Quality assessment of laparoscopic hysterectomy

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Chapter 4

Proficiency for advanced laparoscopic procedures in gynecologic residency program: do all residents need to be trained?

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Journal of Surgical Education (J Surg Educ.) 2015 Apr; 72 (5): 942-948

Abstract

Objectives: To assess the current state of laparoscopic gynecologic surgery in the Dutch residency program, the level of competence among graduated residents, and whether they still perform these procedures. Furthermore, their current attitudes toward the implementation of minimally invasive surgery into residency training were assessed.

Design: An online survey (Canadian Task Force Classification III) regarding the level of competence, performance, training, and interest for gynecologic laparoscopic procedures.

Participants/Setting: Gynecologists who finished residency training between 2008 and 2013 in the Netherlands.

Results: Response rate was 73% (171/235). The scores for all basic and intermediate laparoscopic procedures performed immediately after residency showed the highest competence level (median 5, of scale 1-5). The competence level for advanced laparoscopic procedures was less at 3, indicating that the graduated residents are not able to perform these procedures without supervision. Overall, 56% of the gynecologists no longer perform any level 3 advanced procedures, and 86% do not perform level 4 advanced procedures. Gynecologists who still perform the inquired laparoscopic procedures scored a significantly higher competence level immediately after residency training for most of procedures compared with the gynecologists who do not perform these procedures.

Conclusion: Residents are sufficiently trained for basic and intermediate laparoscopic procedures during residency training. However, they are not sufficiently equipped to perform advanced laparoscopic procedures without supervision. We should consider training advanced procedures especially to a selected group of residents because most gynecologists do not perform these procedures after residency. The learning curve for advanced procedures continues to rise after finishing residency for those who keep on performing these procedures, therefore an additional fellowship is recommended for this group.

Introduction

In 2013, the Dutch gynecologic residency program implemented new guidelines, which also had surgical requirements [1]. Besides the quantity of performed procedures, the level of competence was introduced (Table 1). The requirements of laparoscopic procedures are mainly based on performing basic and intermediate (level 1 and 2) laparoscopic procedures without supervision, but performance of some advanced (level 3 and 4) procedures with supervision is also required (Table 1). Basic and intermediate laparoscopic procedures, according to the European Society for Gynaecological Endoscopy [2], are sufficiently taught during residency in the Netherlands [3]. However, advanced laparoscopic procedures are not formally embedded into this training program [3, 4].

The residency training program forms the basis for the gynecologist to obtain sufficient education and adequate proficiency in laparoscopic skills; however, many graduated residents do not think they are sufficiently prepared to perform all levels of laparoscopic procedures at the completion of their residency program [5-7]. Because laparoscopic approach is increasingly preferred to open surgery, there is a growing demand for an adequate and structured education program for all levels of laparoscopic procedures during residency. The latter is even more important because the Dutch Health Care Inspectorate showed concerns about patient safety regarding minimally invasive surgery (MIS) and stated a need for improved training in MIS [8]. Therefore, residency training programs are under pressure to incorporate both basic and advanced laparoscopic procedures. The question remains whether it is even necessary and required to train all residents in these more advanced procedures, as a large proportion of residents will potentially perform only basic laparoscopic procedures after residency in their daily practice.

Table 1 Dutch requirement of laparoscopic procedures during gynecological residency

Procedure	Required number	Level of competence*
Diagnostic laparoscopy	50	At least 10 on level 4
Laparoscopic adhesiolysis	10	Not specified
Salpingotomy/salpingectomy/ectopic pregnancy	20	Not specified
Cystectomy *(laparoscopic or abdominal)*	25	At least 5 on level 4
Myomectomy *(laparoscopic or abdominal)*	5	Not specified
Hysterectomy *(VH, AH or LH)*	40	Not specified

* *Level 1:* has theoretical knowledge, *level 2:* is able to perform under strict supervision, *level 3:* is able to perform under limited supervision, *level 4:* is able to perform without supervision, *level 5:* is able to supervise and educate others.
VH = vaginal hysterectomy, AH = abdominal hysterectomy, LH = laparoscopic hysterectomy.

