-third was even diagnosed with a moderate (AHI 15-30/hour) or severe form (AHI $\geq 30$/hour).

In **chapter 3** and **4**, the validity of other OSA diagnostics were assessed by comparing results with the gold standard. In **chapter 3** the value of venous derived biomarkers and the validity of a prediction model as a screening tool for OSA in bariatric surgery were analyzed. In this prospective study of 126 patients, OSA was diagnosed by PSG in 57.9%. The optimal prediction model included plasminogen activator inhibitor-1, angiopoietin-like protein 7 and Tumor necrosis factor-alpha. This model is not accurate to replace PSG due to wide confidence intervals, but can be used to rule out moderate or severe OSA in 23% of patients and withhold them from preoperative PSG. In **chapter 4**, the validity of a simple sleep monitor called the Checkme Health Monitor was evaluated by assessing the diagnostic performance of the Checkme derived oxygen desaturation index (ODI) for PSG AHI $\geq 15$/hour. With a sensitivity and negative predictive value of both 100%, the Checkme is valid for exclusion of moderate and severe OSA in bariatric surgery. This simplified sleep study enables bariatric clinics not to perform PSG in all patients scheduled for bariatric surgery.

Subsequent two chapters focused on the association of postoperative cardiopulmonary complications and OSA in bariatric surgery patients. **Chapter 5** presents a systematic review of the literature and included thirteen studies providing 98,935 patients. Overall presented data showed no clear association of OSA with cardiopulmonary morbidity, admissions to the Intensive Care Unit (ICU), mortality or length of stay after bariatric surgery. Important notes are the under diagnosis of OSA with only 37% patients documented with OSA and high risk of bias caused by optimized conditions such as continuous positive airway pressure (CPAP) usage, continuous monitoring of vital parameters and oxygen supplementation. The need of CPAP usage in mild OSA patients (AHI 5-15/hour) who are positional (POSA), meaning that their AHI is at least twice as high in supine sleeping position than in other positions,
was investigated in chapter 6. Out of 277 mild OSA patients, 153 (55 %) had POSA. Severe cardiopulmonary complications occurred in 1.1 % of mild OSA patients. No difference was detected between POSA and non-POSA patients. Results of this study suggest that CPAP is not indicated in mild OSA patients, despite existence of a positional component.

The following four chapters evaluated the influence of OSA on bariatric surgical outcomes including anastomotic leakage, weight loss and quality of life (QoL). The association of perioperative CPAP usage, possibly predisposing to mechanical stress by increased air pressure in esophagus and stomach, and the risk of suture line disruption after bariatric surgery was assessed in chapter 7. A total of 2135 patients were included; 497 (23 %) used CPAP postoperatively. Suture line disruption occurred in 1.2 % and was not associated with CPAP usage. This study concluded that CPAP usage is safe in the early postoperative setting of bariatric surgery. In chapter 8, the influence of the AHI on 30-day complications including severity measured by the Clavien-Dindo classification was explored. Retrospective analyses of 1002 patients showed no effect of the AHI on short-term complications. In chapter 9, one-year weight loss results were compared between different OSA severity levels. Less percentage excess weight loss (EWL) was seen with increasing AHI. However, when adjusted for other OSA related factors, the AHI was of minor importance. It was concluded that the AHI itself does not individually impair weight loss after bariatric surgery. Additionally, the influence of OSA on QoL prior to- and after laparoscopic Roux-en-Y gastric bypass surgery was examined by using the Impact of Weight on QoL-Lite questionnaire (chapter 10). Total scores (n=276) improved from 51.2 to 89.7. QoL improved in both OSA and non-OSA groups. Lower postoperative scores of subscales Public Distress and Work were observed in OSA patients, especially those with a severe form. All postoperative subscale scores were negatively correlated with OSA severity. In chapter 11, the effect of weight loss following bariatric surgery on OSA improvement in terms of CPAP dependency was evaluated. Out of 205 patients with preoperative moderate and severe OSA (AHI ≥ 15/hour), three quarter achieved curation or improved from severe or moderate OSA to a mild form of OSA after surgical induced weight loss. A quarter (25.9 %) had persistent moderate or severe OSA. Predictive factors for this persistence were age ≥ 50 years, preoperative AHI ≥ 30/hour, EWL < 60 % and hypertension.

Chapter 12 outlines a consensus based guideline on the perioperative management of OSA in a bariatric specific population. After systematic literature searches, a panel of 15 international experts provided 58 recommendations or statements covering preoperative screening, treatment, postoperative monitoring, anesthetic care and follow-up. This was done according to the “Amsterdam Delphi method”. With the exception of 3 recommendations (64 %, 66 %, and 66 % respectively), consensus (>70 %) was reached for 55 statements and recommendations. Chapter 13 provides a summary and update on chapter 12, one year after publication.