

Cross-Sectional Survey of Student and Faculty Experiences with Feedback and Assessment of Clinical Competency on Final Year Rotations at American Association of Veterinary Medical Colleges (AAVMC) Member Institutions

M. Carolyn Gates ■ Jared A. Danielson ■ Katherine Fogelberg ■ Jonathan H. Foreman ■ Jody S. Frost ■ Jennifer L. Hodgson ■ Susan M. Matthew ■ Emma K. Read ■ Regina Schoenfeld-Tacher

ABSTRACT

The clinical experiences, feedback, and assessment that veterinary students receive during final year rotations have a significant impact on whether they will achieve entry-level competency at the time of graduation. In this study, a cross-sectional survey was administered to American Association of Veterinary Medical Colleges (AAVMC) member institutions to collect baseline data about current feedback and assessment practices to identify key target areas for future research and educational interventions. Responses were received from 89 faculty and 155 students distributed across 25 universities. The results indicated that there are significant gaps between evidence-based approaches for delivering feedback and assessment and what was being implemented in practice. Most feedback was provided to students in the form of end-of-rotation evaluations sometimes several weeks to months after the rotation finished when faculty were unlikely to remember specific interactions with students and there were limited opportunities for students to demonstrate progress towards addressing identified concerns. Although the most valuable type of feedback identified by students was verbal feedback delivered shortly after clinical experiences, this method was often not used due to factors such as lack of time, poor learning environments within veterinary teaching hospitals, and lack of faculty training in delivering effective feedback. The results also indicated potential challenges with how non-technical domains of competence within the AAVMC Competency-Based Veterinary Education (CBVE) Framework are currently evaluated. Finding avenues to improve feedback and assessment processes in final year clinical settings is essential to ensure that veterinary students are adequately prepared for practice.

Key words: workplace-based assessment, competency-based veterinary education, clinical training, entrustable professional activities, feedback

INTRODUCTION

The primary goal of veterinary medical education programs worldwide is to produce graduates who can competently perform the essential tasks needed to diagnose, treat, and prevent animal diseases at an entry-level practice level. At most veterinary schools, this is accomplished by requiring students to complete 2–4 years of pre-clinical training where they acquire foundational veterinary knowledge and skills through predominately classroom-based learning. This pre-clinical curriculum is followed by 1–2 years of clinical rotations where students have the opportunity to practice entrustable professional activities (EPAs), defined as “essential tasks of a discipline (profession, specialty, or subspecialty) that an individual can be trusted to perform without direct supervision in a given health care context, once sufficient competence has been demonstrated.”¹ In some jurisdictions, individuals who graduate from an accredited veterinary degree program are automatically eligible to enter clinical practice, while other systems require individuals to pass additional licensing exams that focus on what graduates know instead of what they can do. It is therefore largely the responsibility of each veterinary school to ensure that their

students have achieved and demonstrated entry-level clinical competency at the time of graduation. Although accrediting bodies like the American Veterinary Medical Association Council on Education (AVMA COE), Royal College of Veterinary Surgeons (RCVS) in the United Kingdom, and Australasian Veterinary Boards Council (AVBC) provide some general guidance about important competency areas and clinical skills, each school has considerable flexibility in choosing how to teach and assess students to meet these defined outcomes.

While it is acknowledged that accredited veterinary schools are generally producing high-quality graduates who can function competently in clinical practice,² numerous cross-sectional surveys of recent graduates and their employers have highlighted that many individuals still require significant support during their first years in practice to address key deficiencies in clinical knowledge and skills^{3–5} that may be leading to clinical errors⁶ as well as high levels of stress in recent graduates.⁷ This suggests there may be opportunities to improve the way that schools provide feedback (defined as information provided to learners for improving their performance) and conduct assessments (defined as activities that produce information about

student achievement) across the curriculum to produce better prepared graduates. Workplace-based learning environments during final year clinical rotations are particularly important, however, there are many existing challenges, including unclear and conflicting expectations among stakeholder groups about what constitutes entry-level competency in veterinarians; considerable variation in the assessment tools that are used to evaluate whether students have achieved entry-level competency by the time of graduation⁸; and difficulties in providing adequate clinical opportunities to work towards and demonstrate competency on rotations both from low caseloads and faculty time constraints for providing formative feedback and summative assessments.

To address some of these issues, the American Association of Veterinary Medical Colleges (AAVMC) has created the Competency-Based Veterinary Education (CBVE) Model as a means of standardizing the approach to defining, guiding, and assessing clinical competency to improve student outcomes and to allow comparisons between institutions.⁹⁻¹¹ The latter is becoming increasingly important given the high mobility of veterinarians between jurisdictions and the consequent need for more transferable qualifications.^{12,13} One component of the AAVMC CBVE Model of Education consists of the CBVE Competency Framework which comprises nine domains of competence: clinical reasoning and decision-making; individual animal care and management; animal population care and management; public health; communication; collaboration; professionalism and professional identity; financial and practice management; and scholarship. Despite the increasing attentions towards competency-based approaches in medical education, CBVE has been embraced by relatively few veterinary schools. This likely stems from lack of awareness about the approach as well as practical concerns about the logistics of implementing a CBVE curriculum, including timing for curriculum revision, scheduled accreditation, and faculty development. Given the theoretical benefits of shifting towards competency-based educational approaches, there is a need for more baseline data regarding the current methods for providing students with feedback and assessment on different competencies during final year clinical rotations taken from a number of different stakeholder perspectives.

In this study, a cross-sectional survey of final-year students and teaching faculty at AAVMC member institutions was conducted to; (a) evaluate perceptions of student proficiency with different clinical competencies and EPAs, (b) collect baseline data on experiences with and preferences towards different assessment tools to evaluate clinical competency, (c) characterize the feedback culture in the veterinary teaching hospital setting, and (d) identify strengths and weaknesses with the current system for feedback and assessment. Data from the different respondent groups were also compared to highlight differences in how each perceived the current implementation and value of the systems for providing feedback and assessment at their university. The implications of the study findings for driving future research and training activities are discussed.

METHODS

Study Design

The study design was reviewed and approved by the AAVMC in March 2021, after which a cross-sectional survey was administered to final-year veterinary medicine students and teaching faculty at the 53 AAVMC member institutions. The

survey advertisement was emailed by the AAVMC to all Associate Deans of the eligible veterinary schools in the southern hemisphere on July 20, 2021 and in the northern hemisphere on March 8, 2022 using the database of contact details maintained by the AAVMC. Survey dissemination was purposefully timed to occur after most students in those regions would have completed at least 75% of their final clinical year rotations and before most students entered any end-of-year examination periods. The email contained a brief overview of the study objectives and separate hyperlinks for faculty and students to voluntarily complete the anonymized survey online using the Qualtrics platform (Qualtrics XM, Seattle, WA, USA; www.qualtrics.com). The Associate Deans were asked to distribute the survey advertisement to the relevant faculty and students within their own institutions and were also asked to complete a short online survey to provide basic demographic information about their institution's veterinary medical education programme. A reminder email was sent to the Associate Deans 1 month after the initial advertisements were sent out and the surveys were closed 1 month following the reminder email. Copies of the initial and reminder survey advertisements are available in the Supplementary Information. No other channels were used to advertise the survey during the study period.

Survey Design

Two separate versions of the survey were developed: one for final-year students and one for teaching faculty. The surveys asked participants questions about their; (a) general background, (b) level of proficiency with different clinical competencies and EPAs, (c) experiences with and preferences towards different assessment tools to evaluate clinical competency, (d) perceptions around the feedback culture in the veterinary teaching hospital setting, and (e) strengths and weaknesses with the current system for feedback and assessment. The surveys were piloted with six members of the AAVMC CBVE Working Groups to refine the wording and structure of the questions before distribution. Full copies of each survey are provided in the Supplementary Information.

Ethics Approval

This study was reviewed and approved by the Massey University Human Ethics Committee (SOB 21/04). By voluntarily choosing to complete the survey, respondents were assumed to have provided informed consent to participate.

Data Analysis

Data were imported from the online survey tool into R Studio statistical software version 1.4.1103 (R Development Core Team 2021, R Foundation for Statistical Computing, Vienna, Austria) for cleaning and analysis. Only responses that were marked as "Finished" and had >80% of the survey completed according to the standard Qualtrics survey reporting metrics were retained for analysis.

Descriptive statistics were provided on all quantitative study variables. For all Likert-scale questions, the responses were re-coded with a numeric value from 1 to 4 for questions with 4-point scales or a numeric value from 1 to 5 for questions with 5-point scales. A weighted score was then calculated for each question statement by taking the weighted mean value of the responses. Responses from individuals who did not select an answer were excluded from the calculations. The purpose for calculating weighted scores was to provide an objective method for ranking and comparing the relative importance of the statements within each question. Mann-Whitney U

tests (also known as Wilcoxon rank sum tests) were used to compare student versus faculty ratings of their level of confidence in students' abilities with the different AAVMC CBVE domains of competence and EPAs in the students' intended practice area. A *p*-value of .05 was set as the cut-off for statistical significance.

Data from the qualitative free-text responses were imported into a spreadsheet program and either thematic analysis (for questions that asked respondents about their opinions of different topics) or content analysis (for questions that asked respondents to list the most useful and least useful aspects of feedback and assessment) was performed using a simplified version of the methodology described by Braun and Clarke,¹⁴ which involved; (a) reading through all free-text responses for each question multiple times to gain familiarity with the data, (b) reading through the individual responses again in detail, underlining keywords, phrases, and/or ideas exemplifying major themes, (c) collating the coded data into potential themes by subjectively grouping responses with similar perceived meaning, and (d) then re-reading and reflecting on the coded data to identify more in-depth meanings and to make any required amendments to the themes or sub-themes. A subset of quotes from each theme were selected for inclusion in the manuscript to highlight key issues raised by respondents. The objective was to highlight the range of opinions on the different issues rather than quantifying the prevalence of respondents with these opinions.

RESULTS

Respondent Demographics

Responses were received from faculty, students, and Associate Deans located at 25/53 (47%) AAVMC member institutions, including 21 veterinary schools from North America, three veterinary schools from Australasia, and one veterinary school from Europe.

