Summary
SUMMARY

Practical skills in Urology have always been trained according to the classical master-apprentice type of training of ‘see one, do one, teach one’. Subsequently, declaration of residents’ proficiency at the end of their traineeship is based on the number of procedures performed and the subjective judgement of their mentor. However, in present time this way of training is facing multiple challenges. The introduction of minimally invasive surgical techniques (endoscopy, laparoscopy and robot-assisted laparoscopy) has led to longer learning curves, whereas training time is diminished due to the integration of the European Working Time Directive in 2009. This has raised obstacles in attaining appropriate levels of competency during residency training.

Furthermore, it is becoming ethically unacceptable to perform a first procedure directly on the patient. In today’s legal environment more emphasis is placed on patient safety and the standards for clinicians’ proficiency are higher. All these developments have challenged the traditional master-apprentice type of training and have led to two major changes within surgical education.

First, simulation-based training (SBT) is an increasingly accepted method to complement training in clinical practice. The major advantage of SBT is that the initial phase of the residents’ surgical learning curve is moved to a risk-free and time-independent environment. Since the onset of SBT, a great number of simulation models have been designed, and several studies have shown that surgical skills can be improved by SBT.

Although the benefits of SBT are apparent, training programs struggle with the integration of SBT into their curricula. This is due to a multitude of opinions on its content, validation approach and integration strategy, but also due to issues as considerable costs, logistics and limited personnel.

Second, there is a gradual shift from time-based residency training, which ends after a predefined time span, towards competency-based residency training, in which competency levels are defined that have to be met before residents are allowed to perform procedures independently. In this type of training, objective assessment of skills is a prerequisite for final competency levels to be guaranteed. Consequently, benchmark levels of competency will have to be set and assessed. Up till now, the use of high-stakes (summative) assessment has been limited within the Dutch urological curriculum. The first step towards summative assessment was the development, validation, and implementation of the Program for Laparoscopic Urological Skills, in which the basic laparoscopic skills of junior residents are assessed. Further training programs and assessment tools for endoscopic and robot-assisted urological procedures are work in progress.

With the gradual shift towards competency-based residency training, including the rise of SBT, surgical education has entered a new phase. The current challenge for surgical educators is to develop and integrate SBT and objective assessment of skills into
the existing surgical curricula, in an attempt to improve the quality of surgical education and eventually patient safety.

In this thesis we have addressed the two general research questions: “What is the optimal design, content, and implementation strategy for a urological simulation-based training curriculum and what is its educational impact?” and “How can competency in technical and non-technical skills of TURBT be assessed in a validated, standardized simulation setting?”

The first part of this thesis focused on the identification of training needs and training objectives for basic urological procedures. In Chapter 2 we studied the current technical performance of junior and senior residents regarding UCS, TRUS, TRUSP, and TURBT. A total of 146 UCS, 27 TRUS, 38 TRUSP, and 30 TURBT procedures, performed by 11 junior residents and 5 senior residents, were observed. Performance was assessed on completeness of procedural steps, level of independence, time, and the incidence of unintended events.

Senior residents appeared to be more independent, but less thorough in their performance of UCS and TRUSP than junior residents. Performance of junior and senior residents involved a high percentage of unintended events, especially in TRUSP and TURBT, which results in a potential threat for patient safety. Root cause analysis showed that the events were mainly caused by ‘verification’ and ‘skill-based’ issues, such as failure to check a patient’s coagulation status in TRUSP and bladder perforation in TURBT. It was concluded that targeted skills training, including assessment, should be implemented before privileges for independent practice are granted. This could reduce the incidence of unintended events and optimize patient safety. The training needs revealed in this study can be used in the development of targeted skills training.

In Chapter 3 we focused on the patients’ point of view, as we studied the patient comfort and satisfaction during UCS (n=222) and TRUSP (n=84), performed by 9 urologists, 14 junior residents, and 4 senior residents. Furthermore, the degree of interpersonal and communication skills of residents and urologists, as perceived by patients, was investigated. Additionally, the influence of procedure-related factors such as type of scope in UCS and use of anesthetics in TRUSP was evaluated. Patient experiences and communicational aspects were assessed by means of a structured questionnaire. The influence of procedure-related factors on patient experiences was analysed by clinical observations.

The results showed a high level of patient satisfaction and comfort during UCS and TRUSP, which was not affected by the level of training. Patients were very satisfied with the degree of communication, provision of information, and after care provided by their physician. Regarding the influence of procedure-related factors, patients demonstrated
significant favor of local anaesthesia in TRUSP and performance of UCS in the supine position over the lithotomy position.

The results of this study suggest that residents’ interpersonal and communication skills are already highly developed in an early stage of urological residency training. It seems that the current Dutch curriculum pays sufficient attention to interpersonal and communication skills, and that the focus in skills training should be directed towards other problem areas, as described in Chapter 2.

For a successful design and integration of a SBT curriculum it is not only important to objectify the training needs, but also to involve the target audience (namely residents and program directors) and to take their opinions into account. The study described in Chapter 4 aimed to gain insight into the current and ideal urological practical skills training according to residents and program directors. Quantitative data was collected by means of a structured questionnaire that was sent to the residents (n=87) and program directors (n=45) of all Dutch teaching hospitals. Qualitative data were collected by means of 8 semi-structured interviews in which a total of 39 residents and 15 program directors participated.

