Optimizing Veterinary Practice Economics: The Impact of Mid-Level Practitioners on Revenue, Profitability, and Workforce Efficiency

David M. Smith
Pepperdine University

James W. Lloyd
Animal Health Economics, LLC

Donna L. Harris
Michigan State University

This study examines the economic effects of integrating Veterinary Professional Associates (VPAs), a mid-level practitioner role, into companion animal veterinary practices. In the context of a veterinarian shortage, we investigate how VPAs can boost efficiency, productivity, and financial performance. Using a mixed-methods approach, combining over 40 interviews with a partial budget model, we estimated the impact of adding one full-time VPA to a 3.5-veterinarian practice. Our model projects an annual revenue increase of $566,500 and a net profit increase of $177,850. These gains result from optimizing labor by shifting routine tasks to VPAs and allowing veterinarians to focus on higher-value activities. The study provides empirical evidence for the economic benefits of introducing mid-level practitioners in veterinary healthcare, offering insights into workforce optimization in labor-constrained markets.

Keywords: healthcare economics, labor shortage, productivity, workforce optimization

INTRODUCTION

The veterinary medical profession faces a significant challenge: a growing demand for services juxtaposed against an insufficient supply of veterinarians (Gitter & LaFayette, 2024; Lloyd, 2021, 2022, 2023). This imbalance has led to a pronounced shortage, resulting in uneven access to care across various sectors, including companion animal, food animal, and equine practices, as well as public practice, industry, and academia. This shortage, while seemingly acute, has been a persistent issue (Willis et al., 2007). To address this, proposals have emerged to not only expand educational programs for veterinarians and veterinary nurses/technicians but also to introduce a new category of professionals: the mid-level provider (Lloyd, 2023). This supply and demand imbalance has significant economic implications, affecting market prices for veterinary services, resource allocation within the healthcare sector, and the overall efficiency of veterinary care delivery.

In 2009, faculty at Colorado State University's College of Veterinary Medicine and Biomedical Sciences first recommended the implementation of a mid-level provider, or Veterinary Professional

Associate (VPA), to bridge the gap between veterinary nurses/technicians and veterinarians (Kogan & Stewart, 2009). Inspired by the role of physician assistants in human medicine, this concept has garnered support from numerous authors (Chadderdon et al., 2014; Fults et al., 2021; Yagi & Fults, 2021). This research investigates the potential of VPAs to alleviate workforce pressures and enhance service delivery within the veterinary sector. Specifically, we aim to identify potential VPA roles and responsibilities and to estimate their impact on workflow, productivity, and financial performance in companion animal general practices. We employ a partial budget model to analyze the incremental costs and benefits of integrating VPAs, focusing on key economic variables such as revenue generation, cost structures, and profitability. This study contributes to the economic literature on healthcare workforce optimization by providing quantitative insights into the potential of a mid-level provider model to address a labor capacity problem.

LITERATURE REVIEW

The principle of division of labor and specialization, a cornerstone of classical economics, provides the theoretical foundation for analyzing the potential efficiency gains from task shifting in healthcare. This principle suggests that decomposing complex processes into specialized tasks enhances productivity. In healthcare, task shifting allocates tasks to providers based on their comparative advantage, optimizing resource utilization. For instance, physicians can focus on complex diagnoses and advanced treatments, while other healthcare professionals, such as nurse practitioners and physician assistants, manage routine care and preventive services. This specialization provides the opportunity to increase labor productivity, expand service capacity, and improve access to care.

Empirical studies within the human medicine literature reveal that mid-level providers (MLPs), such as nurse practitioners (NPs) and physician assistants (PAs), have demonstrated positive impacts on productivity and patient outcomes. A significant body of research suggests that MLPs can significantly enhance primary care capacity, resulting in improved patient care, increased appointment availability, and increased practice profitability (Medical Economics, 2014). Data from the Medical Group Management Association supports the positive correlation between MLP employment and improved financial performance in human medical practices (Weldon, 2014). One study investigated the economic benefits of employing physician assistants (PAs) in family and general medicine practices by analyzing the tasks performed by PAs, comparing their productivity with national averages, and calculating the financial implications of a PA practice compared to a physician-only practice. Estimates revealed a same-task substitution ratio of 0.86 compared to the supervising physician and a compensation-to-production ratio of 0.36. This suggests that a PA can perform 86 percent of physician tasks in this setting, and for every dollar of revenue generated by the PA, 36 cents were spent on their compensation. Compared to a practice employing a full-time physician, a practice employing a full-time PA experienced a positive financial increase of $52,592 (Grzybicki et al., 2002).

