Acquiring minimally invasive surgical skills

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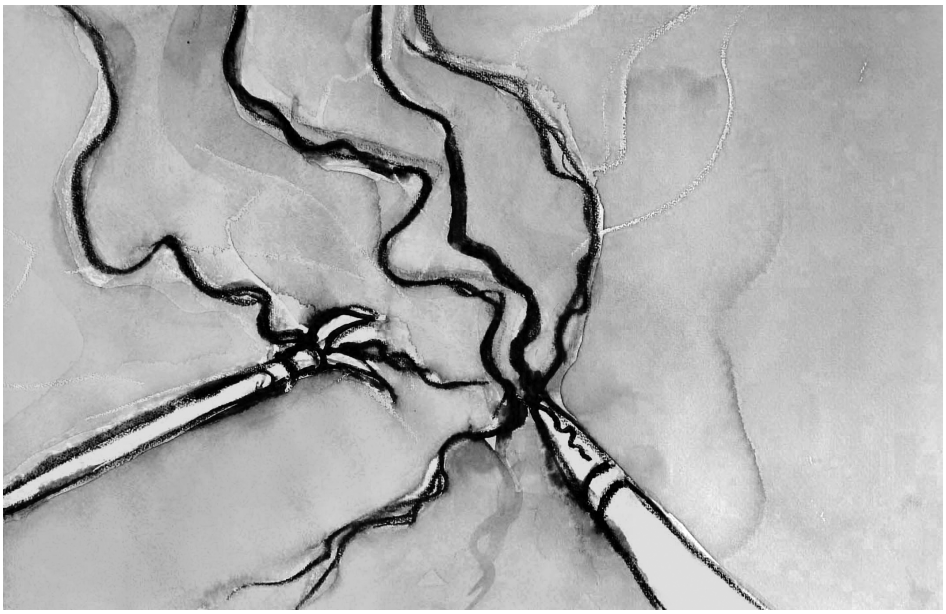
CHAPTER 2

SKILLS TRAINING IN MINIMALLY INVASIVE SURGERY IN DUTCH OBSTETRICS AND GYNAECOLOGY RESIDENCY CURRICULUM



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INTRODUCTION

Minimally invasive surgery (MIS) has evolved into a major surgical approach to treat a variety of gynaecological disorders. This approach has considerable benefits for patients, such as a reduced morbidity, a shorter hospitalization, better cosmetic results, and an earlier return to normal activity.[Darzi et al., 2002]

However, acquiring MIS skills is more challenging than acquiring the skills necessary to perform conventional open surgical procedures. MIS poses specific demands on the surgeon. During MIS the three-dimensional operating field has to be interpreted from a two-dimensional monitor display in which depth perception is altered. In addition, a surgeon has to manipulate long surgical instruments with diminished tactile feedback and fewer degrees of freedom, while adapting to the fulcrum effect.[Gallagher et al., 1998; Munz et al., 2004]

Apart from the complexity of acquiring MIS skills, a residency curriculum has to deal with smaller case volumes in the operating room (OR). This is due to a decrease in resident working hours and a declining trend in major gynaecological surgical procedures in general.[Blanchard et al., 2004; Brolmann et al., 2001] The smaller case volumes, combined with issues such as quality control, patient safety, efficiency and cost-effectiveness have led to an increasing interest in simulator training facilities outside the OR.[Feldman et al., 2004b; Munz et al., 2004] Simulator training aims at progression along the learning curve by repetitive training of surgical skills with a lack a potential burden to patients in a pressure free environment.[Munz et al., 2004]

With respect to MIS training, the implementation into residency programs is shown to be troublesome.[Loh et al., 2002; Navez et al., 1999; Nussbaum, 2002] Even though basic laparoscopic procedures have well been incorporated in residency, more advanced procedures are not.[Brolmann et al., 2001; Kolkman et al., 2005] Lack of adequate training during residency influences the subsequent use of a specific technique and ultimately may restrict the implementation of MIS in daily practice after completion of residency training.[Kolkman et al., 2006; Shay et al., 2002]

In this report we present the organization of MIS skills training in the Dutch obstetrics and gynaecology residency curriculum which has continuously been evaluated and improved over the past 15 years.

