RESEARCH ARTICLE

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Perception of Teaching and Assessing Surgical Proficiency of Veterinary Surgery Postgraduate Programs in Turkey: Suggestions on Prospective Veterinary Surgery Specialist Training

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Abstract

Veterinary specialist needs in Turkey have been provided by postgraduate education for decades. However, the official decision of a separate veterinary specialty program has been approved, and arrangements are ongoing. This study aimed to investigate the perception of supervisors (SPV) and postgraduate students (PGS) of teaching and assessing methods of veterinary surgery postgraduate programs in Turkey as well as to make suggestions on prospective veterinary surgery specialist training. Demographic information, roles in surgical procedures, teaching and assessment methods, satisfaction, predicted outcomes, and future directions were examined. The responses were analyzed statistically by intergroup and in-group comparisons. The number and rate of surveys completed were 72 (53%) for PGS and 46 (46%) for SPV. The most studied areas were orthopedics (PGS 30.3%; SPV 25.8%) and soft tissue surgery (PGS 26.9%; SPV 24.2%). The consistency and differences in the perceptions of SPV and PGS were examined with responses to surveys on teaching and assessment methods. The results revealed that although the teaching and assessment methods applied in veterinary surgery postgraduate programs of various institutions are generally consistent, they do differ in detail. This highlights the need for a nationwide practice whose standards are specifically determined by an authorized committee to gain knowledge and skills in the field of veterinary surgery.

Keywords: Clinical science, graduate education, surgery, orthopedics, veterinary teaching hospital.

INTRODUCTION

Veterinary medicine is a profession wherein it is important to specialize as in other medical branches. In many countries, veterinary specialties are defined by authorized institutions, whereas the conditions for admission and completing specialist training have been standardized. In this regard, veterinary specialist training in the United States of America (USA) and European Union (EU) countries are accomplished examples (Auer, 2011; Johnson and Johnson, 2010; Pettit, 1990). The first veterinary specialist training program in the USA started in 1973, and in Europe in 1991 (Auer, 2011; Pettit, 1990). Today, 27 different specialties have been defined in *The European Board of Veterinary Specialization* (EBVS®) and 30 in the American Board of Veterinary Specialties (AVMA, 2021; EBVS, 2021).

The official decision of the veterinary specialist training program in Turkey was approved in 2018 but implementation is yet to be revealed (Gıda, Tarım ve Hayvancılık Bakanlığı, Resmi Gazete, 2018). According to this decision, the veterinary specialty training program will include 26 different branches. The current practice continues in the form of those who want to specialize in veterinary medicine to receive a postgraduate (master's or doctorate) education in the relevant department. Similarly, the *American College of Veterinary Surgeons (ACVS)* and the *European College of Veterinary Surgeons (ECVS)* have defined the veterinary surgery specialist training program as "allowing a graduate veterinarian to acquire in-depth knowledge of veterinary surgery and its supporting disciplines under the supervision and guidance." (ACVS, 2021; ECVS, 2021).

The differences between veterinary surgery postgraduate education and specialist training in practice and powers show that they belong to separate categories. As the veterinary specialist training program is about to begin, these differences are not yet well-defined. Among the specialties in veterinary medicine, surgery is a challenging area considering the technical competence in practice (Kim et al., 2015).

During the veterinary surgery specialist training program, it is necessary to provide sufficient resources and to gain technical competence for many complex surgical procedures. Veterinary surgery specialist training programs are usually established on an apprenticeship basis (Peyre and Ashley, 2011). The master-apprentice

relationship entails working together and learning by direct interaction in a sufficient number of surgical cases. Presentations, books, articles, wet lab, and models (real or virtual) are used as resources. Practices such as observing and assisting, intraoperative guidance by the supervisor are generally used in teaching technical skills (Gearhart et al., 2012; Kim et al., 2015).

Neither the effective implementation of veterinary specialist training nor specific designated national teaching and assessment criteria for postgraduate programs in veterinary sciences in Turkey is required to be an establishing criteria for PGS. The objective is to bring the PGS to the best technical competence in the initiative of the guidelines of the institutes and the relevant SPV. The questions of whether there may be differences in the perceptions of supervisors and postgraduate students within themselves or based on the experience level, and what are the issues that need to be improved in the training programs stand out as study hypotheses. Additionally, what are the perceived strengths, weaknesses, factors that enhance, inhibit or limit the current veterinary surgery postgraduate programs in Turkey? Finally, what could be better for prospective veterinary specialist training? Therefore, this study aimed to reveal the perceptions of SPV and PGS for teaching and assessing the surgical proficiency of veterinary surgery postgraduate programs in Turkey, and to make scientific suggestions for prospective veterinary surgery specialist training programs, according to the results.