A total of 14/25 participating institutions (56%) completed the administrator's survey to provide basic demographic information about their programs. Of these, 13 institutions (93%) were graduate level program (i.e., DVM or VMD) and 1 (7%) was an undergraduate level programme (i.e., BVSc or BVMS). Most program were 4-year degrees (11/14; 79%) with only one institution with a 5-year degree (7%) and two institutions with 6-year degrees (14%). The mean class size for students on final year clinical rotations was 119 (median: 109, min: 47, max: 300). The mean number of academic staff employed at the veterinary schools was 120 (median: 117, min: 40, max: 238) while the mean number of professional staff was 116 (median: 100, min: 13, max: 450).

There were 89 responses to the faculty survey with sufficiently complete data for analysis. These faculties were located across 19 institutions. The mean number of faculty responses per institution was 4.6 (median: 4, min: 1, max: 13). The distribution by gender was 63 female (71%), 19 male (21%), 3 non-binary (3%), and 4 who did not select a gender (4%). Most respondents were veterinarians (83/89; 93%) with 2 veterinary technicians (2%) and 4 respondents with postgraduate qualifications (Master's or PhD degree) only. Of the 83 veterinarians, 65 (78%) were board certified specialists. Overall, there were 63 respondents (71%) who had spent time working in first-opinion practice prior to joining academia. The mean number of years that faculty had been teaching in clinical settings was 15.5 years (median: 12, min: 0.5, max: 51). There were 53 respondents

(59%) who worked with companion animals, 23 (26%) who worked with horses, 13 (15%) who worked with food animals, 5 (6%) who worked with exotics, 7 (8%) who worked with shelter animals, 1 (1%) who worked in public health, and 4 (4%) not currently working in a clinical role. Respondents held a variety of educational roles including 40 (44%) who were coordinators for clinical rotations, 77 (86%) who were contributors for teaching in clinical rotations, 41 (46%) who were coordinators for pre-clinical courses, 61 (69%) who were contributors for teaching in pre-clinical courses, 23 (26%) who were members of the curriculum committee, 9 (10%) who were members of the student assessment committee, and 7 (8%) who served in other educational roles.

There were 155 responses to the student survey with sufficiently complete data for analysis. These students were located across 20 institutions. The mean number of student responses per institution was 7.8 (median: 8, min: 1, max: 16). The distribution by gender was 121 females (78.1%), 26 males (16.8%), 3 non-binary (1.9%), and 5 who did not select a gender (3.2%). The mean age of students was 27 years (median: 26, min: 20, max: 45). The majority (148/155; 96.1%) were intending to pursue a career in clinical practice with 4 (2.6%) indicating that they would pursue a non-clinical career in the veterinary field, 2 (1.3%) specifying that they would be joining the United States Army, and 1 (0.6%) indicating that they would be pursuing a non-veterinary career. Of the 148 entering clinical practice, 99 (66.9%) were companion animal exclusive, 6 (4.1%) were equine exclusive, 4 (2.7%) were food animal exclusive, and 39 (26.9%) were mixed animal. There were 58 students (39.2%) intending to pursue further training after graduation including 35 (60.3%) interested in an internship, 30 (51.7%) interested in a residency, 12 (20.7%) interested in a Master's, 8 (13.8%) interested in a doctoral degree, and 5 (6.9%) interested in another kind of certification.

Student Experiences on Final Year Rotations

The mean length of time that student respondents had spent on final year rotations at the time of completing the survey was 47 weeks (median: 48, min: 10, max: 80). There were 153/155 students (98.7%) who provided feedback on the last rotation they completed. As highlighted in Table 1, students were most often given primary responsibility for performing physical examinations and gathering a history, but less often involved with performing treatments (including medical and surgical procedures).

Overall, 56/155 students (36.1%) rated their learning experience on their immediate prior rotation as excellent, 58 students (37.4%) as very good, 19 students (12.3%) as good, 14 students (9.0%) as fair, and 6 students (3.9%) as poor. Amongst the students who rated their rotation learning experience as excellent or very good, the main reasons listed in the free-text comments were that the supervising clinicians allowed them to have primary responsibility for managing their cases and provided good feedback to help the students improve their clinical decision-making. Amongst the students who rated their rotation learning experience as good, fair or poor, the major themes from the free-text responses were low caseloads on the rotations with inadequate hands-on opportunities for learning, caseloads that were not representative of those routinely seen in primary care practice, treatment as cheap labor to perform basic patient care tasks like administering medications or restraining animals, insufficient involvement in the clinical decision-making process for the patient, insufficient clinical staff to provide students with adequate supervision, priority

Table 1: Student perceptions of how often they felt they were given primary responsibility for different aspects of case management on their immediate prior clinical rotation

	Never	Occasionally	Often	Almost always	Not applicable	Weighted score*
Gathering a history	19 (14.3%)	21 (15.8%)	22 (16.5%)	71 (53.4%)	22	3.09
Performing a physical examination	5 (3.5%)	16 (11.2%)	36 (25.2%)	86 (60.1%)	12	3.42
Creating a prioritized problem list and differential diagnosis list	10 (6.8%)	40 (27.4%)	49 (33.6%)	47 (32.2%)	9	2.91
Developing a diagnostic and/or treatment plan	12 (8.4%)	43 (30.1%)	49 (34.3%)	39 (27.3%)	12	2.80
Performing and interpreting diagnostic tests	14 (9.7%)	41 (28.5%)	57 (39.6%)	32 (22.2%)	11	2.74
Performing treatments (including medical and/or surgical procedures)	20 (14.1%)	47 (33.1%)	38 (26.8%)	37 (26.1%)	13	2.65
Communicating with clients	22 (17.1%)	30 (23.3%)	34 (26.4%)	43 (33.3%)	26	2.76

*Calculated as a weighted average where Never = 1, Occasionally = 2, Often = 3, and Almost Always = 4.

for teaching being given to interns and residents rather than students, working on species that they were not intending to treat after graduation, and poor organization within the university veterinary teaching hospital. As one student highlighted,

There are so many doctor things (prescribing, diagnosing, and surgery) that we are not allowed to actually be a part of and practice. Fourth year has been shadowing doctors and 70% of the time running around doing technician work, paperwork, or submitting things and only 30% practicing the role of being a doctor.

Several students commented that the learning experiences they had on primary care rotations either in the veterinary teaching hospital or out on externship placements were the most valuable because the students were allowed more autonomy with their cases.

Perceptions of Student Performance within the AAVMC CBVE Framework

When asked about their level of familiarity with the AAVMC CBVE Framework, the distribution of responses for faculty was 8 extremely familiar (9%), 41 moderately familiar (46%), 24 somewhat familiar (27%), 12 slightly familiar (14%), and 4 not at all familiar (5%). In contrast, the distribution of responses for students was 4 extremely familiar (2.6%), 3 moderately familiar (1.9%), 29 somewhat familiar (18.7%), 38 slightly familiar (24.5%), and 81 not at all familiar (52.4%).

Both faculty and students were asked to rate their current level of confidence with student mastery of the nine domains of competence in the students' intended practice area using a scale that ranged from 0 being not at all confident to 100 being completely confident (Figure 1). Overall, the highest ratings across both groups were given to Domain 7: Professionalism and Professional Identity, Domain 6: Collaboration, and Domain 5: Communication, while the lowest ratings were given to Domain 8: Financial and Practice Management, Domain 3: Animal Population Care and Management, and Domain 4: Public Health. Based on the results from Mann-Whitney U tests, student ratings were significantly higher than faculty ratings for Domain 4: Public Health (student median = 58, faculty median = 51, $W = 4259$, $p = .03$), Domain 5: Communication (student median = 89, faculty median = 73, $W = 4050$, $p < .001$), Domain 6: Collaboration (student median = 88, faculty median = 68, $W = 3273$,

$p < .001$), Domain 7: Professionalism and Professional Identity (student median = 94, faculty median = 83, $W = 3676$, $p < .001$), and Domain 9: Scholarship (student median = 74, faculty median = 56, $W = 4067$, $p < .001$).

Faculty and students were also asked to rate their current level of confidence with student mastery of the eight EPAs in the students' intended practice area using a scale that ranged from 0 being not at all confident to 100 being completely confident (Figure 2). Overall, the highest ratings across both groups were given to EPA 1: Gather a history, perform an examination, and create a prioritized differential diagnosis list and EPA 8: Formulate recommendations for preventive healthcare while the lowest ratings were given to EPA 7: Perform general anaesthesia and recovery of a stable patient including monitoring and support and EPA 6: Perform a common surgical procedure on a stable patient, including pre-operative and post-operative management. Based on the results from Mann-Whitney U tests, student ratings were significantly higher than faculty ratings across almost every EPA including EPA 1: Gather a history, perform an examination, and create a prioritized differential diagnosis list (student median = 85, faculty median = 79, $W = 5011$, $p = .001$), EPA 2: Develop a diagnostic plan and interpret results (student median = 79, faculty median = 71, $W = 5474$, $p = 0.019$), EPA 4: Recognize a patient requiring urgent or emergent care and initiate evaluation and management (student median = 82, faculty median = 73, $W = 5046$, $p = .003$), EPA 5: Formulate relevant questions and retrieve evidence to advance care (student median = 81, faculty median = 66, $W = 4328$, $p < .001$), EPA 6: Perform a common surgical procedure on a stable patient, including pre-operative and post-operative management (student median = 72, faculty median = 63, $W = 4816$, $p = .016$), EPA 7: Perform general anaesthesia and recovery of a stable patient including monitoring and support (student median = 82, faculty median = 65, $W = 4077$, $p < .001$), and EPA 8: Formulate recommendations for preventive healthcare (student median = 87, faculty median = 80, $W = 4345$, $p = .002$).