The advantages of MLP integration extend beyond financial gains. A comprehensive review of four decades of research on PA utilization in US emergency departments reveals that these providers, working collaboratively with physicians, have been instrumental in meeting the escalating demand for patient care while achieving favorable patient satisfaction scores (Hooker et al., 2010). MLPs can effectively manage lower acuity cases and address gaps in areas such as telehealth and routine care, thereby allowing physicians to focus on more complex medical issues. A review of randomized controlled trials across multiple countries corroborates these findings, concluding that MLPs enhance patient care, cost-effectiveness, efficiency, and overall patient satisfaction with the quality of care (Htay & Whitehead, 2021).

Studies also reveal that successful MLP integration requires careful planning and execution. The World Health Organization, advocating for the deployment of MLP to improve global healthcare access and affordability, emphasizes the need for adequate training, support, recognition, and compensation, as well as the effective integration of MLP within the healthcare system (World Health Organization, 2017). The optimal deployment of MLPs necessitates their inclusion in the planning process for both general and specialized health practices (“Elements of Successfully Integrating a Mid-Level Provider Into Practice,” 2005).

Employing MLPs also introduces new costs. For Physician Assistants, all states require a supervisory relationship with a licensed physician. In addition to salary and benefits, communication and coordination costs will likely increase as MLPs collaborate with physicians (White et al., 2017). These costs may be particularly pronounced in solo physician practices, potentially negating the benefits of MLP integration (Dobson et al., 2009; Thornton, 1998). Therefore, proper planning and careful implementation are essential, especially within smaller practices, to fully realize the potential benefits of employing MLPs.

Mirroring the trends observed in human medicine, the deployment of mid-level practitioners, such as Veterinary Physician Assistants (VPAs), in veterinary settings may offer comparable benefits. The increasing demand for veterinary services, coupled with a limited supply of veterinarians (AAVMC, 2022), has resulted in escalating costs for veterinary care.[1] The introduction of VPAs could alleviate this excess demand and mitigate rising costs. Similar to their human medicine counterparts, VPAs could expand appointment availability and practice hours, leading to increased profitability, improved access to care, and enhanced patient outcomes. This potential remains even within the existing framework of current veterinary supervision requirements, as outlined in state legislation. The next section of this paper will detail our methodology for investigating the implementation of a VPA within a general small animal practice.

METHODS

This study employed a qualitative approach, utilizing semi-structured interviews to explore the potential integration and impact of a mid-level practitioner within the veterinary profession. Two rounds of interviews were conducted. The first round focused on gathering high-level perspectives from the 2022-23 Lincoln Memorial University Richard A. Gillespie College of Veterinary Medicine Advisory Board, aiming to review background information regarding expected roles and responsibilities and to identify relevant veterinary practice types for analysis. The research presented here focuses on general veterinary practices, although specialty and shelter practices were also explored during the interviews. This initial phase also served to identify individuals with operational knowledge of practice types for subsequent interviews. The second round of interviews delved deeper into the mid-level practitioner's workflow impacts and potential contributions, emphasizing gathering structured insights and quantitative data points for model building. Participants in this phase were asked to reflect on specific roles and responsibilities, staffing levels, compensation strategies, and key performance indicators (KPIs) to monitor the impact of the mid-level practitioner. Pre-circulated background materials guided both rounds of interviews to ensure a common understanding of the research context. The interview protocols were designed to elicit broad perspectives and specific, actionable insights on the operational integration and economic implications of introducing a mid-level practitioner role within veterinary practices. In total, over 40 interviews were conducted with industry leaders and practice owners. These interviews included the foundation for the scenarios to be modeled. Interview scripts and background information are included in Appendix 1.

A partial budget model is developed to assess the potential impact of the Veterinary Practice Associate (VPA) on the financial performance of practices. This approach utilizes a planning and decision-making framework to compare the costs and benefits of alternatives faced by a business, focusing solely on changes in income and expenses resulting from implementing a specific alternative, holding other factors constant (Penn State Extension, 2023). The model includes the anticipated workflow impacts of adding one full-time equivalent (FTE) VPA to a companion animal practice, including the effects on productivity and efficiency. Model results provide estimates of profitability for various related scenarios. The robustness of these estimates is evaluated through sensitivity and scenario analyses centered on key underlying assumptions. Sensitivity analysis assesses the impact of changes in a model's inputs on its final results, highlighting the relative importance of underlying assumptions and identifying potential hidden vulnerabilities. Scenario analysis expands the model beyond a single-point forecast, exploring different plausible future scenarios, each with its own set of assumptions on time allocation and workflow productivity.