MATERIALS AND METHODS

Data Collection and Evaluation:

A survey for SPV, and a survey for PGS were developed. Two questionnaires were prepared in accordance with the ongoing veterinary surgery postgraduate programs of Turkey, modified by studies (Kim et al., 2015) conducted in the USA. The anonymity of participants was preserved. An internet survey tool (Google Forms) was used to collect responses for analysis. The questionnaires were pilot-tested among three faculty SPV and five PGS (four PhD, one MSc) at our institution, and one faculty SPV from another institution. PGS (MSc/PhD) that were included in the study had been trained at least for two semesters or completed their thesis in the last three years in the field of veterinary surgery. The contact information of SPV and PGS was not available as a list, and email addresses were obtained by public access such as university websites or institutional databases. Responses from SPV that did not supervise for at least two years were excluded. All SPV and PGS were emailed a cover letter with a link that provided access to the online survey. The cover letter explained the purpose of the survey. Email messages were sent out twice in the first two months and potential participants were given time (three months) to complete the questionnaire.

The survey contained a series of questions to collect demographic data including year of training (for MSc/PhD students), length of time as a supervisor (for SPV), the number of cases encountered (weekly average), the most practiced animal species groups, and areas. Thereafter, the frequency with which various teaching and assessment tools and methods used were surveyed with a 4-point scale, ranging from never (0) to often (4). Participants were also asked to rank the three most effective forms of surgical skills training. The surveys included a question to estimate the percentage of time (yearly) the postgraduate student was observing and assisting the primary surgeon with direct intraoperative guidance and without direct intraoperative guidance in surgical procedures. Participants were asked to estimate the frequency of discussions between the PGS and SPV regarding cases and surgical procedures. The type of follow-up of the PGS's performance evaluation (instant interviews, appointments and detailed interviews, written general feedback, detailed written feedback) were collected. In addition, it was asked which criteria (practical exam, oral exam, written exam, multiple-choice exam, assignment) were used in the evaluation and assessment of the training. The information of how many scientific publications were made annually was also sought. Effectiveness and objectiveness of assessment methods, availability and use of various equipment and devices for surgical procedures, and predicted ability to obtain adequate proficiency by the end of the postgraduate program were measured using a 5-point Likert scale.(Joshi et al., 2015)

Almost same surveys were performed to both the SPV and PGS, but the questions were phrased according to the perspective of the participant. For example, the question to SPV ‘To what extent do you foresee your PGS will be competent to perform surgical procedures as a specialist?’ was rephrased for PGS as ‘To what extent do you feel you will be competent to perform surgical procedures as a specialist?’ The survey was prepared to generate responses based on the whole postgraduate program experience rather than an individual SPV. Where considered appropriate, a free-text comment section was provided below the choices of a question, allowing the participant to write a response that was not given in the multiple-choice format.

Statistical Analysis

Data were reported as frequency (percentage) per response option or mean of participants for quantitative data. Participants were divided into subgroups by experience level as PGS (≤2, 3, and ≥4 years) and SPV (<9 and ≥9 years), and responses were analyzed. The results of the survey were compared separately between groups of SPV, groups of PGS, SPV, and PGS with the Chi-square test. Independent t-tests were used for comparisons of quantitative data in the group of SPV, and between SPV and PGS groups. In groups of PGS, One Way ANOVA was used to compare quantitative data. For all statistical analyses, $p<0.05$ was considered significant. All statistical analyses were performed by using SPSS (V23.0; SPSS Inc., Chicago, IL, USA).

RESULTS

Demographics

The surveys were sent to 137 veterinary surgical PGS (MSc/Ph.D.) and 101 veterinary surgery postgraduate training SPV. The number and rate of surveys completed were 72 (53%) for PGS and 46 (46%) for SPV. The rates of participants of PGS according to groups were determined as ≤2 years (39%), 3 years (23%), and ≥4 years (38%). The SPV groups were <9 years (41.3%) and ≥9 years (58.7%), between 2-26 years (mean 11.48, SDM 6.76, median 10). The most studied animal species groups were determined as pets (SPV 49%; PGS 60%) and farm animals (SPV 27%; PGS 27%) (Figure 1). The most preferred fields of study were orthopedics (SPV 26%; PGS 30%) and soft tissue surgery (SPV 24%; PGS 27%) (Figure 2). No statistically significant difference was found between the SPV and PGS ($p = 0.863$) in terms of the number of cases encountered weekly (Figure 3).