Mechanisms for Providing Feedback and Assessment

As highlighted in Figure 3, veterinarians were the individuals who most often provided students with feedback on their performance during rotations, followed by veterinary paraprofessionals. Most faculty who provided responses (84/87: 97%) indicated that veterinarians were almost always involved in providing feedback whereas only 77/152 (50.7%) of veterinary

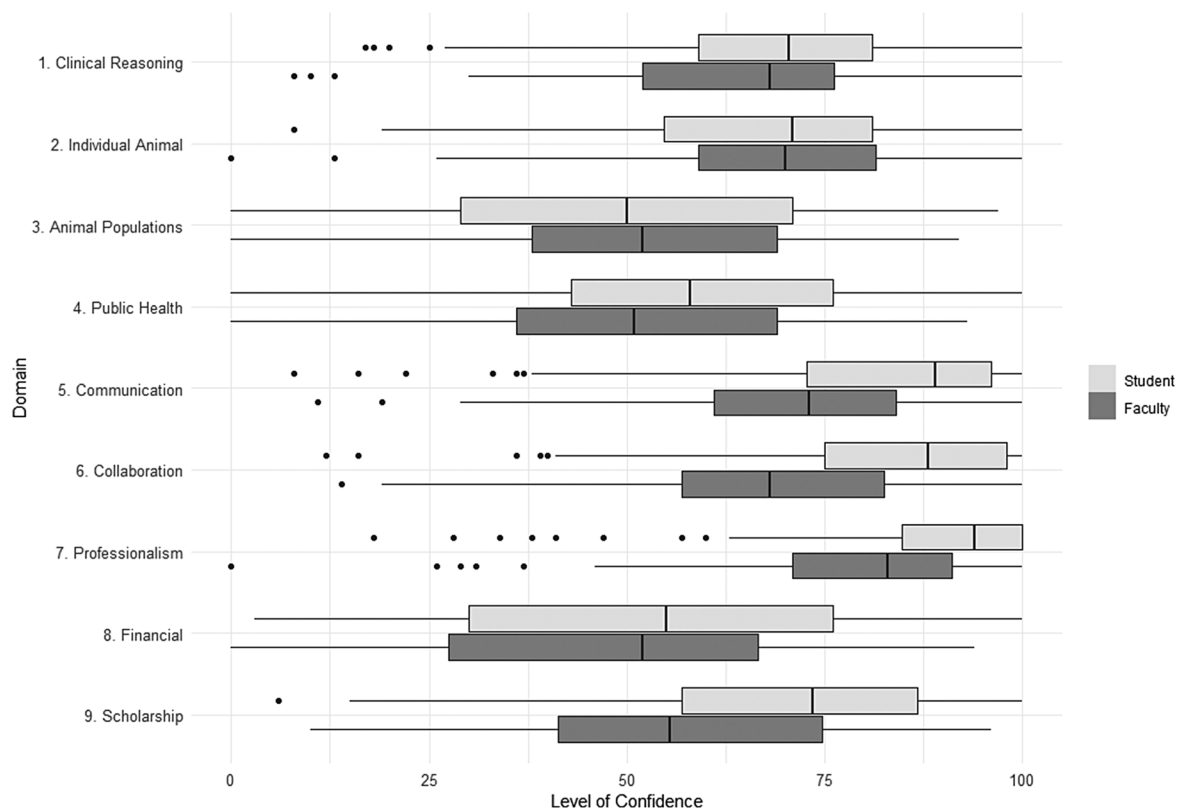


Figure 1: Faculty and student perceptions of their current level of confidence* with student mastery of the nine AAVMC CBVE Framework domains of competence

*Level of confidence was assessed on a scale of 0 being not at all confident to 100 being completely confident.

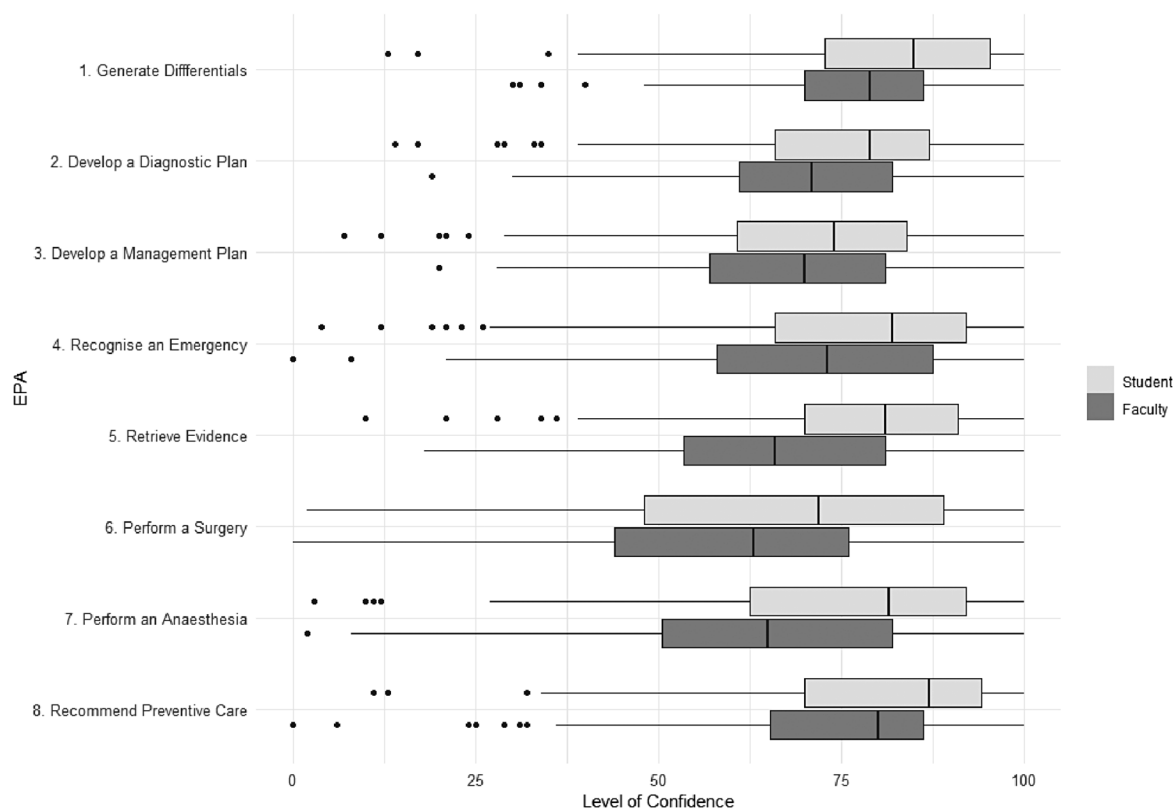


Figure 2: Faculty and student perceptions of their current level of confidence* with student mastery of the eight AAVMC CBVE EPAs

*Level of confidence was assessed on a scale of 0 being not at all confident to 100 being completely confident.

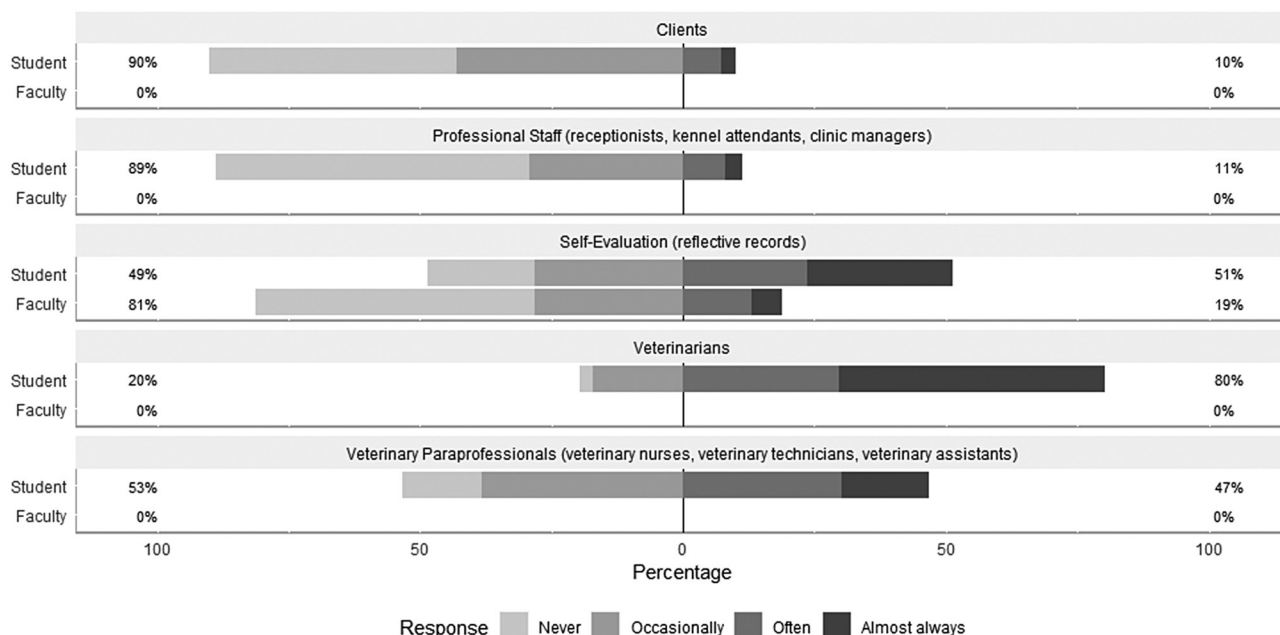


Figure 3: Faculty and student ratings of how often different groups provide students with feedback and assessment on rotations*

*The % value on the left indicates the % of respondents who answered Never or Occasionally while the % value on the right indicates the % of respondents who answered Often or Almost Always. See Supplementary Tables 1a and 1b for raw data.

students indicated that veterinarians almost always involved in providing them with feedback. Approximately half of students who provided responses (78/153; 51%) indicated that they often or almost always engaged in self-reflection whereas only 16/85 faculty (19%) thought that students engaged in self-reflection to assess their performance. Clients and other professional staff besides faculty (including nurses, technicians, and general clinic staff) were almost never or only occasionally involved in providing students with feedback.