The general practice model contains specific assumptions related to roles, responsibilities, and impacts on the workflow of hiring one FTE VPA.[2] These model parameters were defined through second and third-

level interviews, extending beyond the LMU-CVM Advisory Board, which involved veterinary professionals actively engaged in the general practice sector. Using sector-specific factors enables the capture of the expected impact of one FTE VPA on productivity and profitability.[3]

MODEL AND ESTIMATES

We develop a model to analyze the impact of integrating Veterinary Professional Associates (VPAs). This model is grounded in microeconomic theory, with a specific focus on the firm's production function, labor demand, and revenue maximization. A partial budgeting approach is used as it allows us to isolate the effects of VPA integration within the veterinary services market, holding other factors constant. This approach is consistent with standard microeconomic analysis of specific markets and builds on the theoretical framework of firm production functions (Cobb & Douglas, 1928) and labor demand theory (Hamermesh, 1993). We conceptualize the veterinary practice's output (Q) as a function of veterinarian labor (L^{DVM}), VPA labor (L^{VPA}), non-DVM staff ($L^{Non\text{-}DVM}$), and capital (K): $Q = f(L^{DVM}, L^{VPA}, L^{Non\text{-}DVM}, K)$. The introduction of VPAs is hypothesized to alter the marginal productivity of other labor inputs, potentially leading to an overall increase in output.

Interview data provided insights into typical appointment lengths, service prices, and time allocation, which were then used to parameterize the model. Specific quantitative assumptions regarding anticipated impacts on workflow and efficiencies informed patient care roles. It is also acknowledged that the introduction of a VPA would likely have a positive effect on practice leadership. However, this would be not easy to measure, and it is left to consider from a qualitative standpoint. A prototype practice is used to represent a typical general practice based on data from a 3.5 FTE DVM, full-service companion animal practice in the Midwest.

Key assumptions included the legal delegation of activities to a VPA, which is crucial as it defines the scope of VPA labor and the substitutability or complementarity between DVM and VPA labor inputs, thereby affecting the firm's labor demand. Additionally, sufficient client demand was assumed to support increased workflow. The latter implies an excess demand curve for veterinary services, allowing the practice to absorb the increased capacity without a decrease in prices. Average Client Transaction (ACT) refers to the average revenue generated per client visit for each type of service. Table 1 presents the key prototype practice parameters, including the ACT for various services and the baseline workflow allocation of DVM time. These parameters serve as the basis for the pre-VPA scenario.

TABLE 1
OVERALL PRACTICE PARAMETERS AND VETERINARIAN WORKFLOW

OVERALL PRACTICE PARAMETERS	
DVM Appointment Weeks Per Year	50
Average client transaction (new patient visit)	$170
Average client transaction (recheck)	$50
Average client transaction (preventative care)	$125
Average client transaction (urgent care)	$200
Average client transaction (surgery)	$400
Ave length of new patient visit (min)	30
Ave length of recheck visit (min)	10
Ave length of preventive care visit (min)	20

OVERALL PRACTICE PARAMETERS	
Ave length of urgent care visit (min)	30
Ave length of surgery (min)	30
CURRENT DVM WORKFLOW	
% of DVM FTE spent with new patients	10%
% of DVM FTE spent with rechecks	10%
% of DVM FTE spent on preventive care	30%
% of DVM FTE spent with urgent care	15%
% of DVM FTE spent in surgery	25%
% of DVM FTE spent in comm + admin	10%

Table 2 presents the baseline labor input of a full-time equivalent (FTE) veterinarian, measured in weekly hours, and the corresponding output in terms of the number of appointments and revenue generated. This represents the pre-VPA scenario, and this table quantifies the initial production function of the veterinary practice, where DVM labor is a primary input. The annual number of appointments is derived by multiplying the weekly hours allocated to each activity by 50 weeks per year and then dividing by the average length of each appointment type (as shown in Table 1). The percentage time allocations are based on data obtained through interviews with practice owners. The revenue values in Table 2 represent the firm's output, which is a function of the labor input (DVM time) and the price of each service (Average Client Transaction from Table 1). This table illustrates the initial level of production and revenue, serving as the benchmark against which the impact of VPA integration will be measured.