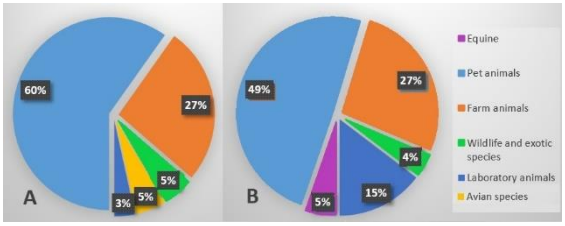

Figure 1. Distribution of the most practiced animal species groups in postgraduate training (A: PGS, B: SPV).

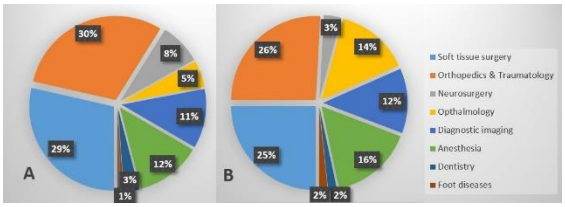

Figure 2. The most practiced fields in veterinary surgery (A: PGS, B: SPV).

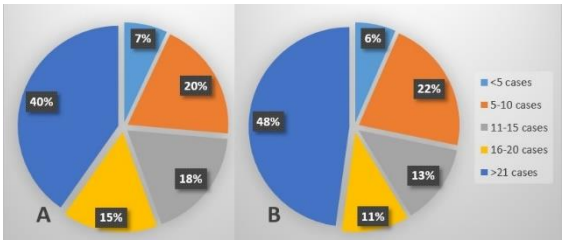

Figure 3. The number of cases encountered weekly (A: PGS, B: SPV).

Role in Surgery

According to the responses of SPV and PGS, the estimated amount of time spent by PGS in surgical roles during their training is presented in table 1. In comparing the responses of SPV and PGS, in terms of surgical roles, 'observing' created a higher average by SPV, and 'Primary surgeon with intraoperative guidance' generated a statistically significant difference with a higher average by PGS (Table 1). There was no statistically significant difference between the responses of the SPV with <9 years and those with ≥ 9 years of experience (p = 0.962). The responses of both SPV groups show that PGS was mostly involved in surgery with assisting (mean 36.9% in <9 years SPV and 33.3% in ≥9 years SPV). Among the PGS responses, the rates of 'primary surgeon without intraoperative guidance' were found to be significantly higher in those ≥ 4 years than the ≤ 2 and 3 years groups (p = 0.038), but no significant difference was observed in other roles (Table 1).

Table 1. Postgraduate student's role in surgical procedures (%).

Group	Observing	Assisting	Primary surgeon with intraoperative guidance	Primary surgeon without intraoperative guidance
SPV	19.5	35.2	24.9	19.6
PGS	14.2	34.4	25.4	26.7
p	0.009	0.518	0.987	0.068

With regard to the question about verbal discussion before or after surgery to make a technical evaluation of the surgical procedure in cases, PGS answers showed that a detailed discussion was made in 40.8%, a short discussion was made in 36.3%, and no discussion was made in 23% of cases. In the SPV responses, these rates were observed at the levels of 49.9%, 36.1%, and 14%, respectively. No statistically significant difference was found in the in-group comparison of both SPV and PGS responses. In comparing the responses of the SPV and PGS, the rates of detailed case discussion were significantly higher in SPV than the PGS answers (p = 0.029). The summary of the responses of the SPV and PGS to the case discussion rates evaluating the procedure technically before or after surgery is presented in Table 2.

Table 2. Discussion of cases before/after surgery

	Group	Mean	Median (Min-Max)	p
No discussion	SPV	14	10 (0-60)	0.116
	PGS	23	18.2 (0-90)	
Short discussion	SPV	36.1	36.6 (10-70)	0.798
	PGS	36.3	33.3 (0-80)	
Detailed discussion	SPV	49.9	50 (20-90)	0.029
	PGS	40.8	40 (0-100)	

Teaching Techniques

The SPV and PGS responses about the frequency of the use of certain teaching techniques and tools are presented in Table 3. In comparing SPV and PGS responses, significant differences were found in didactic lectures, direct intraoperative instruction, discussing the cases, and external course options (p < 0.001). In-group comparisons of SPV and PGS groups meanwhile revealed no significant difference.