When faculty were asked to describe when they most commonly provided students with feedback over the previous 6 weeks of rotations, the distribution of responses was 19 (21%) immediately after the clinical experience, 24 (27%) more than a few hours after the clinical experiences, but still sometime within the rotation, 41 (46%) within 1–2 weeks after the rotation finished, 1 (1%) 3–4 weeks after the rotation finished, and 4 (5%) greater than 1 month after the clinical rotation finished. During a typical rotation, faculty indicated that on average feedback was provided as verbal comments 44.5% of the time (median 40%, min 0%, max 100%), as written comments 27.2% of the time (median 20%, min 0%, max 95%), and as standardized assessment rubrics/scales 27.9% of the time (median 25%, min 0%, max 90%).

When students were asked to describe when they most commonly received feedback from faculty over the previous 6 weeks of rotations, the distribution of responses was 16 (10.3%) immediately after the clinical experience, 13 (8.4%) more than a few hours after the clinical experiences, but still sometime within the rotation, 67 (43.2%) within 1–2 weeks after the rotation finished, 35 (22.6%) 3–4 weeks after the rotation finished, and 24 (15.5%) greater than 1 month after the clinical rotation finished. During a typical rotation, students indicated that on average feedback was provided as

verbal comments 28.5% of the time (median 20%, min 0%, max 100%), as written comments 30.3% of the time (median 25%, min 0%, max 95%), and as standardized assessment rubrics/scales 41.3% of the time (median 40%, min 0%, max 100%).

The most common contexts for evaluating student performance were through observed consults, reviews of medical records, and student participation in either case rounds or grand rounds presentations (Figure 4). Simulated clinical scenarios were almost never or only occasionally used. In the free-text comments, students noted that clinical skills checklists were frequently used to determine whether they had met the learning objectives for certain rotations.

There were differences in how students and faculty ranked how often students used five different methods for assessing student progress towards clinical competency on rotations using a scale of 5 = used the least and 1 = used the most (Figure 5). Feedback from rotation evaluations was the highest ranked for both groups. In contrast, 77% of students ranked self-evaluation of performance as 1 or 2 compared with only 28% of faculty and 52% of faculty ranked checklists of essential skills as 1 or 2 compared with only 12% of students. Other methods of evaluating performance provided by students in the free-text comments included feedback from clients, monitoring patient response to treatment, comparisons to classmates without discussion, level of confidence with approaching the case, researching decisions on the internet, and soliciting informal feedback from professional staff in the teaching hospital. Most of the free-text comments from faculty indicated that students also used the informal verbal feedback they provided and comparisons against classmates for metrics such as time taken to complete routine surgical procedures.

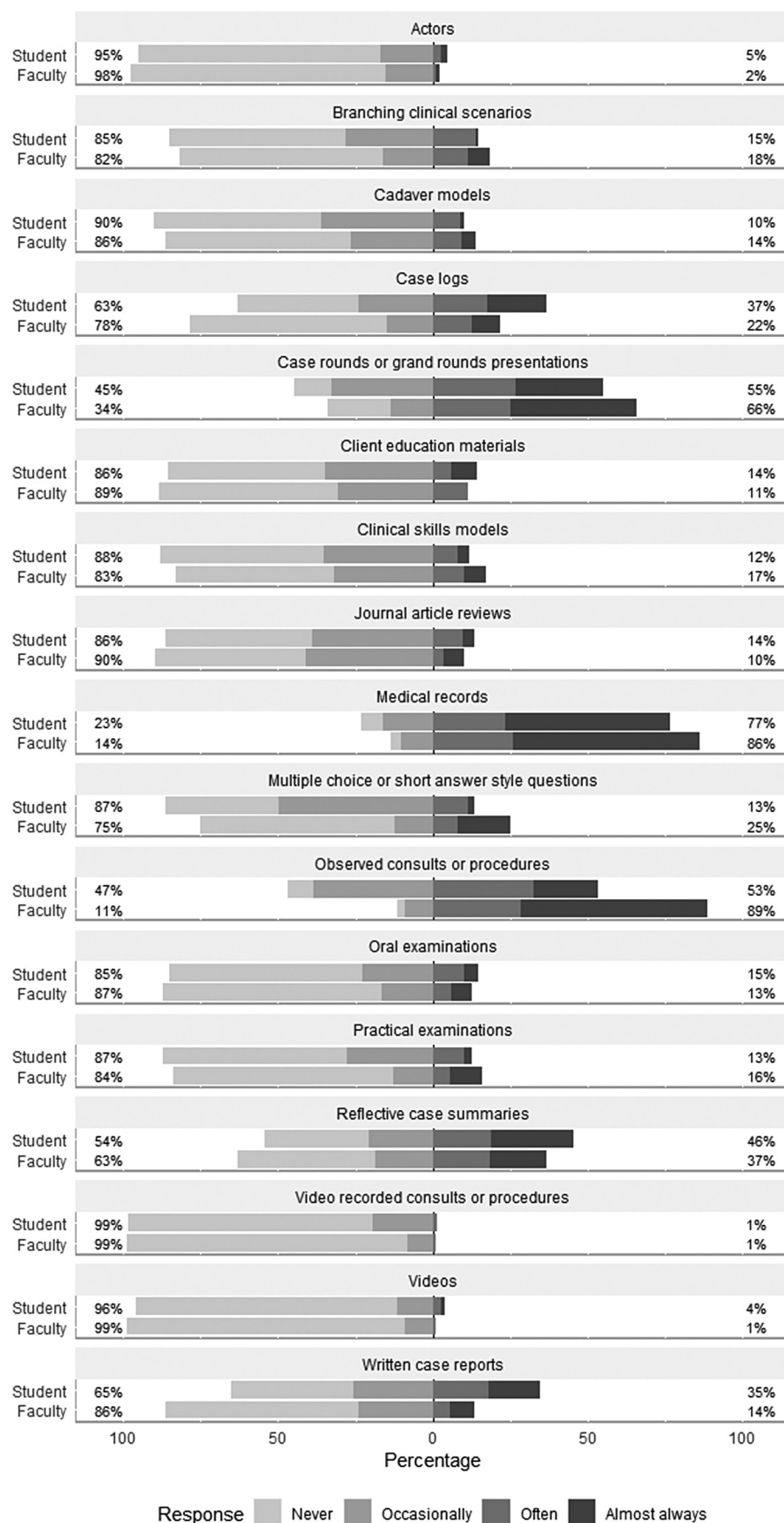


Figure 4: Faculty and student perceptions of how often different tools are used for feedback and assessment on clinical rotations*

*The % value on the left indicates the % of respondents who answered Never or Occasionally while the % value on the right indicates the % of respondents who answered Often or Almost Always. See Supplementary Tables 2a and 2b for raw data.

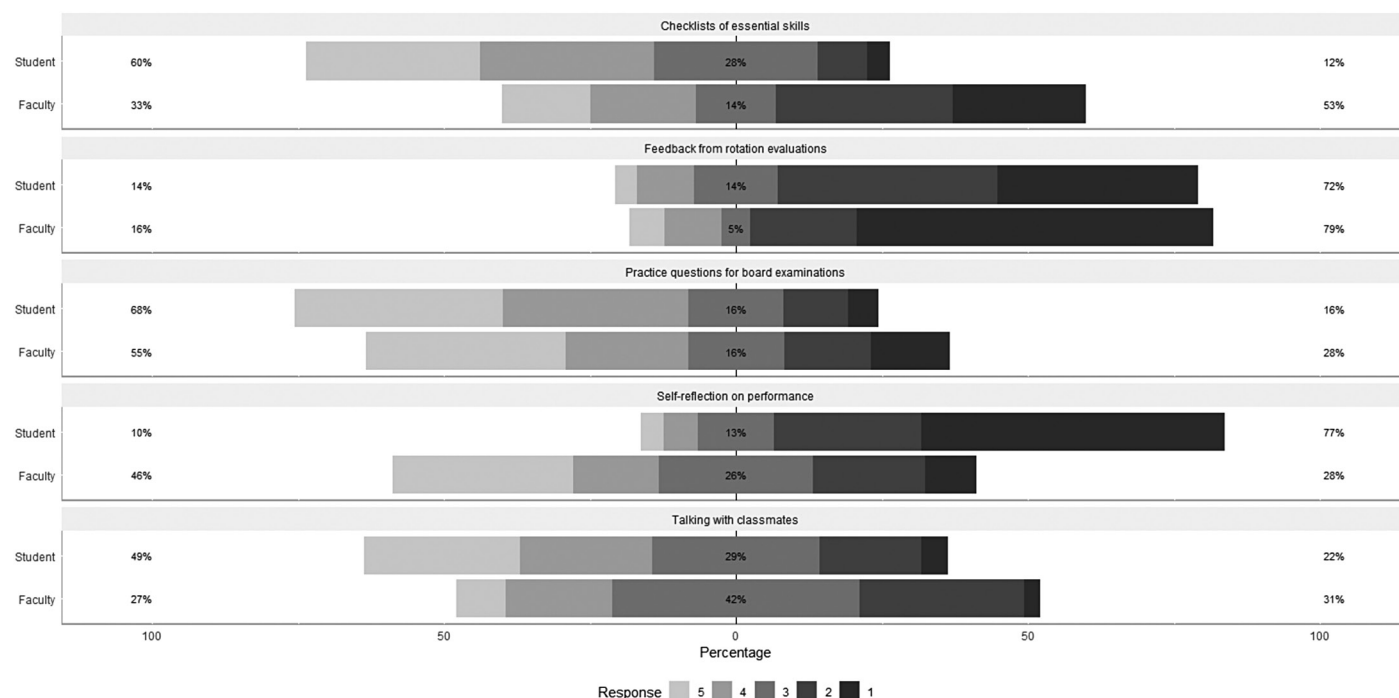


Figure 5: Faculty and student rankings of what students perceive as the most valuable tools for assessing their progress on clinical rotations*

*The % value on the left indicates the % of respondents who answered 5 or 4 while the % value on the right indicates the % of respondents who answered 2 or 1. See Supplementary Tables 3a and 3b for raw data.