The aim of this study is to assess the implementation of laparoscopic gynecologic surgery in daily residency training program, the level of competence among graduated residents, whether they still perform laparoscopic procedures, and at which level they currently perform these procedures. Furthermore, this study determines their current attitudes towards the implementation of MIS into residency program, to identify barriers and find practical ways to optimize the implementation of MIS into the gynecologic residency curriculum.

Materials and methods

A web-based survey (NetQ) was sent through e-mail to all gynecologists who finished residency within the previous 5 years (2008-2013) and were registered at the Dutch Society of Obstetricians and Gynecologists (NVOG). Names and e-mail addresses were obtained from the NVOG. To maximize the response rate, 3 reminder mails were sent.

The survey consisted of questions covering demographic characteristics, level of competence immediately after finishing residency, current level of competence, and whether the respondent still performs these procedures. The same questions were asked regarding abdominal and vaginal hysterectomy to compare the different surgical approaches to hysterectomy. In addition, the survey included questions about the interest of the respondents in performing the procedures and training acquired during residency. The last item of the survey was a request for possible solutions to optimize laparoscopic training during residency and was answered as free text. A 5-point Likert scale was used to measure the state of agreement and the degree of their interest: 1 (strongly disagree) to 5 (strongly agree); 1 (not interested) to 5 (very interested). Guidelines of the European Society for Gynaecological Endoscopy [2] were used to classify the requested laparoscopic procedures according to the 4 levels of difficulty- first level (*basic*): diagnostic laparoscopy and laparoscopic sterilisation; second level (*intermediate*): salpingotomy/salpingectomy/ectopic pregnancy, salpingo-oophorectomy, moderate adhesiolysis, and minimal endometriosis; third level (*advanced*): hysterectomy, myomectomy, extensive adhesiolysis, and severe endometriosis; and fourth level (*advanced*): sacrocolpopexy, lymphadenectomy, and recto-vaginal endometriosis. To indicate the level of competence, the Dutch residency curriculum uses 5 different competence levels to perform surgery, based on Miller's pyramid of clinical competence (Figure 1) [9] - *level 1:* has theoretical knowledge, *level 2:* is able to perform under strict supervision, *level 3:* is able to perform under limited supervision, *level 4:* is able to perform without supervision, and *level 5:* is able to supervise and educate others.

If the respondents did not answer every item of the questionnaire, subcalculations with different denominators were made. Teaching hospitals represent university and nonuniversity teaching hospitals.