According to PGS, the three most effective training methods are observing and assisting (86.1%), being a primary surgeon with intraoperative guidance (50%) and being a primary surgeon without intraoperative guidance (44.4%). In the opinion of SPV for the same question, the ranking was observing and assisting (82.6%), being a primary surgeon without intraoperative guidance (73.9%), and discussing cases (52.2%). The full ranking is presented in Table 4.

Assessment Techniques

The most frequently used methods for PGS performance assessment were instant interviews (SPV 95.7%; PGS 84.7%) and detailed interviews with appointments (SPV 65.2%; PGS 37.5%) in both SPV and PGS responses. The entire ranking is presented in Table 5. In terms of the question of which method they used the most for assessment and evaluation, the first three of the SPV answers were oral exam (79.1%), practical exam (69.6%), and assignment (63%). PGS stated that they mostly evaluated by assignment (62.5%), oral exam (43.1%), and practical exam (34.7%) in their answers to the same question. All of the rates of assessment and evaluation usage frequencies according to the responses of the SPV and PGS are given in table 6.

Table 3. Frequency of use of teaching and assessment methods/tools in veterinary surgery

	Responses	SPV	PGS
Didactic lectures	**Never**	1 (2.2 %)	15 (20.8 %)
	Infrequently	10 (21.7 %)	31 (43.1 %)
	Occasionally	17 (37 %)	19 (26.4 %)
	Frequently	18 (39.1 %)	7 (9.7 %)
p		<0.001	
Observing & Assisting	**Never**	-	-
	Infrequently	1 (2.2 %)	3 (4.2 %)
	Occasionally	12 (26.1 %)	12 (16.7 %)
	Frequently	33 (71.7 %)	57 (79.2 %)
p		0.416	
Primary surgeon with intraoperative guidance	**Never**	0 (0 %)	5 (6.9 %)
	Infrequently	2 (4.3 %)	16 (22.2 %)
	Occasionally	14 (30.4 %)	27 (37.5 %)
	Frequently	30 (65.2 %)	24 (33.3 %)
p		0.001	
Primary surgeon without intraoperative guidance	**Never**	1 (2.2 %)	7 (9.7 %)
	Infrequently	14 (30.4 %)	18 (25 %)
	Occasionally	21 (45.7 %)	24 (33.3 %)
	Frequently	10 (21.7 %)	23 (31.9 %)
p		0.185	
Case discussions	**Never**	0 (0 %)	7 (9.7 %)
	Infrequently	0 (0 %)	19 (26.4 %)
	Occasionally	14 (30.4 %)	22 (30.6 %)
	Frequently	32 (69.6 %)	24 (33.3 %)
p		<0.001	
Laboratory work (Wet lab)	**Never**	16 (34.8 %)	40 (55.6 %)
	Infrequently	20 (43.5 %)	18 (25 %)
	Occasionally	7 (15.2 %)	10 (13.9 %)
	Frequently	3 (6.5 %)	4 (5.6 %)
p		0.132	
External courses	**Never**	2 (4.3 %)	26 (36.1 %)
	Infrequently	22 (47.8 %)	30 (41.7 %)
	Occasionally	12 (26.1 %)	12 (16.7 %)
	Frequently	10 (21.7 %)	4 (5.6 %)
p		<0.001	
Virtual surgery	**Never**	34 (73.9 %)	55 (76.4 %)
	Infrequently	5 (10.9 %)	9 (12.5 %)
	Occasionally	6 (13 %)	5 (6.9 %)
	Frequently	1 (2.2 %)	3 (4.2 %)
p		0.674	

Table 4. The most effective methods to improve surgical skills

Group	The most effective methods	Percent (%)
SPV	Didactic lectures	34.8
	Observing & Assisting	82.6
	Primary surgeon with intraoperative guidance	73.9
	Primary surgeon without intraoperative guidance	32.6
	Case discussions	52.2
	Laboratory (wet) work	6.5
	External courses	10.9
	Virtual surgery	2.2
PGS	Didactic lectures	22.2
	Observing & Assisting	86.1
	Primary surgeon with intraoperative guidance	50.0
	Primary surgeon without intraoperative guidance	44.4
	Case discussions	25.0
	Laboratory (wet) work	11.1
	External courses	19.4
	Virtual surgery	23.6

Assessment Techniques

The most frequently used methods for PGS performance assessment were instant interviews (SPV 95.7%; PGS 84.7%) and detailed interviews with appointments (SPV 65.2%; PGS 37.5%) in both SPV and PGS responses. The entire ranking is presented in Table 5. In terms of the question of which method they used the most for assessment and evaluation, the first three of the SPV answers were oral exam (79.1%), practical exam (69.6%), and assignment (63%). PGS stated that they mostly evaluated by assignment (62.5%), oral exam (43.1%), and practical exam (34.7%) in their answers to the same question. All of the rates of assessment and evaluation usage frequencies according to the responses of the SPV and PGS are given in Table 6.