TABLE 2
VETERINARIAN TIME ALLOCATION (FTE BASIS) AND REVENUE GENERATION (PRE-VPA)

DVM FTE ALLOCATION (PRE-VPA)			DVM REVENUE (PRE-VPA)	
Activity Type	**Avg Hours/Wk**	**% Time**	**No. of Appts**	**Revenue**
New Patient	4.0	10.0%	400	$68,000
Recheck	4.0	10.0%	1,200	$60,000
Preventative	12.0	30.0%	1,800	$225,000
Urgent	6.0	15.0%	600	$120,000
Surgery	10.0	25.0%	1,000	$400,000
Communication + Admin	4.0	10.0%	n.a.	n.a.
VPA Supervision	n.a.	n.a.	n.a.	n.a.
Totals	40.0	100%	5,000	$873,000

Table 3 presents the key assumptions regarding the labor input of the Veterinary Professional Associate (VPA). These assumptions are critical in modeling the VPA's role as a distinct labor input and its interaction with existing veterinarian (DVM) labor. These assumptions inform the substitution and complementarity relationships between DVM and VPA labor in the veterinary practice's production function. The

requirement for veterinarian supervision of employees with less training, such as veterinary technicians, is mandated in most legislative practice acts. We estimate that this will require approximately 10 percent of the veterinarian's time, based on data derived from our interviews, which has implications for the optimal allocation of DVM time and the overall cost of VPA integration.

The allocation of VPA time across different types of services reflects the task-shifting hypothesis. We assume VPAs primarily handle routine and less complex cases (rechecks, preventive care, and some urgent care), while DVMs focus on more complicated procedures and new patients. The assumption that 30% of VPA FTE is spent on administrative and management tasks acknowledges the potential for VPAs to contribute to practice management and administrative efficiency, which can indirectly enhance overall productivity. Delegating 50% of FTE DVM administrative and management tasks to VPA assumes that VPA can take on some administrative tasks, thereby freeing up DVM time for clinical activities. These assumptions directly impact the estimated output and revenue generated by the VPA and, consequently, the overall profitability of the practice. The assumptions about DVM supervision time impact the net increase in available labor input, as DVMs allocate some time to supervising rather than directly providing services. We acknowledge that these assumptions may vary across different practices and geographic locations. However, they are based on information and insights gathered from interviews with practice owners and serve as a baseline for our model. The sensitivity analysis discussed later in the paper explores the impact of varying these assumptions on the model's results, particularly concerning VPA compensation and DVM supervision time.

TABLE 3
VPA WORKFLOW ASSUMPTIONS

VPA WORKFLOW PARAMETERS		
VPA Work Weeks/Year (per FTE)		50
VPA Hours/Week (per FTE)		40
% of VPA FTE spent with new patients		0%
% of VPA FTE spent on rechecks		15%
% of VPA FTE spent on preventive care visits		35%
% of VPA FTE spent on urgent care visits		20%
% of VPA FTE spent doing surgery		0%
% of VPA FTE spent in comm + admin + leadership		30%
DVM Efficiency Factors	% FTE DVM in VPA supervision	10%
	% of FTE DVM comm and admin delegated to VPA	50%

Table 4 illustrates the reallocation of labor inputs (DVM and VPA time) after the integration of one FTE VPA. This table represents how task shifting enables the more efficient utilization of both DVM and VPA labor, potentially leading to increased overall productivity. This table illustrates the new labor input mix, reflecting the division of labor between the DVM and VPA following VPA integration, and how this affects the practice's production function.

The increase in DVM time allocated to new patients and surgery is based on the fact that these activities generate higher revenue and require the specialized skills of a veterinarian. This reallocation reflects a firm's profit-maximizing behavior, shifting resources to higher-value activities. The allocation of VPA time to rechecks, preventive care, and some urgent care aligns with the task-shifting hypothesis. By assigning routine and less complex tasks to the VPA, the model assumes that DVMs can focus on more complicated cases, thereby increasing overall productivity. The 4 hours per week allocated to DVM supervision of the

VPA represents the regulatory environment related to DVM supervision. This supervisory role is a necessary input for VPA integration and affects the net increase in available labor input.