Usefulness of Feedback and Assessment

Faculty and students were asked to rate the usefulness of feedback provided to students across the different CBVE domains of competence (Figure 6) and EPAs (Figure 7). In general, students tended to rate feedback for any category as being less useful than the ratings assigned by faculty. Feedback received or provided on *Domain 4: Public Health* and *Domain 8: Financial and Practice Management*, EPA 5: *Formulate relevant questions and retrieve evidence to advance care*, and EPA 9: *Formulate recommendations for preventive healthcare* were ranked as the least useful by both students and faculty.

When faculty were asked to rate the overall usefulness of feedback they provided to students, the distribution of responses was 9 (10%) extremely useful, 28 (32%) very useful, 34 (38%) moderately useful, 16 (18%) slightly useful, and 2 (2%) not at all useful. There were 206 free-text responses provided to the question asking faculty to list the three methods they found most useful for helping students gauge their progress. The more common methods including verbal feedback (69 responses), written comments particularly on end of rotation evaluations (36 responses), in-the-moment feedback (37 responses), practical skills examinations (13 responses), self-reflection (11 responses), medical records reviews (11 responses), standardized rubrics or grading systems (5 responses), peer feedback (6 responses), and quizzes or exams (2 responses). There were 134 free-text responses provided to the question asking faculty to list the three methods they found least helpful for assessing student progress. The most common responses were written feedback, particularly when received after the rotation finished (31 responses), standardized rubrics

(19 responses), number grades (9 responses), and checklists (9 responses), summative exams or quizzes (7 responses), peer evaluation (5 responses), and case logs (4 responses).

When students were asked to rate the overall usefulness of feedback they received from faculty, the distribution of responses was 17 (11.0%) extremely useful, 31 (20.0%) very useful, 51 (29.7%) moderately useful, 39 (25.2%) slightly useful, and 17 (11.0%) not at all useful. There were 323 free-text responses provided to the question asking students to list the three methods they found most helpful for assessing their progress. The more common methods included verbal feedback (86 responses), written comments (64 responses), in-the-moment feedback (43 responses), self-reflection (20 responses), rubrics (15 responses), peer feedback (13 responses), client feedback (5 responses), and quizzes (4 responses). There were 168 free-text responses provided to the question asking students to list the three methods they found least helpful for assessing their progress. The most common responses were written feedback received after the rotation finished (32 responses), summative exams (23 responses), rubrics (23 responses), receiving no feedback (11 responses), receiving generic feedback (11 responses), number grades (7 responses), and checklists (7 responses).

Barriers to Ensuring that Students Receive Adequate Feedback

Figure 8 highlights the perceptions of students and faculty towards different potential barriers to ensuring that students receive adequate feedback on rotations with responses assigned a score ranging from 1 = Not a barrier to 4 = Extreme

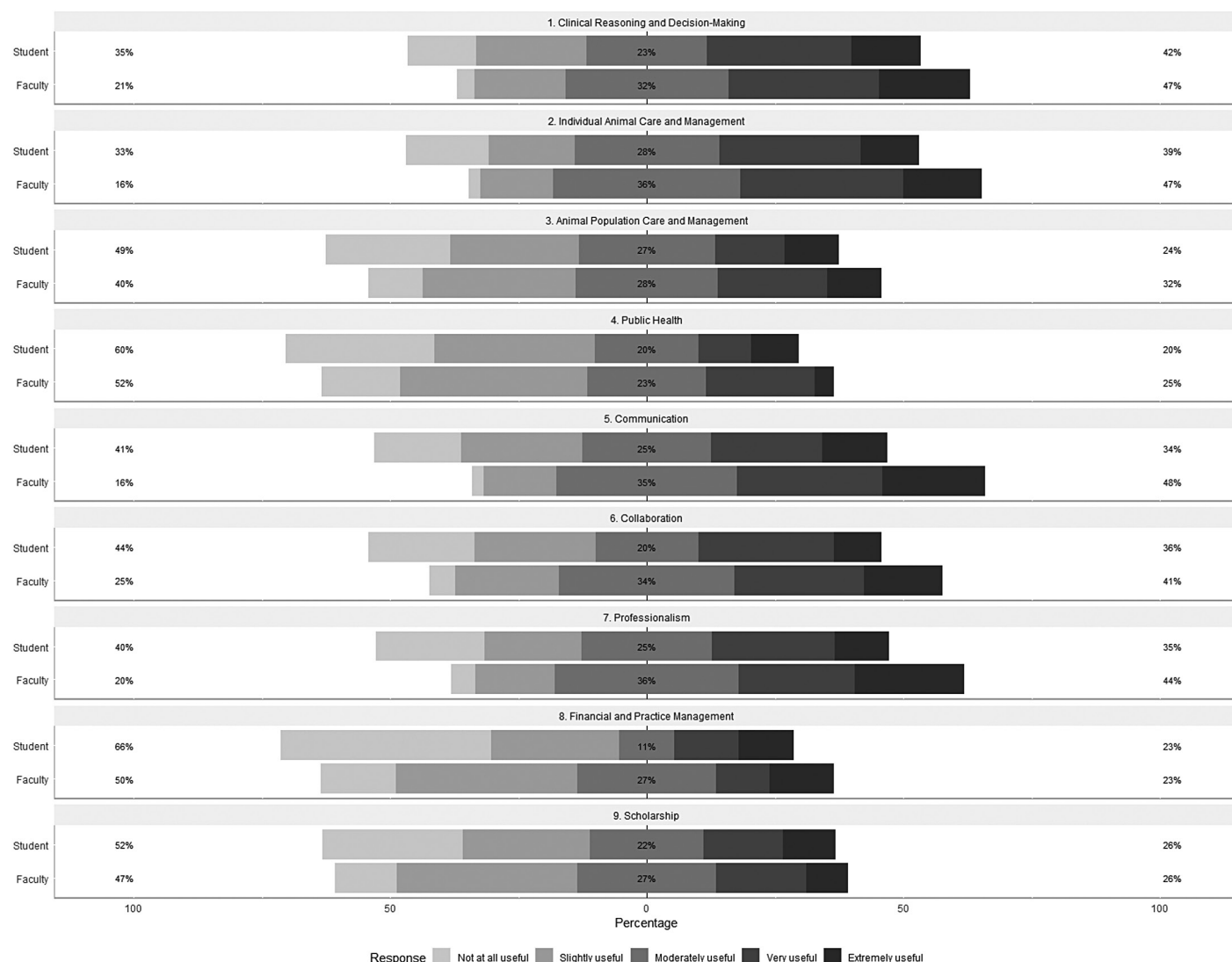


Figure 6: Faculty and student perceptions of the usefulness of feedback given or received to improve student performance with domains of competency*

*The % value on the left indicates the % of respondents who answered Not at all useful or Slightly useful while the % value on the right indicates the % of respondents who answered Very useful or Extremely useful. See Supplementary Tables 4a and 4b for raw data.

barrier. The top three barriers identified by faculty were faculty too busy (weighted score = 3.36), variation within and between rotations in feedback and assessment methods (weighted score = 2.80), and faculty not being proactive about giving feedback (weighted score = 2.77); the factors least likely to be barriers were inadequate caseload numbers to demonstrate clinical competency (weighted score = 1.78), inconsistent caseloads between rotation weeks (weighted score = 2.09), and too many students on rotations (weighted score = 2.16).

For students, the top three barriers were faculty too busy (weighted score = 3.12), faculty not being proactive about giving feedback (weighted score = 3.10), and lack of central oversight of faculty performance in teaching and assessing competency (weighted score = 2.78), while the bottom three were lack of student training around feedback (weighted score = 1.80), poor IT systems for recording feedback and

assessment (weighted score = 1.88), and students not being proactive about seeking feedback (weighted score = 1.96). The greatest discrepancies between student and faculty perceptions of barriers to ensuring that students receive appropriate feedback were students not being proactive about seeking feedback and lack of student training around feedback.

Many additional themes were raised in the free-text comments provided by faculty (Table 2) and students (Table 3) around additional barriers to students receiving adequate feedback and assessment. For faculty, these largely centred around frustration that the current methods for evaluating students were not sufficient for ensuring that students were competent to practice at graduation and difficulties with handling students who were underperforming on clinical rotations. For students, the main concerns focused on faculty being unable to remember students they were assessing, students having