Table 5. Percentage (%) of responses to frequency of methods to assess technical skills

Group	Methods to Assess Technical Skills	Percent (%)
SPV	Instant interviews	95.7
	Detailed interviews with appointments	65.2
	Written general feedback	15.2
	Detailed written feedback	17.4
PGS	Instant interviews	87.5
	Detailed interviews with appointments	37.5
	Written general feedback	5.6
	Detailed written feedback	4.2

Table 6. Usage rates of evaluation and assessment criteria applied to postgraduate students

Group	Evaluation and Assessment Criteria	Percent (%)
SPV	Oral exam	79.1
	Written exam	32.6
	Multiple-choice exam	6.5
	Practical exam	69.8
	Assignment	63.0
PGS	Oral exam	43.1
	Written exam	23.6
	Multiple-choice exam	1.4
	Practical exam	34.7
	Assignment	62.5

Satisfaction, Predicted Outcomes, and Future Direction

In the responses of SPV and PGS, a significant difference was found in terms of the average number of publications (Table 7). While 10.9% of SPV stated that they were not co-author(s) of any scientific publications with PGS, this rate was 34.7% in PGS responses ($p = 0.029$). In-group comparisons of SPV revealed no significant difference in evaluating the answers to the questions of how effective

and objective were the methods of evaluating the knowledge and skills of PGS, the adequacy of tools/equipment, and the extent to which PGS will be proficient in surgical procedures after postgraduate education. In PGS in-group comparisons, no significant difference was found in the answers to the questions of how effective were the methods of evaluating the knowledge and skills, the adequacy of tools/equipment, and the extent to which PGS will be sufficient in surgical procedures after postgraduate education. However, ≤ 2-year PGS scores were significantly higher than 3 and ≥ 4 years for the objectivity of SPV (p = 0.036). In the comparison of SPV and PGS, the scores given to the questions of the adequacy of tools and equipment, and effectiveness/objectivity of the methods of evaluating the knowledge and skills were significantly lower in PGS responses. No significant difference was observed only in answers to the question of "to what extent PGS will be proficient in surgical procedures after postgraduate education." The summary of these answers is given in Table 8. Finally, freely written suggestions and comments about the postgraduate program are presented in Table 9 with the numbers of repetitions.

Table 7. The average number of publications per year based on responses.

Group		No publication	1 Publication in 3-5 years	1 Publication in 2 years	1 Publication yearly	2 Publications yearly or more	Total
SPV	N	5	11	13	15	2	46
	%	10.9	23.9	28.3	32.6	4.3	100
PGS	N	25	11	17	13	6	72
	%	34.7	15.3	23.6	18.1	8.3	100

Table 8. Summary of the scoring in the answers to the questions of effectiveness, objectivity, equipment adequacy, and surgical competency expectation after training in postgraduate education assessment and evaluation methods.

	Group	Mean	Std Deviation	Median	Min	Max	p
How effective are assessment and evaluation methods?	SPV	3.9	0.8	4	2	5	0.003
	PGS	3.3	1.1	3	1	5	
How objective are assessment and evaluation methods?	SPV	3.5	0.9	4	1	5	0.023
	PGS	3.1	1.1	3	1	5	
How adequate are the tools and equipment?	SPV	3.5	0.7	4	1	5	0.021
	PGS	3.1	1.1	3	1	5	
How competent is expected in surgical skills after training	SPV	4	0.7	4	3	5	0.062
	PGS	3.7	0.8	4	1	5	

Table 9. Recommendations of SPV and PGS for improving veterinary surgery postgraduate education (Listed by repeat count, high to low).