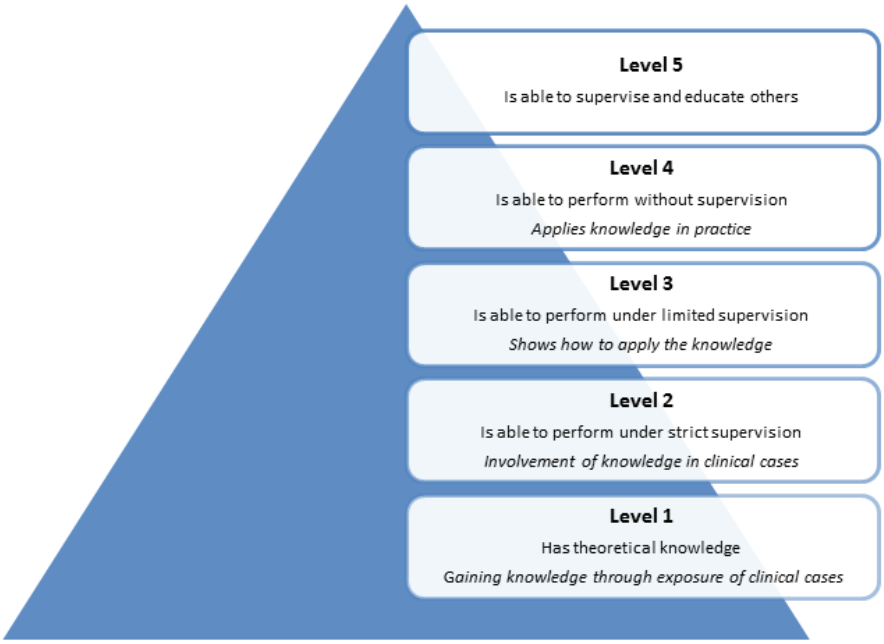

Figure 1 Competence levels used in the Dutch curriculum based on Miller's pyramid.

Subanalysis of the basic characteristics was performed for sex. Furthermore, the distribution of the different subspecialties was calculated. In addition, a subcalculation including the gynecologists who are and those who are not performing the surveyed procedures currently was performed. This subcalculation is necessary to avoid skewed data, because some respondents (e.g., subspecialists maternal-fetal medicine) do not practice any advanced laparoscopic procedures.

Data were analysed with SPSS version 20 (IBM SPSS Statistics, Chicago, IL). The *t* test and chi-square test were used to calculate the demographic differences between sexes. The paired and unpaired t tests were used to assess the difference between the levels of competence. Both mean and median levels of competence were calculated, as both provide useful information. A $p < 0.05$ was considered statistically significant.

Results

Of 235 surveyed gynecologists, 171 responded (73%). Table 2 shows the general characteristics of these participants. In total, 51 (30%) respondents were men. Most respondents worked

Table 2 Baseline characteristics of respondents

Variable	Men (n=51)	Women (n=120)	Total (n=171)	P value
Mean age *(range, median)*	38.5	38.0	38.2 *(33-49, 38)*	0.276
Currently working % *(n)*				
Non-teaching hospital	9.8 *(5)*	25.8 *(31)*	21.1 *(36)*	0.019
Teaching hospital*	90.2 *(46)*	74.2 *(89)*	78.9 *(135)*	0.019
Subspecialty % *(n)*				
General gynecology	27.5 *(14)*	25.8 *(31)*	26.3 *(45)*	0.854
Reproductive gynecology/infertility	17.6 *(9)*	19.2 *(23)*	18.7 *(32)*	0.816
Maternal-fetal medicine	41.2 *(21)*	35 *(42)*	37 *(63)*	0.444
Oncology	11.8 *(6)*	16.7 *(20)*	15.2 *(26)*	0.414
Urogynecology	17.6 *(9)*	16.7 *(20)*	17 *(29)*	0.876

* Teaching hospitals represent university and non-university teaching hospitals.

in a teaching hospital (n = 135, 78.9%), of which 51 (29.8%) worked in a university teaching hospital.

There was an equal distribution of the number of years after finishing residency between the respondents; 22% graduated less than one year ago, 24 % 1 to 2 years ago, 18% 2 to 3 years ago, 18% 3 to 4 years ago, and 18% finished their residency 4 to 5 years ago.

Level of competence

For the respondents who are still performing the procedures, the current level of competence is significantly higher for the majority of all procedures compared with their competence level immediately after residency (Table 3). Furthermore, comparing the competence level immediately after residency between performing and nonperforming gynecologists, a significantly higher competence level is observed for most of the procedures in favor of the respondents who still perform the procedures. Only basic laparoscopic procedures show similar competence levels for both groups (Table 3).

For all groups, basic and intermediate laparoscopic procedures scored a median and mean competence level between 4 and 5 (Table 3), immediately after residency as well as currently. All advanced laparoscopic procedures (level 3 and 4 procedures) were scored a competence level less than 3 after residency, indicating that the graduated residents were not able to perform these procedures under limited supervision. Furthermore, 56% of the gynecologists

Table 3 Percentage of respondents not performing the procedures currently and competence level of the respondents, divided between respondents performing and not performing the procedures currently