SURGICAL SKILLS IN THE DUTCH RESIDENCY CURRICULUM

The obstetrics and gynaecology residency program lasts six years in the Netherlands. A basic surgical skill course, named the Cobra-alpha course, was incorporated in the curriculum in 1992. It has been evaluated and improved ever since. Attendance to this course was made compulsory for residents obstetrics and gynaecology in 1997, and they had to attend it during postgraduate year (PGY) 1 or 2. resident. One third of this two-day course is spent on theory, while the complementary two thirds are spent on hands-on training. The first day focuses on basic technical skills, like instrument handling and knot tying, for conventional surgery, while the second day concerns the basic skills required for MIS which is subdivided into laparoscopy

and hysteroscopy. Three handbooks, focusing on the basics of surgery, hysteroscopy and laparoscopy, are used for study purposes and have been written for this course.[Jansen F.W. et al., 2008; Jansen et al., 2006; Trimbos J.B., 2007]

The goal of the hands-on training in MIS during the Cobra-alpha course is to provide an introduction to simulator training for laparoscopic and hysteroscopic skills. Additionally, residents need to expand the acquired skills on simulators and have these skills evaluated by a mentor or MIS expert in their own clinic. Necessarily, time for training and evaluation has to be scheduled into the busy clinical practice of the residency program.

A range of simulators is available for the hands-on training. Inanimate box trainers are used to practice basic laparoscopic skills like hand-eye coordination, adaptation to the lack of depth perception and camera holding. The construct validity is established for five of the available exercises in the box trainers.[Kolkman et al., 2008] These five exercises are placing a pipe cleaner through four small circles, stretching a rubber band around 16 nails, placing 13 beads in a letter 'B', cutting a marked circle from a rubber glove and intra-corporeal knot tying. The laparoscopic box trainer exercises are presented in figure 1. With regard to hysteroscopic simulators, vegetable models are available like pumpkins and red peppers.[Kingston et al., 2004] Furthermore, a chicken meat simulates endometrium in a water filled box and a porcine bladder simulates a uterus. A selection of hysteroscopic exercises is presented in figure 2. Basic hysteroscopic skills such as camera holding, instrument handling, safe use of energy sources and distension medium are trained. Besides, some procedures like diagnostic hysteroscopy, endometrium resection and resection of polyps or myomas are simulated.

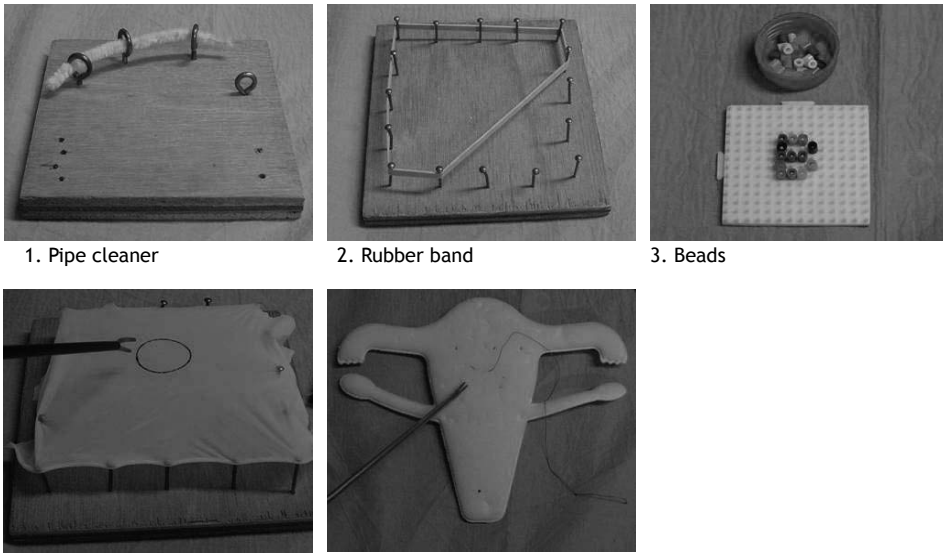
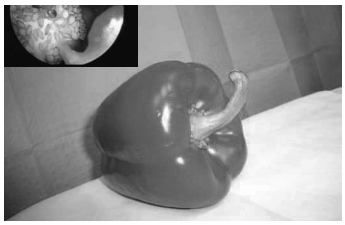
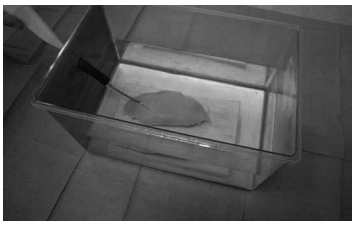