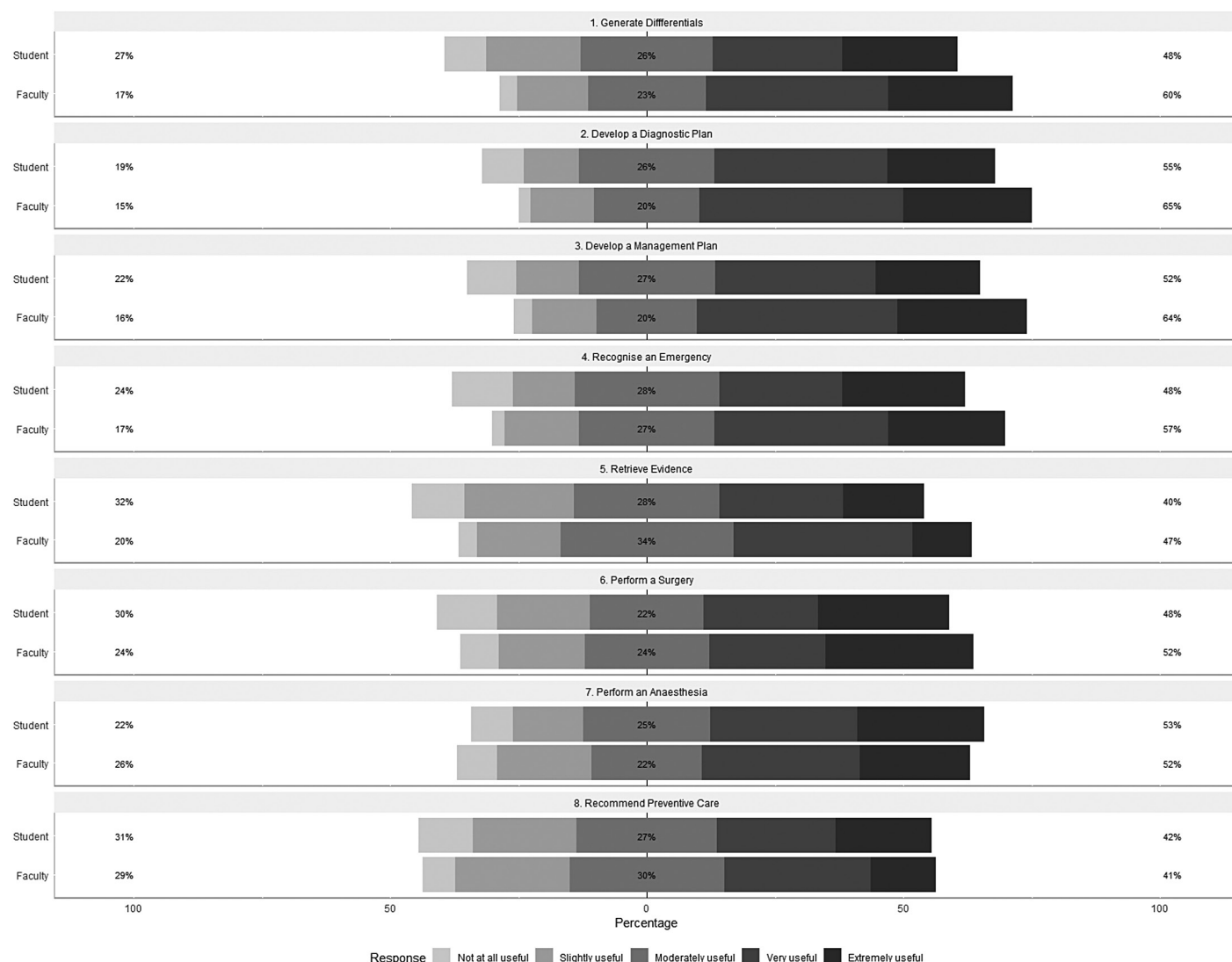


Figure 7: Faculty and student perceptions of the usefulness of feedback given or received to improve student performance with essential professional activities*

*The % value on the left indicates the % of respondents who answered Not at all useful or Slightly useful while the % value on the right indicates the % of respondents who answered Very useful or Extremely useful. See Supplementary Tables 5a and 5b for raw data.

insufficient opportunities to demonstrate growth over time, and poor learning environments in the veterinary teaching hospital.

The final survey question asked faculty and students to provide any additional thoughts they would like to share about feedback and assessment. There was a highlighted need for faculty to have better awareness of what was being taught to students in the pre-clinical years, so students were not being penalized for giving different answers than what the supervising clinician expected:

It is difficult to know what is taught in other courses in the 1-3rd year curriculum; most people who teach in the 4th year did not attend school at our institution, so often teach students slightly conflicting clinical information, which can be challenging/frustrating for some students who have difficulty with "shades of grey."

It was also noted that students spend considerable amount of time on rotations adapting to the administrative tasks and workflows of a particular rotations rather than spending time focusing on the clinical tasks:

The large variation in paperwork expectations between rotations means students waste a lot of time figuring out how a given rotation wants THEIR paperwork done rather than learning actual information. Enforcement of standardization between clinical blocks as much as is reasonable would help students transition between blocks and spend less time learning the specifics of survival within a specific institution and more about the basic information that will actually be applicable outside of our building. Students often end up getting assessed more on how well they function within the institution/logistics of the institution rather than on how well they are actually applying information that will be useful beyond their tenure in the 4th year.

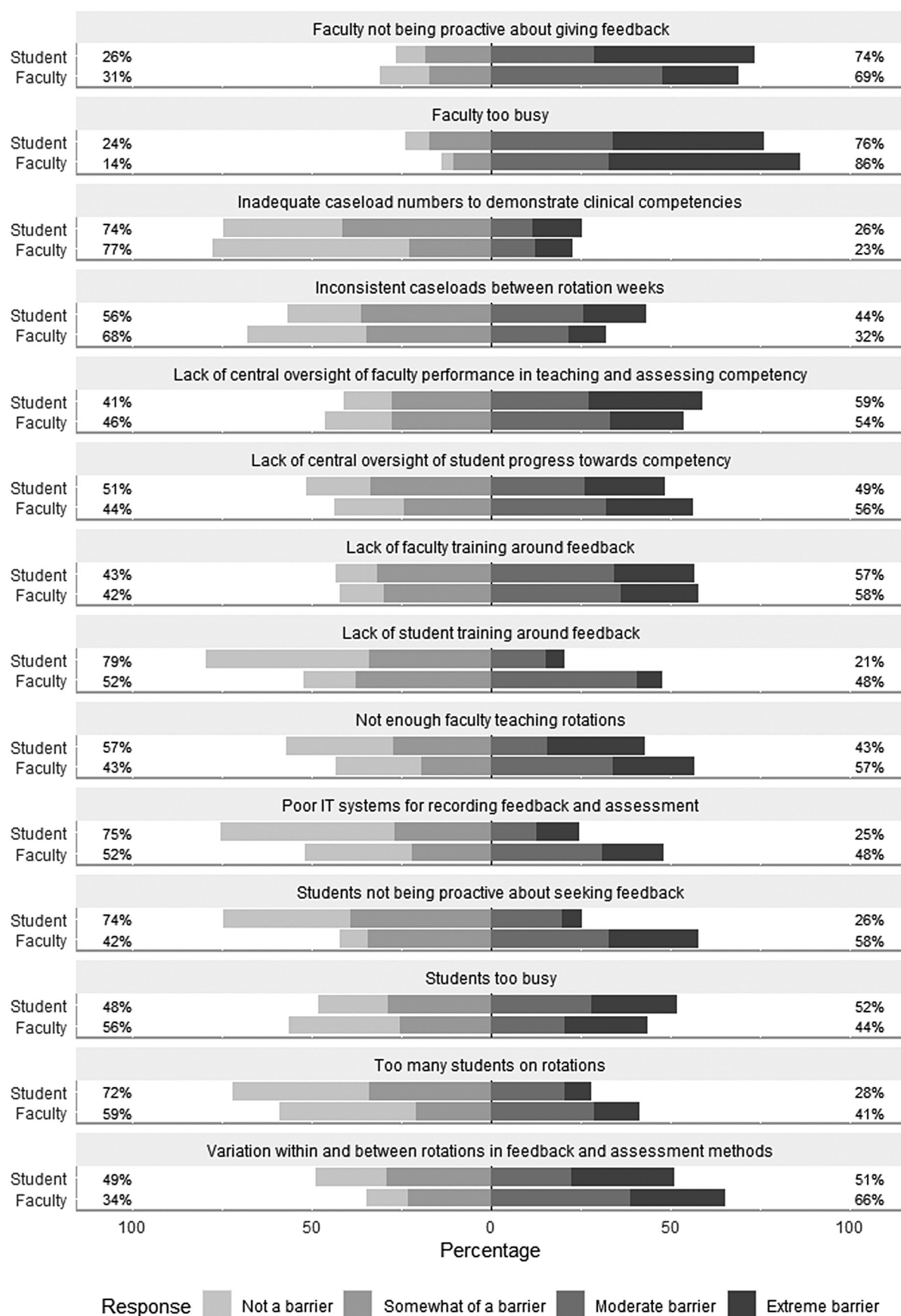


Figure 8: Faculty and student perceptions of barriers to ensuring that students receive valuable feedback on clinical rotations*

*The % value on the left indicates the % of respondents who answered Not a barrier or Somewhat of a barrier while the % value on the right indicates the % of respondents who answered Moderate barrier or Extreme barrier. See Supplementary Tables 6a and 6b for raw data.

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Table 2: Themes and exemplar quotes from faculty-reported barriers encountered in providing students with feedback about their progress

Theme	Exemplar quote
Lack of student awareness that they are receiving feedback	<i>Students don't understand when feedback is being provided in the moment - they don't see everything as feedback, so it gets dismissed</i>
Wrong type of caseloads to assess students	<i>We have the wrong caseload for teaching vet students in the teaching hospital. It is far too advanced and referral based. As a result, students do too much procedure watching and working up zebras to be day-one ready for practice. I can evaluate them on their ability to discuss referral cases and complete test requests, but I don't have the opportunity to evaluate them on the bread-and-butter work of practice.</i>
Inability to fail underperforming students	<i>[Students] know it is nearly impossible to fail out of vet school, so some aren't motivated to seek feedback or even pay attention when it is directly provided. They know they'll just keep getting passed along with the bare minimum.</i>
Assessing students against unrealistic rubrics or standards	<i>If we graded according to the verbiage in our rubric most students would be getting Cs which would cause an uproar. So they get As and Bs and if they read the rubric that goes with that will have an inflated sense of their abilities. SLOs are also not useful. This is check box vs. how well do you do the task. For example, "correctly interpreted a musculoskeletal radiograph". Most students can't actually do this, especially in large animal during the first half of clinics, but we check the box because we sat down and went over the findings on a radiograph with them. Completely useless.</i>
Difficulty collecting feedback from multiple staff	<i>I try to gather staff feedback to incorporate, but they are too busy as well.</i>
Too many competencies to assess	<i>Too many things to assess dilutes out the feedback and makes it take too long to complete delaying feedback at times by some faculty.</i>
Fear of offending students	<i>As faculty, we are screwed no matter what we say - upset the student and you are wrong, even if it was honest.</i>
Inability to follow-up on student performance	<i>We usually do not have the opportunity to follow up with students after we given them feedback in the formal, written format as end of rotation evaluations to know if they implemented and improved their abilities or disregarded the feedback.</i>
Poor memory of student performance	<i>I often cannot remember details how each student performed by the time I write evaluation after each rotation ends.</i>

Concerns were also raised by faculty about the pressure from administration to inflate student grades and pass poor performing students to the detriment of the veterinary profession:

We have catered to student criticism to the point that we are [having to inflate] our grading and are afraid to provide any honest assessment of students for fear of poor review, or more recently harm to student mental well-being. This has resulted in production of less competency on average in our profession. This is clear if you follow any of the social media "vet-to-vet" sites. The practice of poor veterinary medicine decision-making and lack of evidence-based treatment dominates these sites and is frightful. This is what our profession should be truly focused on evaluating!