Procedure	Percentage of all respondent who not performing currently % (n)	Median level of competence [a] of respondents performing the procedure currently		P value	Median level of competence [a] of respondents not performing the procedure currently	P value [c]
		Immediately after residency *(mean, SD)*	Now *(mean, SD)*		Immediately after residency *(mean, SD)*	
Vaginal hysterectomy	43 (67)	4 *(4.41, 0.64)*	5 *(4.71, 0.53)*	<0.01	4 *(3.95, 0.81)*	<0.01
Abdominal hysterectomy	23 (35)	5 *(4.54, 0.63)*	5 *(4.81, 0.44)*	<0.01	4 *(4.12, 0.77)*	<0.01
First level laparoscopy *(basic)* [b]						
Diagnostic laparoscopy	17 (26)	5 *(4.85, 0.38)*	5 *(4.91, 0.28)*	0.05	5 *(4.77, 0.51)*	0.42
Laparoscopic sterilisation	30 (45)	5 *(4.83, 0.43)*	5 *(4.86, 0.52)*	0.22	5 *(4.84, 0.43)*	0.94
Second level laparoscopy *(intermediate)*						
Salpingotomy/salpingectomy/EP	16 (25)	5 *(4.60, 0.60)*	5 *(4.81, 0.45)*	<0.01	4 *(4.13, 0.74)*	<0.01
Salpingo-oophorectomy	23 (35)	5 *(4.62, 0.57)*	5 *(4.82, 0.41)*	<0.01	4 *(4.18, 0.76)*	<0.01
Moderated adhesiolysis	44 (66)	5 *(4.54, 0.66)*	5 *(4.79, 0.47)*	<0.01	4 *(4.18, 0.95)*	<0.01
Minimal/mild endometriosis	42 (64)	5 *(4.49, 0.65)*	5 *(4.81, 0.45)*	<0.01	4 *(3.85, 1.04)*	<0.01

Table 3 continues on next page

Table 3 *Continued*

Procedure	Percentage of all respondent who not performing currently % (n)	Median level of competence [a] of respondents performing the procedure currently		P value	Median level of competence [a] of respondents not performing the procedure currently	P value [c]
		Immediately after residency *(mean, SD)*	Now *(mean, SD)*		Immediately after residency *(mean, SD)*	
Third level laparoscopy *(advanced)*						
Laparoscopic hysterectomy	63 (97)	3 *(2.88, 0.99)*	4 *(4.06, 1.03)*	<0.01	2 *(2.31, 0.83)*	<0.01
Myomectomy	88 (133)	2 *(2.28, 0.90)*	3 *(3.00, 1.28)*	0.02	2 *(2.02, 0.82)*	0.21
Extensive adhesiolysis	77 (115)	2 *(2.67, 1.14)*	4 *(3.78, 0.94)*	<0.01	2 *(2.04, 0.79)*	<0.01
Severe endometriosis	88 (133)	2 *(2.39, 1.38)*	3 *(3.22, 1.35)*	<0.01	2 *(1.90, 0.74)*	0.02
Fourth level laparoscopy *(advanced)*						
Sacrocolpopexy	95 (145)	1 *(1.86, 1.22)*	2 *(2.29, 1.5)*	0.08	1 *(1.39, 0.65)*	0.08
Lymphadenectomy	94 (144)	2 *(2.11, 0.93)*	3 *(3.33, 1.12)*	0.04	1 *(1.28, 0.53)*	<0.01
Recto-vaginal endometriosis	96 (145)	2 *(2.00, 1.23)*	1 *(2.20, 1.64)*	0.66	1 *(1.31, 0.55)*	0.01

[a] Levels of competence: *Level 1:* has theoretical knowledge, *level 2:* is able to perform under strict supervision, *level 3:* is able to perform under limited supervision, *level 4:* is able to perform without supervision, *level 5:* is able to supervise and educate others.
[b] Classification of laparoscopic procedures according to the ESGE (European Society of Gynaecological Endoscopy).
[c] P value of level of competence directly after residency between respondents performing the procedures and respondents not performing the procedures currently.
EP = ectopic pregnancy.

no longer perform any level 3 procedure currently, and depending on the type of procedure, the response varied between 63 and 88% (Table 3). For level 4 procedures, the response was 86%, and depending on the type of procedures, it varied between 94 and 96% (Table 3).