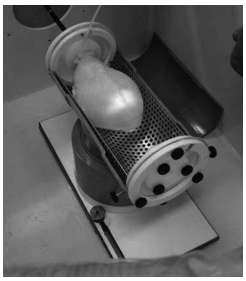
Figure 1. Laparoscopic training exercises.



1. Red pepper



2. Chicken meat in a water filled box



3. Porcine bladder

Figure 2. Hysteroscopic training exercises.

Prior to the start of hands-on training, the exercises are introduced and explained with the aid of audio-visual demonstration. Afterwards, the participants go through a rotation of simulators. The surgical performance is assessed by calculating a score that rewards precision and speed. In the validated exercises, the calculated individual scores are compared to a previously established performance standard.[Kolkman et al., 2008] Training on the laparoscopic and hysteroscopic simulators is intensively supervised by experts in MIS. Regarding the number of participants attending the course, which varies from 32 to 36, each simulator is used by two or three residents and is supervised by one supervising expert.

In addition to the mandatory Cobra-alpha course which is mainly focused on basic skills, residents can apply to two advanced courses in MIS, a laparoscopy course and a hysteroscopy course. These courses can be attended on a voluntary basis. The advanced courses are more procedure orientated than the Cobra-alpha course. In spite of using simulators, life surgery is used for teaching purposes. Procedure specific courses can further enhance skills and knowledge, like a sacrocolpopexy course and a course regarding laparoscopic adnex surgery. Besides, a variety of (inter)national congresses focuses on MIS are organized.

The mandatory Cobra-alpha course, advanced MIS courses and congresses form the training structure in the Dutch residency curriculum, combined with simulator training in the teaching hospitals during clinical rotation.

DISCUSSION

The Dutch obstetrics and gynaecology residency curriculum has a clear structure regarding the training of MIS skills. A mandatory basic surgical skills course is established for residency training which is nationwide accepted and has a broad Dutch faculty. Intentionally, the course has to be attended during PGY 1 or PGY 2. Additionally, residents may attend advanced courses and congresses focusing on laparoscopy and hysteroscopy. This structure enhances the implementation of basic MIS skills training into the residency curriculum.

Basic MIS skills can be trained on simulators. Simulators have shown great potential for training and objectively assessing laparoscopic skills.[Lentz et al., 2001; Scott et al., 2001] The skills acquired are transferable to real operative procedures[Anastakis et al., 1999; Hyltander et

al., 2002; Seymour et al., 2002] and skills training is shown to decrease patient complications. [Cadeddu et al., 2001] For every resident there is a learning curve to achieve proficiency in performing MIS. Presumably, acquiring basic MIS skills by simulator training leads to progression along the first part of this learning curve resulting in better prepared residents for the actual surgery. After achievement of the basic skills, more attention can be paid to the specific procedure during surgery on real patients. With the growing evidence of valuable aspects of MIS simulator training, we feel there is no excuse for depriving residents of this training.