This sentiment was echoed in the additional comments from students:

The entire grading process in clinics seems like a formality. Unless a student is blatantly compromising patient care, they will be given the scores necessary to graduate regardless of whether they are truly competent or not. I can only imagine this is in part to the school needing to maintain its graduation rates for funding and advertisement, but can also be influenced by faculty availability to adequately assess students (despite that being a primary responsibility when working in a TEACHING hospital) and unwillingness to discuss poor performance or areas to be improved upon with students in fear of hurting feelings.

One of the highlighted challenges to making any institutional change was that many individuals who oversaw curriculum design had poor awareness of the skills students actually need to achieve entry-level competency:

At our institution, we have many teaching experts who do not understand what students need to be competent on day 1. The administration does not understand clinical training...nor, sadly, does the AVMA, who makes all the guidelines and provides expectations.

Many students also reiterated that they were often treated like "children rather than colleagues" on specialty rotations in part because the cases involved complex procedures that were well beyond what they would be expected to perform as new graduate veterinarians:

I have been fortunate to have very "hands on" rotations thus far, but during some of these (such as anaesthesia) I have been able to observe other students on other rotations (such as [internal medicine] and various [surgery] rotations). For the most part, they are not being taught procedures and how to use tools, such as orthopaedic repairs and endoscopy, and are merely glorified paperwork monkeys there to write up a report and summary after someone else does the work or procedure. I don't expect to be taught how to perform a kidney transplant, but many other procedures are very relevant to general practice. We spend too much money to be relegated to bandage changes and punching keyboards.

Table 3: Themes and exemplar quotes from student-reported barriers encountered in providing students with feedback about their progress

Theme	Exemplar quote
Inadequate opportunities to demonstrate growth from feedback	<i>The only barrier I have experienced clinical year is from feedback after the rotation has finished. It doesn't really help to get feedback once the rotation has finished because then I am unable to adjust in time to get the most out of the rotation. Most [faculty] will not write any feedback nor tips to improve the score you received and there are no opportunities to refute scores based upon misunderstandings</i>
Lack of clear expectations for student performance	<i>I felt that often expectations were not made clear and after the rotation I would receive feedback saying how much more I could have been doing, but those opportunities were never made clear to me</i>
Fear of asking for feedback with the power dynamic between students and faculty	<i>There is a power dynamic between students and teachers that makes it difficult for us students to give feedback and ask for feedback without fearing repercussions</i>
Too many instructors involved in providing feedback and assessment	<i>On some rotations we are graded by the head clinician who was not even on the rotation. I am sure that the input is from the other clinicians, residents, & interns, but it makes it difficult to assess how much I actually need to grow vs how much was due to lack of observation. [There are] too many different instructors (multiple residents and faculty) switching every week. Not many instructors have the opportunity to monitor students' progress over more than 1 week</i>
Competition with interns and residents for caseloads	<i>Having many interns on a rotation with small caseloads can take away some opportunities from the students performing some of the tasks.</i>
Clinician biases towards particular students	<i>There is a lot of bias on clinics. If you get along well with the clinicians/residents on the rotation and they like your personality, you will receive better feedback and a better grade.</i>
Faculty unable to remember students they are assessing	<i>Clinical supervisors often don't remember us well enough to give us useful feedback. We often get specific comments that were clearly meant for a different person. Faculty [often] mix up students - especially those that may look relatively similar.</i>
Feedback delivered in a hostile or critical manner	<i>Interns and residents did not maintain professional teaching abilities and regularly talked negatively towards students. It was very difficult to learn because the hospital is hostile.</i>
Faculty who do not care about providing students with feedback	<i>Faculty just fill out our evaluations with no care or investment into the student. It's just another box to check for most faculty members and [some] just don't want students there.</i>
Practice of scaling grades in a manner that does not reflect student performance	<i>So many rotations don't believe in giving 4.0 so they give feedback saying that I'm doing great only to take away points in all categories. I don't understand how that is supposed to help me improve or how I am expected to continue to work hard to improve and perform well when I am being taught that no matter how hard I try I will never be good enough. [There is] nothing worse than getting a B but not being told why or hearing that the dean forbids an A unless you want to specialize.</i>

DISCUSSION

Findings from this study highlight that veterinary schools worldwide face many similar challenges with being able to provide students with adequate feedback and assessment on rotations to ensure that they have achieved entry-level competency by graduation. We acknowledge that our study sample was likely biased towards faculty who are more enthusiastic about clinical teaching and students who had either very positive or very negative experiences on final-year rotations. Furthermore, the study was conducted during the COVID-19 outbreak when faculty at veterinary schools were under additional workload pressures and there were significant disruptions to the normal delivery of final year clinical rotations. Some caution must therefore be taken in making inferences about prevalence of issues raised by this study given that the sample is likely not fully representative of the general population of faculty and students at veterinary schools. However, we believe that the general trends are still robust and emphasise important knowledge gaps to focus on with future research studies.

At the time of completing the survey, most students who responded were nearly finished with their final year rotations and therefore expected to have broad experience with different methods for receiving feedback and assessment in clinical settings. A common theme across all survey sections was that students felt they gained the most educational value from clinical experiences where they were given primary case responsibility with adequate support from supervising clinicians to discuss the strengths and weaknesses in how they approached case management. However, many students reported that they often spent more time performing basic administrative and patient care tasks on their rotations through the veterinary teaching hospital rather than being involved in clinical decision-making and performing medical or surgical procedures. This was partly attributed to the teaching hospital caseloads being skewed towards complex referral cases that required advanced clinical skills beyond entry-level expectations, but also a reflection of wider systemic issues with the current methods of delivering final year clinical teaching.

In most veterinary educational programs, final year rotations are delivered in 1–4 week blocks that are distributed across various clinical services and often have multiple interns, residents, and faculty involved in supervising students. The short duration of the rotations means that students have a very limited window to develop and demonstrate their skills, especially when it may take several days for students to acclimatize to the different work environment and expectations of the particular service.

Having multiple clinical supervisors can also make it more difficult to effectively monitor student progress over the course of the rotation. The problem is further compounded by the current systems for providing students with feedback and assessment. Approximately 40% of students reported that the main feedback they received from faculty was in the form of summative, written end-of-rotation evaluations that were provided several weeks to sometimes months after the rotation had finished. The feedback was considered relatively useless at this stage because faculty often did not remember enough about student performance to provide meaningful comments and there were also no follow-up mechanisms in place to ensure students took action to address any issues that were noted.

Similar to previous studies, faculty and student respondents indicated that feedback is most valuable when it is delivered verbally in-the-moment as soon as possible after a clinical experience.¹⁵ It was interesting to note that faculty indicated that about 45% of all feedback they provided was verbal whereas students indicated that it was closer to 28% on average. One possible explanation is that the faculty who responded to our survey were more motivated teachers than the average teaching hospital clinician and were providing better quality feedback to their students. However, other possible explanations are that students may not recognize that the discussions they are having with a clinician are providing feedback or that faculty may not recognize that the discussions they are having with students are not actually providing feedback in a form that is recognisable as such by students. This disconnect could be addressed by clearly signposting to students at the beginning of a conversation that they are about to be receiving feedback on their performance. One problem with such signposting is that other students, staff, clients, and/or faculty may be present, which raises a question of privacy rights and the potential semi-public embarrassment of anything other than a glowing evaluation.

The most common contexts for evaluating student performance on rotations were through observing students performing clinical tasks or through reviewing medical records from their clinical cases. Other formats such as using simulated patients or clients, having the students generate materials to demonstrate their competency, or administering standardized examinations, were on balance never or only occasionally used. While it is ideal to be evaluating final year students in real-world clinical settings, there can be significant challenges with ensuring that students are exposed to sufficient and consistent caseloads to allow fair assessment across an entire class.¹⁶ Large animal caseloads can be quite seasonal making these student experiences quite variable. Some veterinary schools have addressed this by having students practice more in the clinical skills lab before being allowed to perform procedures on live patients to maximize the learning opportunities from limited caseloads. With the increasing sophistication of online learning platforms as well as the necessity born out of the COVID-19 pandemic

response, many veterinary schools have also started to explore the use of virtual case scenarios to supplement student learning experiences on clinical rosters. Some published examples include developing a virtual veterinary emergency clinic¹⁷ or a portfolio of small animal internal medicine cases.¹⁸

Both faculty and student respondents rated faculty being too busy as the main barrier to ensuring that students receive valuable timely feedback on rotations. Given that one of the primary functions of a veterinary teaching hospital is to support student learning, this finding suggests the need to adjust clinic workflows to ensure that faculty have adequate time to provide students with feedback and to explore different models for delivering feedback and assessment that can deliver better quality outcomes with fewer staff resources. One possible avenue is encouraging students to take a more active role both in seeking out feedback as well as documenting feedback.¹⁹ Approximately 60% of faculty in our survey thought students not being pro-active about seeking feedback was a moderate to extreme barrier to ensuring that students receive valuable feedback on rotations compared with 26% of students. In one study that compared student satisfaction with feedback during clinical encounters, student transcription of verbal feedback onto standardized templates was found to be no different in quality than having faculty complete the sample templates.²⁰ However, it is important to note that some students may feel uncomfortable interrupting clinical workflows to ask for feedback out of concerns that they may be marked down or perceived negatively by their assessors or their peers.²¹ Furthermore, high-performing students are more likely to seek out feedback than low or average performing students, who would be more likely to benefit from feedback.²²

There has also been growing interest in exploring opportunities for engaging other assessments, including self-reflective activities, peer and support staff evaluations, and client comments in the process of evaluating students. According to the results from our survey, most feedback and assessment is currently being provided by veterinarians only. Faculty also appeared to underestimate how often students rely on self-evaluation of their performance, with 77% of students ranking self-reflection on their performance as their top choices compared with only 28% of faculty. One possible explanation is that our study sample was biased towards more motivated and engaged students. While self-reflection has been identified as an important tool for helping students think critically about their performance and take positive steps towards self-improvement, care must be taken in using the self-determined scores for assessment purposes due to the Dunning-Kruger effect, whereby individuals with the least competence tend to be more likely to overestimate their skills.^{23,24}