Hysterectomy

A subcalculation including all respondents showed that performance of the vaginal hysterectomy scored a median level of competence of 4 (mean = 4.2) immediately after residency, which is significantly lower ($p < 0.001$) compared with abdominal hysterectomy (median = 5, mean = 4.4). The laparoscopic approach scored the lowest level of competence (median = 2, mean = 2.5, $p < 0.001$). On a Likert scale, the respondents are significantly less interested in performing a vaginal hysterectomy compared with performing an abdominal approach (mean = 3.7 vs. 4.2, $p < 0.001$).

Interest of respondents

Overall, 82% and 88% of the respondents are interested (Likert scale 4 and 5) in performing level 1 and level 2 laparoscopic procedures (basic and intermediate), respectively. For level 3 and 4 procedures, 58% and 39%, respectively, are interested in performing these advanced procedures.

Overall, 65% of the participants is satisfied (Likert scale 4 and 5) with their current laparoscopic skills, and all participants agreed that they were adequately trained to perform basic procedures during residency. However, for laparoscopic procedures levels 2, 3 and 4 this is 91%, 26% and 6.4 %, respectively.

Possible solutions

All respondents were asked to consider a solution to optimize laparoscopic training during residency. Table 4 shows the mentioned solutions. The 3 most mentioned solutions were more mandatory simulation training (66%), early differentiation during residency (19%), and a more structured laparoscopic curriculum (16%).

Table 4 Possible solutions mentioned by the respondents to optimize laparoscopic training during residency

Mentioned solution	Percentage of respondents %
More mandatory simulation training, including competition elements and a compulsory exam	66
Early differentiation during residency	19
A more structured laparoscopic curriculum with guidelines and protocols	16
More and sooner full responsibility for residents during surgical procedures	13
Surgical educators need more education and laparoscopic skills training in order to train their residents sufficiently	8
More scheduled operation time during residency	7

The requested possible solutions were not a mandatory item in the questionnaire and were answered as free text. Only the solutions that were mentioned by >5% of the respondents were included.

Discussion

The main findings of this study show that basic and intermediate laparoscopic surgical procedures are sufficiently taught and adequately implemented in the Dutch gynecologic residency program. However, the training and implementation of advanced procedures into the current residency program is not fully embedded. Furthermore, at the end of residency program, a significant higher competence level was found for those who keep on perform laparoscopic procedures compared with those who do not. A considerable number of gynecologists do not perform any level 3 or 4 laparoscopic procedures currently. Moreover, the respondents who keep on performing these procedures after residency are not able to do them without direct supervision, and their learning curve for advanced procedures continues to rise after finishing residency.

The scores for all basic and intermediate procedures represented the highest level of competence immediately after residency. This was already observed in 2003 [3], although the level of competence in the current study is even slightly higher. We therefore conclude that the implementation has been optimized during the past decade. The low competence level for advanced laparoscopic procedures is also observed in the United States and Spain [4, 5, 10, 11]. Einarsson et al. suggested the need to improve training for these advanced procedures. We consider that this is not feasible currently, and we plead for selection of certain residents to train them in these advanced laparoscopic procedures during residency, as most gynecologists will not even perform advanced laparoscopic procedures during their further career (Table 3). In addition, training programs are under pressure as work-hour

restrictions have affected the resident's case experience and a growing emphasis is placed on subspecialties [12-14]. At the same time, more complex surgical possibilities in MIS have emerged, and there is an increasing demand to measure quality and skills of residents and gynecologists [15]. In this context, we state that only to a selected group of residents who wish to specialize in the field of gynaecologic surgery should perform and be exposed to advanced procedures, and preliminary selection during residency could be an appropriate solution. To underline this idea, we found that 19% of the inquired gynecologists spontaneously gave the same solution and assume that early differentiation could be a realistic option to "optimize the implementation of MIS into residency". Consequently, this will increase the laparoscopic exposure to this selected group in daily practice [16, 17].