The nationwide basic surgical skills course provides an introduction in simulator training for acquiring MIS skills. However, distributed practice is superior above massed practice, which is provided during a two-day course, for actually achieving these skills.[Moulton et al., 2006; Verdaasdonk et al., 2007b] Consequently, MIS skills can only be acquired if residents continue simulator training and evaluation in their own clinic. A first precondition for this continuance of training is the presence of simulator facilities in every cluster of teaching hospitals. A second precondition is that residents really do use these facilities. The first precondition is partially met. All 46 Dutch teaching hospitals are grouped in eight clusters and simulator training is offered in at least one teaching hospital of each cluster. However, the equipment varies widely among these hospitals. The advantage of training on the simulators used during the Cobra-alpha course is that these are easily fabricated and inexpensive. Besides, the exercises for the laparoscopic box trainer have been validated and a performance standard has been established. Regarding the second precondition, unfortunately only one third of residents actually train on a simulator if training is offered on a voluntary basis.[Kolkman et al., 2005] The fact that most residents do not voluntarily train is in contradiction with the residents' opinion that simulator training is an important addition to their residency program.[Kolkman et al., 2005] Hence, formal mandatory MIS training is urgently needed in every training hospital, which has to be scheduled in the busy practice of the residency program.

In spite of structured training, proper evaluation of skills contributes to the learning effect. [Reznick et al., 1997] However, the majority of residents' surgical skills are evaluated informally and in a non-standardized fashion. There is a growing need for objective assessment tools. An example of such a tool is the Objective Structures Assessment of Technical Skills (OSATS). This evaluation method consists of a global rating scale and has proven high reliability and construct validity for simulators.[Goff et al., 2002; Reznick et al., 1997]

Regarding surgical competence, the requirements essential for certification in obstetrics and gynaecology are clearly defined in the Netherlands. These requirements are set on a total number of each procedure a resident minimally has to perform. Additionally, the number performed on competence level 4 is established. Level 4 is defined "able to perform without supervision" on a 1 to 5 global rating scale (Table 1). The target numbers for the laparoscopic and hysteroscopic procedures are expressed in Table 2.[NVOG-HOOG 2005] Although numbers of procedures are easily quantifiable, total numbers do not represent the actual competence of a resident due to individual difference in learning curves.[Park et al., 2002a] Assessing a residents surgical skills and comparing these skills to an established performance standard would be a more suitable than counting the number of procedures. In this way, the individual training demands can be met. This emphasizes on one hand the importance of objective assessment tools for evaluation of surgical skills and to set a performance standard. On the other hand

simulator training can fulfil the individual training demands, as a source of unlimited training while the training possibilities on real patients in the OR are scarcer. Ultimately, every resident should be able to achieve the predetermined level of skills at the end of residency.

Table 1. Global rating scale for level of competence.

Level	Definition
1	Has theoretical knowledge
2	Is able to perform under strict supervision
3	Is able to perform under limited supervision
4	Is able to perform without supervision
5	Is able to supervise and educate others

Table 2. Target numbers of MIS procedures required for certification

Procedure	Target number (Total)	Target number performed on competence level 4
Laparoscopic surgery		
Diagnostic laparoscopy / sterilization	50	10
Minor adhesiolysis	10	not applicable
Salpingectomy / salpingotomy (inclusive EP)	20	5
Cystectomy	10	not applicable
Hysteroscopy		
Diagnostic hysteroscopy	40	10
Resection polyps	10	5
Resection myomas type 0-I	10	not applicable
Resection myomas type II	10	not applicable

Although some adaptations have to be made to incorporate continued training and evaluation in daily practice, a uniform introduction to MIS training on simulators is guaranteed for every resident in the Netherlands by a mandatory basic skills course, while advanced courses and congresses provide possibilities for enhanced education. Hopefully, this will facilitate and accelerate the implementation of MIS techniques in the gynaecological surgical palette.