This reallocation is expected to alter the marginal productivity of both DVM and VPA labor. By focusing on more specialized tasks, the DVM's marginal productivity is hypothesized to increase. Similarly, the VPA's focus on routine care allows them to increase their productivity in those tasks. The assumption that fees do not vary between VPA and DVM services simplifies the model, focusing on the impact of task shifting rather than differential pricing. This assumption is based on the notion that clients value the service provided, regardless of whether it's delivered by a DVM or VPA, as long as quality is maintained. The optimal labor allocation may vary depending on the practice's size, location, clientele, and the specific skills and preferences of the DVMs and VPAs. Therefore, the results presented here should be considered a prototype scenario rather than a general prediction.

TABLE 4
TIME ALLOCATIONS WITH VPA

FTE ALLOCATIONS WITH VPA				
	DVM WITH VPA		VPA	
Activity Type	Avg Hours/Wk	% Time	Avg Hours/Wk	% Time
New Patient	6.0	15.0%	0	0.0%
Recheck	2.0	5.0%	6.0	15.0%
Preventative	4.0	10.0%	14.0	35.0%
Urgent	8.0	20.0%	8.0	20.0%
Surgery	14.0	35.0%	0	0.0%
Communication + Admin	2.0	5.0%	12.0	30.0%
VPA Supervision	4.0	10.0%	n.a	n.a.
Totals	40.0	100.0%	40.0	100.0%

To understand how financial outcomes might change within a model of VPA integration, it is essential to define the cost structure of a general veterinary practice. Based on information derived from our interviews with industry leaders and practice owners, general cost assumptions included in the model are exhibited in Table 5. The percentages for Cost of Goods Sold (COGS), non-DVM staff, and DVM compensation serve as proxies for the typical cost structure of a general veterinary practice. These ratios reflect the relative importance of input costs (COGS), support staff (Non-DVM), and professional labor (DVM) in the production of veterinary services. The allocation of DVM supervision revenue from VPA is a form of internal transfer pricing, where a portion of the VPA's revenue is allocated to compensate the DVM for their supervisory role. This percentage is based on a practical estimate of the time and effort required for adequate supervision, consistent with current legislation.

The VPA salary and benefits are based on data gathered during the interviews. This figure represents the expected compensation for a mid-level practitioner, assuming the specified scope of responsibilities. This salary is considered a fixed cost in our model, as it is assumed to be independent of the VPA's output or the practice's overall revenue. It is acknowledged that, over time, practices may adjust VPA compensation in response to performance or market conditions. The other cost components (COGS, non-DVM staff, DVM compensation) are treated as variable costs directly proportional to total revenue. This assumption reflects the nature of these costs, which tend to increase as the volume of services provided increases.

The increase in non-DVM staff expenses is a critical aspect of our model, reflecting the concept of labor complementarity. The VPA's role is not a simple substitute for DVM labor but rather complements the existing workforce. The VPA's ability to handle routine tasks enhances the productivity of DVMs, which in turn necessitates additional support staff to manage the increased volume of patients and administrative tasks. From an economic standpoint, labor complementarity refers to the marginal productivity of one type of labor increasing as the quantity of another type of labor increases. In this case, the VPA's presence increases the marginal revenue production of both DVMs and non-DVM staff, leading to an overall increase in the practice's output.

These cost percentages may vary across different practices and geographic locations. Factors such as practice size, location, client demographics, and the specific mix of services offered can all influence the cost structure. However, the percentages represent a reasonable average based on the data gathered and serve as a starting point for the analysis. The sensitivity analysis described later in the paper explores the impact of varying these cost assumptions on the model's results, particularly concerning VPA salary and non-DVM staff expenses.

TABLE 5
GENERAL COST STRUCTURE

GENERAL COST PARAMETERS	
COGS as % of Total Revenue	20%
Non-DVM Staff as % of Total Revenue	20%
DVM as % of Total Revenue	20%
DVM as % of VPA Revenue*	10%
VPA Salary+Benefits	$100,000

**This cost is proposed as veterinarian compensation for the time allocated to VPA supervision.*

Table 6 presents the projected revenue generated by the VPA based on the parameters outlined in Tables 1 and 3. It is important to note that the revenue in Table 6 is not entirely new. Instead, it represents revenue previously generated by the DVM but is now allocated to the VPA due to the task shifting outlined in Table 4. This table illustrates the potential for VPAs to generate significant revenue by handling routine and less complex cases, thereby contributing to the practice's overall financial performance and directly impacting the firm's profitability.