Supervisors	Postgraduate Students
1. Increasing the applications carried out with supervisors (10) 2. Development of wet labs, animal model, cadaveric and virtual surgery application opportunities (8) 3. Uncompromising continuity (7) 4. External courses should be encouraged (6) 5. Opportunity to work with scholarships. credits or staff in postgraduate education should be provided (5) 6. The supervisor's individual attention should continue (4) 7. Study subject and supervisor should be focused, other tasks should be reduced (3) 8. PGS should be involved in scientific studies/projects (3) 9. Infrastructure and equipment should be improved (3) 10. Research funds should be increased (3) 11. Should receive training such as methodology and personal development (3) 12. Conducting didactic lectures regularly and fully (2) 13. Cooperation and student exchange should be made between domestic/foreign universities (2) 14. Foreign language level should be increased (2) 15. Should be specialized in certain branches (1) 16. Training should be done in practice farms (1)	1. Increasing the applications carried out with supervisors (19) 2. Weekly case discussions and scientific seminar/presentation hours should be made (10) 3. Conducting didactic lectures regularly and fully (10) 4. External courses should be encouraged (10) 5. Supervisor's interest. competence. dedication. control (9) 6. Infrastructure and equipment should be improved (7) 7. Development of wet labs. animal model. cadaveric and virtual surgery application opportunities (5) 8. Study subject and supervisor should be focused. other tasks should be reduced (5) 9. Opportunity to work with scholarships. credits or staff in postgraduate education should be provided (3) 10. Practical exams should be increased (2) 11. Should be specialized in certain branches (2) 12. It should be a process that is more objective. has implementation schedules in which tasks are determined in writing and concrete evaluations are made (2) 13. Scientific studies and publications. pieces of training of methodology and writing should be encouraged (1)

DISCUSSION AND CONCLUSION

Concerns about the efficiency of technical skills training in surgical specialist programs in human and veterinary medicine have led to the investigation of teaching strategies in this area in many countries (Jelovsek et al., 2010; Kim et al., 2015; Lodge and Grantcharov, 2011; Maurin et al., 2018; Memon et al., 2010; Moulton et al., 2006; Sanfey et al., 2010; Van Hove et al., 2010). In this context, studies conducted in the USA and EU countries evaluate practices in veterinary surgery specialist training programs and university hospitals (Hubbell, 2008; Kim et al., 2015).

They discuss the techniques, methods, and strategies that need to be developed, changed, and improved, also providing scientific publications and recommendations accordingly. As a remarkable statement, a study conducted in the USA suggested that veterinary teaching hospitals of universities must change to maintain their viability (Hubbell, 2008). In a study examining the veterinary postgraduate programs, surgery (36%) was reported to be the most preferred branch of clinical sciences in Turkey (Başağaç Gül et al., 2010). Despite this, no scientific studies have investigated the teaching and assessment techniques used in veterinary surgical postgraduate training in Turkey. In this research, teaching and assessment methods used in veterinary surgery postgraduate education in Turkey and the perceptions of supervisors and postgraduate students based on the experience during the aforementioned training were addressed. With the interpretation of results, recommendations for the development of veterinary surgery postgraduate education and more qualified planning of future veterinary specialty training programs were presented from a scientific perspective.

The surveys did not seek personnel information, as it was aimed to get responses without biases or hesitations. Although it was predicted that including retrospective questions might cause an individual margin of error in the answers, it was thought that this would not lead to significant changes in the results. In this respect, the method adopted by the current study is consistent with similar scientific studies in different countries (Au Yong et al., 2019; Kim et al., 2015; Schneider et al., 2007). Inconsistencies in responses of SPV and PGS are thought to be caused by varied perceptions and interpretations (Kim et al., 2015). One of the main contributions of this study is to reveal this difference in perceptions. It was not possible to make regional comparisons in the evaluations because the information was obtained anonymously. This however, was not seen as a disadvantage, as study aimed to provide a nationwide assessment. The inconsistencies of in-group comparisons are thought to be due to the presence of participants with different levels of practices and perception differences. Although the surveys were filled out voluntarily, all consultants and postgraduate students in this field could not possibly fill in, as sufficient survey participation was achieved to reveal a certain level of data in different studies (Au Yong et al., 2019; Kim et al., 2015).

The comparison of SPV and PGS responses revealed consistency in terms of demographic data such as animal species groups studied, study areas, and the number of cases encountered (Figure 1-3). This may be an indicator that the reliability of the questionnaire responses increases, although it cannot be stated with any certainty. However, the balanced distribution of the subgroups formed according to the experience level within the SPV and PGS groups certainly makes the comparisons more meaningful. Halsted's apprenticeship-based method is generally applied in surgical postgraduate training. Most surgeons who get competent in this manner claim to be highly skilled in both their surgical practice and teaching (Peyre and Ashley, 2011). Nevertheless, due to the complexity of surgical procedures and current developments, many issues need to be discussed in terms of approach to learning and teaching surgical skills. It is also notable that most veterinary surgery educators do not have pedagogical training and do not have a certain format in teaching methods (Lane and Strand, 2008; Shires, 2003). It is discussed whether the human and veterinary surgery postgraduate or specialty training that is conducted over the master-apprentice relationship are ideal (Peyre and Ashley, 2011; Picarella et al., 2011; Schneider et al., 2007). Apprenticeship-based applications are in progress throughout the world as well as in Turkey.

