# Summary

There are several methods to reproduce the course of a surgical procedure. The most obvious is by eye witness account, i.e. the primary surgeon or those first hand involved in surgery. For purposes of accessibility and continuity of care, an operative report is composed, describing the most important events that transpire during surgery and providing the reader with extra information regarding the surgeon's considerations for certain actions. All content however is determined by the extensiveness and whim of the person transcribing and therefore subject to omission and error. Addition of video and/or audio recording to this narrative operative report would supply other parties with objective information of the aforementioned events almost in full.

In this thesis, we aimed to identify the quality factors in abdominal surgery, with laparoscopic colorectal surgery and laparoscopic cholecystectomy as focal point, that might benefit from use of intraoperative video and audio recording.

## PART 1 – Multimedia as a quality improvement tool in surgery

In **Chapter 2,** we outlined benefits of intraoperative video recording during surgery and put them in context with important legal, ethical and technical issues currently forming a barrier for implementation. First is the argument of consent, mainly regulated by the Medical Treatment Agreement Act and the former Personal Data Protection Act (now covered by the European General Data Protection Regulation – GDPR). Three situations exist in the process of intraoperative video recording: Situation 1: Video is integral to the treatment provided, i.e. endoscopic surgery. Situation 2: Recorded images are not indispensable in terms of treatment, however might be of added value. Situation 3: Use of images for different purposed than initially intended. For situation 1, consent for intraoperative video is interwoven with consent for the surgical procedure in the Medical Treatment Agreement Act. For situation 2 and 3, additional consent is necessary. The second issue is retention period. For images included in the patient file a retention period of 15 years is uphold. For images not included in the patient file, no consensus have been met yet and the period has to be well defined before collection.

As an improvement to the error prone narrative operative report, some practitioners in the surgical field have been experimenting or even implementing the synoptic operative report. A synoptic operative report is a summarized documentation containing essential criteria of a surgical procedure, often formalized in computerized templates. To compare the completeness and the user-friendliness of the synoptic operative report compared to the currently used narrative operative report, we conducted a systematic review, of which the results are reported in **chapter 3.** For the synoptic operative report, overall completion and completion of subsections were higher than the narrative operative report. Furthermore, the time until completion of the report was shorter when the synoptic format is used.

Despite the increasing availability and use of multimedia capturing devices and recording tools inside the operating room, the perspectives of medical professionals are poorly known.

Consideration of these are imperative before implementation could be considered. We present the results of a cross-sectional survey in **chapter 4** regarding the use of intraoperative multimedia recording. Of the respondents, half feel that the operative report currently used is insufficient for future quality requirements. Most of the respondents recognize the added value of intraoperative video recording, and, to a lesser extent, for intraoperative audio recording. Furthermore, over half would think it's unlikely they would alter their behavior during surgery whilst recorded on video and the vast majority, 82.8%, would think it is unlikely that their surgical methods would be altered. Many, however, fear for privacy infringement.

In **chapter 5** the effects of segmentation in video-based learning of a surgical procedure (i.e. open inguinal hernia repair) are assessed. We used point-of-view recordings of medical students performing open inguinal hernia repair (Lichtenstein's procedure) after being exposed to either a step-by-step or continuous video-demonstration of the procedure, after which the steps of the procedure were reviewed on the video recordings for procedural and executional errors using the principles of the Observational Clinical Human Reliability Assessment. We found out that subjects in the step-by-step group made fewer procedural errors than the continuous group and also experienced a lower extraneous cognitive load compared to the continuous group

## PART 2 – Quality assurance in colorectal cancer surgery

To investigate the added value of intraoperative systematic video recording we performed the Imaging for Quality control trial (IQ-Trial). In this trial we aimed to investigate the added value of intraoperative systematic video recording during laparoscopic colorectal cancer surgery in terms of quality and safety and information collection. This trial consists of a pilot study (**chapter 6**) in which we aimed to explore the feasibility of systematic intraoperative video recording and the main study (**chapter 7**). For the pilot study, 15 elective cases of laparoscopic colorectal cancer surgery were intraoperatively recorded using standard endoscopic recording modalities available. We then compared them to a retrospective group of 32 cases from the historic control group and in terms of the availability of information (i.e. predetermined essential steps of laparoscopic colorectal procedures) between video and operative report. Significant differences in availability of information were found in favor of video, as well as a combination of video and the operative note, compared to the written operative note alone

After feasibility was established, the main study, a multicenter, prospective, observational cohort study, was performed (**chapter 7**). In this study, procedures of 113 study patients were recorded and analyzed for availability of information and then compared to an identical number of case-matched individuals. This resulted in a significant increase in reporting quality by using intraoperative systematic video recording (78.5% adequacy for systematic video recording and 85.1% for the combination of the systematic video recording with the narrative operative report). Only half of the steps reported in narrative report were adequately described.

## PART 3 – Quality and safety in laparoscopic cholecystectomy

Cholecystectomy is one of the most common surgical procedures performed today, of which more than 80% is performed laparoscopically. Despite the benefits of the laparoscopic approach over the classic 'open' approach, the incidence of one major complication, bile duct injury, increased drastically. To counter this upsurge, several safety measures have been developed. We performed a comprehensive systematic review on several of these modalities in **chapter 8**, categorizing for dedicated surgical approaches, (including the Critical View of Safety technique, fundus first laparoscopic cholecystectomy and laparoscopic subtotal cholecystectomy), supportive imaging techniques (including intraoperative radiologic cholangiography, intraoperative ultrasonography and fluorescence cholangiography) and other techniques. Dedicated surgical approaches demonstrate promising results. Also intraoperative radiologic cholangiography and ultrasonography show beneficial effects in BDI prevention, however are hampered by their learning curve. For all studies the level of evidence is low.

The Critical View of Safety technique is one of the most important surgical techniques to reduce the odds of bile duct injury in laparoscopic cholecystectomy. The crux of this technique is the decisive identification of the structures to be transected (i.e. cystic duct and cystic artery), without inflicting accidental damage to the central ducts of the biliary system. Many surgeons in the world utilize this technique in their procedures. However, to what extent surgeons and residents properly utilize the Critical View of Safety is unknown. To explore this, we conducted a nationwide survey among surgeons and residents in training. The results are reported in **chapter 9**. We inquired surgeons and surgical residents for their current methods of performing laparoscopic cholecystectomy and their knowledge on the topic of the Critical View of Safety technique.

Almost all respondents stated to use the Critical View of Safety technique in their current practice. Only 72% performed the essential steps of the technique frequently however. Furthermore, only half of the respondents were able to identify the corresponding steps of the Critical View of Safety technique, and just 16.9% were able to distinguish these adequately from possible harmful steps. Noteworthy was the fact that residents performed and selected the steps of the Critical View of Safety technique significantly more often than surgeons.

In **chapter 10 and 11** we investigated the value of both intraoperative video and audio recording in operative reporting. The addition of synchronous voice recording next to intraoperative video recording might add a new dimension to operative reporting by capturing the surgeons' considerations as well. To explore this, we investigated in a multicenter prospective observational trial whether intraoperative voice dictation could resolve discrepancies between videos and operative notes in laparoscopic cholecystectomy. For this, a total of 79 procedures were recorded on video whilst simultaneously recording audio (i.e. speech). Video recordings resulted in higher adequacy for the inspection of the gallbladder, inspection of the liver condition and the circumferential dissection of the cystic duct and the cystic artery. The total adequacy was also higher for the video recordings compared to the narrative operative report. The additional audio recordings significantly lowered the discrepancy rate between video and operative report note.