The VPA's contribution to revenue measures its marginal revenue product, which is a key factor in determining the firm's labor demand. The 0% allocation of VPA time to new patients and surgery, and consequently, $0 revenue for those categories, is based on the model's assumption that VPAs primarily handle routine care and that DVMs retain responsibility for complex procedures and initial assessments. This assumption reflects regulatory constraints and the focus on task shifting rather than task substitution for complex cases.

The allocation of VPA time and the resulting revenue may vary across different practices and geographic locations. Factors such as the specific scope of responsibilities for VPAs, client demand, and the practice's business model can influence these figures. However, the data in Table 6 represent a reasonable baseline based on our assumptions and data. Sensitivity analysis discussed later in the paper explores the impact of varying the VPA's time allocation and the corresponding revenue generation.

TABLE 6
VPA REVENUE GENERATION

VPA REVENUE		
Appt Type	**No. of Appts**	**Revenue**
New	0	$0
Recheck	1,800	$90,000
Preventative	2,100	$262,500
Urgent	800	$160,000
Surgery	0	$0
Totals	4,700	$512,500

Table 7 presents the projected changes in revenue for the entire practice after the integration of one full-time equivalent (FTE) Veterinary Professional Associate (VPA). This table illustrates how the task-shifting strategy, outlined in Table 4, results in a reallocation of service delivery and a subsequent shift in revenue streams. The increase in revenue is driven by the VPA's ability to handle routine and less complex cases, enabling the DVM to focus on new patients and surgical procedures, which generate higher revenue. The total revenue change is a combination of VPA-generated revenue and DVM-generated revenue after reallocation. This analysis assumes an excess demand for veterinary services, allowing the practice to absorb the increased capacity without a decrease in prices.

TABLE 7
VETERINARIAN REVENUE GENERATION (WITH VPA)

DVM REVENUE WITH VPA		
Appt Type	**No. of Appts**	**Revenue**
New Patient	600	$102,000
Recheck	600	$30,000
Preventative	600	$75,000
Urgent	800	$160,000
Surgery	1,400	$560,000
Totals	4,000	$927,000

Table 8 summarizes the projected changes in costs resulting from the integration of the VPA. The cost changes reflect the addition of VPA salary as a fixed cost and the adjustment of variable costs in proportion to revenue. The variable cost components (COGS, Non-DVM Staff, and DVM compensation) are assumed to increase in direct proportion to the increase in total revenue.

TABLE 8
ADDITIONAL COSTS INCURRED WITH VPA

ADDITIONAL COSTS WITH VPA	
COGS	$113,300
Non-DVM Staff	$113,300
DVM - Base Production*	$10,800
DVM - VPA Production**	$51,250
VPA	$100,000
Total	$388,650

**This increased cost is a result of a net increase in veterinarian-generated revenue and would take the form of increased veterinarian compensation.*
***This increased cost is proposed as a method of compensating for the 10% of one veterinarian FTE allocated to VPA supervision and would take the form of increased veterinarian compensation.*

When combining the VPA-generated revenue (from Table 6) with the DVM revenue generated post-VPA (from Table 7), a total revenue of $1,439,500 is projected. Compared to the revenue generated solely by the one FTE DVM pre-VPA ($873,000, as shown in Table 2), the expected revenue increase is $566,500. Considering the expected increase in revenue of $566,500, along with the additional costs of $388,650 (as shown in Table 8), the net expected impact on profitability from adding one VPA is $177,850 in this prototype. Note from Table 8 that, in addition to increased profitability for the practice, veterinarian compensation is projected to increase by $10,800 + $51,250 = $62,050 based on the increased productivity of the practice. The net profit increase represents the bottom-line impact on the practice's financial health. This net profit increase represents a return on the investment in a VPA and suggests that VPA integration can lead to significant economic benefits for general veterinary practices.

Along with the reallocation of veterinarian time, the increase in revenue is attributed to a rise in appointments. The data presented in Table 2 suggests that a total of 5,000 appointments are expected in the pre-VPA situation. From Tables 6 and 7, the number of appointments is projected to be 4,700 + 4,000 = 8,700 with one FTE VPA. Since some of these appointments involve rechecks, it is unlikely that an additional 3,700 animals would receive care. However, the increase in access to care would be substantial.