Veterinary surgery specialty programs in the USA and EU countries are based on the apprenticeship model but with some features, they are distinct from the postgraduate education in Turkey. The most important differences are that postgraduate education and specialty programs are separated, which are linked to certain objective standards. Additionally, postgraduate education is focused on scientific research, whereas specialty training is focused on surgical competence. In Turkey, the veterinary specialty is in their postgraduate programs, and a separate veterinary surgery specialist program has not yet come into force. Standards have been set for the completion of postgraduate training, but there no specific and objective standards have been set for surgical competence (such as the types and number of surgical procedures to be involved). Moreover, within the veterinary specialty program in the USA and EU countries, veterinarians can complete the specialist program in private animal hospitals that meet certain standards. This is an important difference that is not implemented in Turkey (ACVS, 2021; ECVS, 2021; Kim et al., 2015). Boarded surgeons are evaluated on surgical skills competencies, experience and knowledge. However, after an official decision taken in 2018, the regulation has begun for a separate veterinary specialty program from postgraduate education in Turkey (Gıda, 2018).

Consistent with the master-apprentice relationship in our study, it was observed that roles in surgical procedures were gradually transferred from the supervisor to the postgraduate student. The responses showed that the proportion of time spent observing and assisting decreased with each passing year of training, and the proportion of time spent performing surgical procedures on its own is increased. Similar results have been obtained with different studies that showed apprenticeship-based practices are very effective (Kim et al., 2015). In a study conducted in the USA, an ordered training method was reported that used simulators or artificial materials to gain the most basic skill. This was followed by working with cadavers, working with the animals in the local shelter, and lastly, treating patients (Smeak, 2007).

The frequency of used teaching methods (didactical lectures, intraoperative guidance, case discussions, and external courses) are significantly higher in responses of SPV but lower in PGS. It may be associated with the inconsistency of individual practices, the lack of specific national standards for teaching methods, or lack of control. PGS reported the three most effective teaching methods as observing and assisting, being a primary surgeon with intraoperative guidance, and being a primary surgeon without intraoperative guidance, respectively. A generally

similar pattern of responses has been received from SPV whereas SPV finds the intraoperative guidance more effective than PGS. A study conducted on a similar subject in the USA supported our findings (Kim et al., 2015). Another study conducted in the USA reports that, contrary to popular belief, it is not efficient to allow PGS to perform surgical procedures on its own. It is more efficient to perform a surgical procedure under the guidance of a supervisor until he or she acquires certain skills. Otherwise, the surgical specialist candidate may lose self-confidence of competency, thus adversely affecting his success (Smeak, 2007).

In the question of how much time postgraduate students spend in roles in surgery, higher rates of SPV to the role of observing and assisting, and PGS to the role of being a primary surgeon without intraoperative guidance, can be associated with the above-mentioned lacks of national specific standards. In PGS in-group comparison, the high rate of being a primary surgeon without intraoperative guidance for ≥ 4 years group was consistent with apprenticeship-based practice. In this context, a study conducted on veterinary surgeons who were in the 3rd year of the program showed that the period of being a primary surgeon without guidance had significant effects on the success of the procedure and postoperative morbidity. Based on the data obtained, it was reported that the planning of veterinary surgery training was rearranged for the following years (Kennedy et al., 2011).

In human and veterinary surgery training, it is extremely important to bring experience and proficiency as well as theoretical knowledge in surgical practices. For this purpose, many methods are used to improve psychomotor skills (Fransson et al., 2012; Gearhart et al., 2012; Gopinath et al., 2012; Kim et al., 2015; Lodge and Grantcharov, 2011). Due to ethical concerns arising from interventions on patients, the salient elements of the human surgery specialty training programs are options outside of the operating room such as cadavers, live animals, and virtual exercises (Atesok et al., 2012; Kim et al., 2015; Lodge and Grantcharov, 2011; Peyre and Ashley, 2011; Sutherland et al., 2006). Simulation models are recommended for the development of motor skills (Peyre and Ashley, 2011). In veterinary surgery, non-operating room methods are rarely used worldwide, as ethical concerns are less than those for humans (Kim et al., 2015). The results of our study show that the use of these methods is quite limited in Turkey. Today, patient owners have high expectations from surgical specialists. In this process, similar challenges are experienced with human medicine surgical training programs (Au Yong et al., 2019; Caston et al., 2016; Jones and McCullough, 2013; Jones et al., 2003; Patronek and Rauch, 2007; Smeak, 2007). Therefore, in parallel with the evolving technology, the use of such methods is likely to increase worldwide and in Turkey. A significantly lower rate of detailed discussion of cases in PGS responses in the comparison of SPV and PGS can also be associated with the stated national standardization deficiencies.