The question remains, however, how and when do we select these residents? First, we observed that 42% and 61% of the respondents are not interested in performing level 3 and level 4 procedures, respectively. Probably, based on their interests, we can already exclude a reasonable high number of residents. However, a remark has to be made. Because we surveyed postgraduates and not the residents themselves, this statement might be relative and, for example, their loss of interest could have occurred because of lack of training. Secondly, a significantly lower level of competence was observed immediately after residency for gynecologists who do not perform these procedures currently, compared with the gynecologists who do perform these procedures nowadays (Table 3). Therefore, on theoretical grounds, an early selection can be made during residency, as this variation of competence can be observed during surgical training by using Objective Structured Assessment of Technical Skills (OSATS). However, the use of OSATS alone will not be completely sufficient as there are some concerns about the objectivity of this tool [18, 19]. Furthermore, it should be emphasized that minimal knowledge of advanced laparoscopic procedures is still required for all residents.

Another possible solution for better laparoscopic training during residency is more mandatory simulation training as mentioned by two-third of respondents. This solution is already implemented, and all Dutch residents need to attend and succeed a mandatory basic surgical course, including laparoscopic training and examination. Furthermore, in 2013, 90% of the Dutch residents had free access to a skills laboratory in their clinic; whereas in 2003, this was only 35% [3, 20].

The strength of our study is the high response rate of our survey of 73%, which is higher than comparable published studies [6, 11]. Moreover, there is an equal distribution between the respondents in years after residency and subspecialties. Both suggest that our results demonstrate an accurate representation of the Dutch residency program. A potential weakness is that we asked competence levels in retrospect. As competence levels are self-rated and therefore subjective, this could make these data less reliable.

We observed that the learning curve of gynecologists who currently perform level 3 and 4 laparoscopic procedures continues to rise after residency and that they are not able to perform these procedures without supervision (Table 3). Therefore, additional training after residency, for example, a fellowship, is highly recommended for this group of gynecologist.

Since the implementation of the new guidelines for the Dutch gynecologic residency program in 2013, the residents are already challenged to choose a subspecialty after 4 years to practice this subspecialty during the last 2 years of the total residency training program of 6 years [21]. With these new guidelines, residents will be trained more extensively in their field of interest and subsequently finish residency at a higher competence level in this field.

A remarkable observation in our study is the lower competence level and the lower interest in performing the vaginal hysterectomy compared with abdominal approach. Miskry et al. observed similar results in the UK [22]. Because the vaginal approach remains the surgical method of choice for hysterectomy, this is a matter of concern [23]. In addition, recent research showed an undesirable decrease of the vaginal approach in the Netherlands (from 36% in 2007 to 25% in 2012) [24]. Therefore, the vaginal approach should be trained extensively during residency, and we have to ensure that this approach of hysterectomy will not disappear from the gynecological surgical palette [25].

Conclusion

Residents are sufficiently trained to perform basic and intermediate laparoscopic procedures (level 1 and 2) after residency training. For advanced procedures (level 3 and 4), residents are not sufficiently equipped to perform these procedures without direct supervision. Therefore, it is obvious that the learning curve for advanced procedures continues to rise after finishing residency. Additional training or a fellowship after residency to perform these procedures independently is recommended. Moreover, these advanced laparoscopic procedures should especially be taught to a selected group of residents, because most gynecologists will never perform these procedures after residency. This will also reduce the problem of the limited caseload of advanced procedures in residency program. An important area for future research will be the further development of selection tools and determination of how to identify residents who should or should not pursue advanced laparoscopic training.

Acknowledgment

We thank all gynecologists who filled out the survey for their cooperation and dr. E.W. van Zwet, associate professor medical statistics, for his statistical advice.

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