Residents indicated that current training consists of patient-related ‘learning by doing’. Structured practical skills training in local hospitals took place according to 12% of the residents versus 44% of the program directors. Ideally, residents preferred to practice certain procedures on simulation models first, especially in endourology. Subsequently, the outline of the newly designed Dutch Urological Practical Skills (D-UPS) curriculum was presented and design characteristics that could increase the curriculums’ acceptability were assessed. The D-UPS curriculum combines the acquisition and rehearsal of basic theoretical knowledge with practical training of basic urological skills and techniques. Important features of the D-UPS curriculum are (1) training of technical and non-technical basic urological skills; (2) local hospital setting; (3) small groups; (4) use of peer teaching and expert supervision, and (5) yearly recurrence. The majority of residents (92%) and program directors (87%) approved of implementing the newly developed skills training program. They expected the D-UPS curriculum would have a positive effect on patient safety, time efficiency in the OR, self-confidence of the residents and uniformity of actions. The main expected difficulties in the implementation of the D-UPS program were logistics and lack of motivation of the program directors. Design characteristics that could increase its acceptability according to residents and program directors were structured scheduling, the use of peer teaching and high fidelity models.

Between September and December 2014, the D-UPS curriculum was implemented on a national scale. During this period, the first 8 training modules were performed in 20 out of 26 Dutch teaching hospitals. In the second part of this thesis (Chapter 5), we aimed to assess the educational impact of this national implementation, as perceived by residents and program directors, and to provide focus points for improvement of the D-UPS curriculum. A quantitative cross-sectional survey amongst residents (n=63) and
supervisors (n=58) was conducted and qualitative individual module-specific feedback was obtained.

A considerable survey response of 95% for residents and 76% for supervisors was obtained. Modules were attended by junior and senior residents, supervised by a urologist, and peer teaching was used. The vast majority of supervisors and residents agreed they were motivated to participate in the curriculum. Ninety percent of supervisors versus 67% of residents judged the D-UPS curriculum as an important addition to current residency training. However, the impact of training on e.g. knowledge of materials and the ability to anticipate on complications was significantly higher for junior residents than for senior residents. This indicates that increased efforts should be made to adjust the required level of performance to the experience level of residents in different phases of the residency program. In order to reach this, a more personalized approach by the integration of spiral learning was suggested.

The final part of this thesis focused on the assessment of surgical competency in TURBT, in a validated simulation setting. In Chapter 6 the simulation setting was addressed. First, the educational value of the physical ‘Simbla’ TURBT simulator as an educational tool within urological residency training was investigated. A training needs analysis was performed to identify the training objectives of TURBT, e.g. procedural steps and pitfalls. A total of 21 procedural steps and 17 pitfalls were identified, of which 13 steps and 8 pitfalls were covered by the Simbla. Subsequently, the feasibility, acceptability, and face, content, and construct validity of the SIMBLA was assessed. Participants (n=76) were divided into three groups based on their experience in TURBT: novices, intermediates, and experts. Participants performed two standardized TURBT procedures on the simulator. Face and content validity as well as feasibility and acceptability were assessed with a quantitative survey. Construct validity was assessed by comparing the performance of novices, intermediates and experts on resection time, quality of tumour resection and overall performance.

Participants rated the Simbla’s overall realism (face validity) with a score of 8 out of 10 (range 6-9). All aspects regarding realism and usefulness were rated above the acceptability threshold of 6/10, clearly demonstrating face and content validity. Intermediates (100%) and experts (96%) considered the Simbla to be a useful educational tool within the urological curriculum. Regarding construct validity, resection time was longer for novices than for experts. In addition, the overall performance of novices was rated lower compared to intermediates and experts, and novices showed more irradical resections and bladder perforations. It was concluded that the Simbla TURBT simulator is a valid, feasible and acceptable educational tool for training procedural skills.

In the final study of this thesis, which is presented in Chapter 7, the development of the TOCO-TURBT tool is described; a high-stakes assessment tool that measures surgical competency in TURBT. The TOCO-TURBT tool was designed by means of cognitive task analysis (CTA), which included hierarchical task decomposition, clinical observations,
and expert consensus. The tool consists of 51 items and is divided into three phases: preparatory (n=15), procedural (n=21), and completion (n=15).

A validation study was performed in which the TOCO-TURBT tools’ feasibility, content validity, construct validity and reliability was assessed. A total of 51 residents and 25 urologists participated in this validation study. They performed two TURBT procedures in a simulated setting, which was videotaped. The participants’ degree of competency was assessed by a panel of 8 independent expert urologists using the TOCO-TURBT tool. Each procedure was assessed by a set of two raters. Feasibility, acceptability and content validity were evaluated by a quantitative cross-sectional survey. Regression analyses were performed to assess the strength of the relation between experience and test scores (construct validity). Reliability was analyzed by generalizability-theory (G-theory).

The majority of assessors and urologists indicated the TOCO-TURBT tool to be a valid assessment of competency and would support the implementation of the TOCO-TURBT assessment as a certification method for residents. Construct validity was clearly established for all outcome measures of the procedural phase. G-theory analysis showed high reliability (coefficient Phi ≥ 0.8) when using the format of two assessors and two cases to assess a participant. We concluded that the TOCO-TURBT tool has the potential to be used for future certification of skills in TURBT for residents and urologists. Moreover, the methodology of CTA might be valuable in the development of assessment tools in other areas of clinical practice.

In Chapter 8 our main findings are discussed in the light of the literature. This is followed by the answer to our main research questions in an overall conclusion. Finally, recommendations, practical implications, and suggestions for further research are presented.
REFERENCES


(16) Aydin A, Ahmed K, Shafi AM, Khan MS, Dasgupta P. The role of simulation in