The use of effective and objective assessment methods in the postgraduate education process is one of the most important factors determining the quality of this education. More objective teaching and assessment methods aiming at the development of surgical skills are used in human medicine, such as follow-up charts and checklists specific to surgical procedures (Johnson and Johnson, 2010; Kim et al., 2015). Doyen authors working in the field of veterinary surgery also report that there is a need for more concrete and objective practices, such as creating lists or forms (Johnson and Johnson, 2010). Instruction, intraoperative guidance, and performance feedback are commonly used tools in the teaching and evaluation of surgical skills. Feedback can be received in the form of verbal, written, and detailed work-based evaluations. The value and applicability of such methods have been extensively researched for human medicine (Gearhart et al., 2012; Lodge and Grantcharov, 2011; Memon et al., 2010; Moulton et al., 2006; Van Hove et al., 2010). Verbal feedback is more subjective and ad-lib, written feedback is more formal and concrete. Verbal feedback is considered less reliable in terms of the technical competence assessment, as it is not formal and may not reflect the true level (Van Hove et al., 2010). This study revealed that rate of verbal feedback was quite high in Turkey according to both SPV and PGS responses consistently. In a similar study conducted in the USA, verbal feedback was reported to be used at a very high rate in veterinary surgery specialty training (Kim et al., 2015). The fact that written feedback was less preferred despite its stated advantages can be attributed to the additional time required in practice. The differences in the ranking of the most commonly used assessment and evaluation methods according to SPV and PGS responses were also probably due to the lack of a national standard practice. The reasons for the differences in answers regarding the average number of scientific publications may be as follows: the differences in the participant PGS education year, the lack of a nationwide regulation on this subject in the education process, and individual factors. The lower scores of PGS in the answers to the questions about how effective and objective are the assessment and evaluation methods used in postgraduate training in veterinary surgery, and how sufficient the equipment and tools are for that purpose, reveal the difference in perceptions between SPV and PGS. To reduce or even eliminate these differences in the perceptions, the options of implementing teaching and assessment methods with more specific and objective goals and rules should be examined.

In order to reduce or even eliminate these differences in perception, the options of teaching and assessment methods with more specific and objective goals and rules should be considered. Furthermore, according to the responses of the last question (Table 9), the most widely used suggestion made by SPV and PGS as "Increasing the applications carried out with supervisors" supports the increase of apprenticeship-based applications. Although there are similarities between SPV and PGS in other suggestions, the variation in the number of suggestions reveals differences in perceptions. These assessments can contribute to more efficient planning by authorities of the prospective veterinary surgical specialist training program in Turkey.

The standards of veterinary surgery specialist training were determined in the USA in the 1970s and have been developed to date. In this context, a study conducted in the USA evaluated the efficiency of the existing methods was evaluated. It was observed that the dialogue and interactions between the supervisor and the postgraduate student should be increased to train more competent veterinary surgeons at the end of the program (Kim et al., 2015). This study showed that it is also needed in the development of the program's teaching and assessment methods in Turkey. Gaining veterinary surgery proficiency is an ongoing and highly complex process. The methods and results yielded as a result of this research are expected to contribute to similar studies in Turkey and other countries.

Although the teaching and assessment methods applied in veterinary surgery postgraduate programs of various institutions are generally consistent, the results obtained in this study reveal that they differ in detail according to perceptions of supervisors and postgraduate students. Therefore, in bringing knowledge and skills in the field of veterinary surgery, it is apparent that there is a need for a nationwide practice, whose standards are specifically determined by the authorized committee. However, further detailed studies are needed to achieve world-class postgraduate or specialist training in veterinary clinical sciences, particularly in the field of veterinary surgery.

Ethics Committee Approval

The study was approved by the local ethical committee (No. 21817443-050.99, Hatay Mustafa Kemal University Scientific Research and Publication Ethics Board).

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Conflict of Interest

The authors declare that they have no conflict of interest.

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