When asked to rank various methods that students used to benchmark their progress, feedback from rotation evaluations were the highest ranked for both groups. Faculty appeared to overestimate the value of standardized checklists, with 52% of faculty ranking them as their top choices compared with only 12% of students. In the free-text comments several students and faculty expressed concerns that checklists were often used simply as box-ticking exercises with limited value in ensuring that students have achieved competency. When veterinary students were previously surveyed about their opinions towards the use of checklists, most appreciated having a framework for knowing what skills they needed to master by graduation, but cited the lack of opportunities to practise these skills due

to variable caseloads on clinical rotations, the lack of clarity around knowing when they had mastered the skills, and issues with clinical supervisors not allowing students to perform procedures as significant limitations to using checklists for tracking progress towards achieving entry-level competency.²⁵ Many of our survey respondents did not like assigning letter grades for similar reasons. Although concerns have been raised that eliminating letter grade systems may reduce student motivation, previous research has shown that pass-fail grading systems are as effective as letter grades on clinical rotations since many students report their main intrinsic drivers for improvement as providing good patient care and being successful in practice rather than wanting to compete against their classmates.²⁶ Further research is also needed to determine whether diminishing the use of letter grading on clinical rotations has an impact on students' candidacies for academic internships, residencies, and graduate programs until or unless those programs emphasize factors other than grades and class rank in their candidate evaluation processes.

Another significant issue raised by faculty in the free-text comments was around how to manage underperforming students. Some faculty reported that they felt uncomfortable giving negative feedback out of fear that students would perceive it as a personal attack while others reported that they were actively discouraged from failing students by school administrators because of the time and hassle involved. In previous studies from the medical literature, the four main reasons for failure to fail were lack of documentation, lack of knowledge about what to document, anticipation of an appeal, and lack of remediation options.^{27,28} In a more recent study of veterinary educators, other reported reasons included faculty perceptions that their own teaching and skills were inadequate or that the assessment frameworks they were using were inappropriate for documenting poor student performance.²⁹ Providing faculty with additional training around giving constructive feedback and establishing clearer guidelines around the criteria and processes for failing students is an important step for ensuring that unsafe students are prevented from graduating until they can demonstrate basic competency.

One of the key advantages of the AAVMC CBVE Model is that it is heavily focused on student progression towards achieving entry-level competency and encompasses non-technical domains of competence required to be a successful veterinarian, including communication, collaboration, professionalism, and financial management, that have not traditionally been included and evaluated in veterinary curricula. The faculty who responded to our survey had higher self-reported awareness of the AAVMC CBVE Model than the students who responded. This difference is not surprising given that relatively few AAVMC member institutions are currently implementing the AAVMC CBVE Model within their curricula and that most efforts to raise awareness of CBVE have been targeted at faculty rather than students through avenues such as email newsletters, conference workshops, and virtual town hall meetings.

Several interesting trends emerged from the question asking students and faculty to rate their current level of confidence in student mastery of the AAVMC CBVE domains of competence and EPAs. For the competency domains, students and faculty ranked student performance as being the highest for professionalism and professional identity, collaboration, and communication. However, students gave themselves

significantly higher ratings in these areas compared with faculty. While this finding again may reflect biases in our study sample, there may also be issues with how these domains are currently being assessed. Although there have been an increasing number of published studies on evidence-based approaches for evaluating communication skills,³⁰⁻³² there is still a paucity of tools for evaluating professionalism and collaboration and there are some challenges to evaluating communication skills on rotations. For example, students and staff who are non-native speakers of the instructional language can struggle more with general communication³³ or may hold back from participating in group discussions out of concerns that they will use incorrect terminology, which may be perceived by assessors that students have a lack of knowledge or understanding about the subject.³⁴ Furthermore, there may be other cultural differences that influence a student's ability to engage in small talk or to interject in group conversations, which may again generate perceptions that the student is unable to work effectively in team environments.³⁵ Further research is needed to determine the best ways of providing feedback for these domains. We also found that faculty rated the usefulness of feedback provided for financial management, public health, and scholarship the lowest compared with other competencies. However, it is unclear whether this faculty observation reflects issues with the current assessment frameworks or whether these domains were not often focused on within the context of standard clinical rotations. This suggests that not all competencies in the CBVE framework are suited for evaluation in the clinic and may therefore require alternate times and assessment types to ensure that students have appropriate standards. In contrast, there was very little variation in how faculty and students rated the usefulness of feedback given with regards to EPAs, which may be related to the fact that they cover common aspects of clinical case management that students routinely encounter on rotations and are potentially more generally understandable to practicing clinicians.

One of the key limitations of this survey was that there were insufficient faculty and/or student survey responses from the same institutions to assess how well student perceptions around feedback and assessment matched faculty perceptions within the same clinical teaching environment. Just as students suffer from the Dunning-Kruger effect, it is also possible that veterinary teaching staff have poor ability to assess how well they are supporting students, which highlights the need to develop and implement better systems for providing faculty with feedback on how they provide feedback to students. Our survey was also targeted towards faculty working within teaching hospitals, but we recognize that many universities operate a distributive clinical rotation model where students complete part (if not all) of their final year clinical training in private veterinary practices.³⁶⁻³⁹ The primary advantage is that students are exposed to working environments and caseloads that are more similar to what they will likely encounter in their first employment position, which is received favorably by students.⁴⁰ However, concerns have been raised that students may not get as much hands-on experience since some veterinary clinics are uncomfortable with letting students perform procedures on client-owned animals⁴¹ and some veterinarians may not have sufficient experience with teaching to provide students with meaningful feedback.⁴² Future research studies on feedback and assessment on final year rotations should aim to include this group.

CONCLUSIONS

Overall, the survey findings highlighted that there is considerable variation within and between veterinary schools in how students are provided with feedback and assessed on their performance during final-year clinical rotations. This likely creates challenges both for monitoring student progression towards entry-level competence over the course of their final year and for comparing student outcomes across the different veterinary schools. Non-traditional entry level competencies like professionalism, collaboration, communication, and ability to retrieve evidence appeared to be particularly difficult to assess, which was reflected in discrepancies in how faculty and students gauged student performance in these areas. In addition to ensuring that students are given adequate opportunities to take primary responsibility for clinical cases in the teaching hospital so they can be assessed for competency, there is also a clear need to provide faculty and students with better training on how to give and receive feedback as well as standardizing methods of assessment. Further research is needed to explore whether the current systems for providing students with feedback and assessment on final year rotations are adequate for ensuring that new graduates have entry-level competency to function safely and effectively in clinical practice.

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AUTHOR INFORMATION

M. Carolyn Gates, BSc, VMD, PhD, SFHEA (ID 0000-0002-7790-1945), is Professor of Evidence-Based Veterinary Practice, School of Veterinary Science, Massey University, Private Bag 11-222 Palmerston North, 4442, New Zealand. Email: c.gates@massey.ac.nz. Her research interests include peer learning, blended learning, clinical assessment, curriculum design.

Jared A. Danielson, MS, PhD (ID 0000-0002-3657-3412), is Senior Associate Dean for Academic and Student Programs, Success, and Innovation, College of Veterinary Medicine, Iowa State University, 2270F Vet Med 1800 Christensen Drive, Ames, IA 50011-1134 USA. His research interests include veterinary education.

Katherine Fogelberg, DVM, PhD (Science Education), is Associate Dean for Professional Programs and Professor, Population Health Sciences, Virginia-Maryland College of Veterinary Medicine, 245 Duck Pond Dr Blacksburg, VA 24061 USA. Her research interests include faculty professional development, global public health, education.

Jonathan H. Foreman, DVM, MS DACVIM-LAIM (ID 0000-0002-9305-6120), is Professor, Equine Medicine and Associate Dean, Academic and Student Affairs, Department of Veterinary Clinical Medicine, University of Illinois, 2001 South Lincoln Avenue, Urbana, IL 61802 USA. His research interests include exercise physiology and veterinary curriculum development.

Jody S. Frost, PT, DPT, PhD, FAPTA, FNAP (ID 0000-0002-0430-092X), is Immediate Past President, National Academies of Practice, Education Consultant and Facilitator, 198 Harbor Drive, Lusby, MD 20657 USA. Her research interests include assessment, interprofessional education, interprofessional practice, competency-based education.

Jennifer L. Hodgson, BVSc, PhD DACVM (ID 0000-0002-5199-7205), is professor, Population Health Sciences, Virginia-Maryland College of Veterinary Medicine, 245 Duck Pond Dr Blacksburg, VA 24061 USA. Her research interests include veterinary education, curricular design and development.

Susan M. Matthew, PhD BVSc (Hons), BSc (Vet) (Hons) GradCertEdStud (HigherEd) (ID 0000-0003-0683-5976), is Berger Keatts Distinguished Professor and Associate Chair of Veterinary Medical Education, Professor and Associate Chair of Veterinary Medical Education, Department of Veterinary Clinical Sciences, College of Veterinary Medicine, Washington State, PO Box 646610, Pullman WA 99164-6610 USA. Her research interests include veterinary education and professional practice.

Emma K. Read, DVM, MVSc, DACVS ( [0000-0002-3714-2278](https://orcid.org/0000-0002-3714-2278)), is Associate Dean for Professional Programs in the Office of Professional Programs, College of Veterinary Medicine, The Ohio State University, 127E Veterinary Medicine Academic Building, 1900 Coffey Road, Columbus, OH 43210 USA. Her research interests include assessment, clinical skills teaching and learning, simulation, and curriculum design.

Regina Schoenfeld-Tacher, PhD ( [0000-0003-1884-0270](https://orcid.org/0000-0003-1884-0270)), is Professor of Veterinary Education Development, Molecular Biomedical Sciences Department, NCSU College of Veterinary Medicine, 1060 William Moore Drive, Raleigh, NC 27607 USA. Her research interests include veterinary education.