Sensitivity and scenario analyses were conducted to assess the robustness of the general practice model. Sensitivity analysis examined the impact of varying key prototype assumptions, such as VPA salary and benefits, non-DVM staff expenses, average client transactions, and appointment fill rates. Scenario analyses explored alternative operating conditions, including variations in DVM supervision time and VPA time allocation. These analyses demonstrated that while changes in specific assumptions impacted the magnitude of the projected profitability increase, the core finding—that integrating a VPA significantly enhances practice financial performance—remained consistent. As the results were robust to both sensitivity and scenario analyses, the positive economic impact of VPA integration is not overly sensitive to minor variations in the model's parameters. This reinforces the validity and reliability of the prototype model's findings.[4]

Beyond the quantitative findings, integrating Veterinary Professional Associates (VPAs) is anticipated to yield significant qualitative benefits with broader economic implications. While challenging to quantify directly, these impacts are important for a comprehensive understanding of the value of VPA integration. Drawing parallels with human medicine, where mid-level practitioners have improved health outcomes and patient satisfaction, similar benefits are likely to be seen in veterinary care, where the patient is the animal and the client is the owner. By alleviating veterinarian shortages and expanding capacity, practices can provide more timely care, which may lead to improved health outcomes for pets. This improved timeliness reduces the implicit cost of waiting for veterinary services, enhancing pet owner welfare and contributing

to a more efficient allocation of healthcare resources by decreasing deadweight loss from service delays. Furthermore, VPAs can address labor shortages, boost overall productivity, and improve the financial sustainability and accessibility of veterinary healthcare delivery.

Second, reduced wait times and improved communication are expected to enhance client satisfaction. Shorter waits decrease the opportunity cost for pet owners seeking care, making services more accessible and convenient. Enhanced communication can improve understanding and adherence to treatment plans, potentially leading to better patient outcomes. Consequently, the veterinary clinic's reputation can improve, fostering increased client retention and positive referrals. Economically, this strengthens the practice's brand equity and customer capital, valuable intangible assets that contribute to long-term profitability and competitive advantage.

Third, increased appointment availability enables more frequent check-ups and facilitates the early detection of health issues. This proactive approach to care can lead to more effective treatment options and better pet health outcomes. From a healthcare economics perspective, this represents a shift from reactive to preventive healthcare, which can ultimately reduce the overall cost of care by avoiding more expensive emergency treatments or advanced interventions. Additionally, improved animal welfare can have positive externalities, such as increased owner happiness and reduced emotional distress for clinicians and clients, which are difficult to quantify but can contribute to a better workplace environment, along with owner well-being.

DISCUSSION

The findings of this study provide evidence for the potential economic benefits of integrating Veterinary Professional Associates (VPAs) into general companion animal veterinary practices. The post-pandemic surge in demand for veterinary services has placed significant strain on existing resources, leading to increased wait times and the rise of urgent care facilities (Raphael, 2021). The pandemic amplified the long-standing veterinarian shortage. Our model demonstrates that VPAs can alleviate this strain by enhancing practice capacity and productivity. By assuming responsibility for routine care (preventative, rechecks, and simple urgent care for established clients), VPAs free up veterinarian time for more complex cases, new patients, and surgical procedures, thereby increasing the overall output of the practice.

This task-shifting strategy aligns with the economic principles of specialization and the division of labor. By assigning tasks based on skill level and training, the practice can optimize labor inputs and increase efficiency. This is analogous to the role of mid-level practitioners (MLPs) in human healthcare, where physician assistants and nurse practitioners handle routine tasks, allowing physicians to focus on more complex medical issues. Our model assumes that licensing regulations require veterinarians to establish a Veterinary-Client-Patient Relationship (VCPR) through an "in-person" exam, which further emphasizes the importance of VPA integration in allowing DVMs to focus on new client acquisition.

The model relies on various assumptions built into the baseline parameters, which may vary across practices and geographic locations. Therefore, individual practices should tailor their assessments to their specific circumstances. However, the robustness of the general practice model under different assumptions, as demonstrated by our sensitivity analysis, suggests that the core finding—that VPA integration enhances profitability—is generally applicable.

Beyond the direct financial impacts, our interviews revealed that VPAs are expected to contribute to qualitative improvements, including enhanced client and staff communication, care coordination, and team leadership. These qualitative benefits, while challenging to quantify, are likely to improve workflow efficiency, hospital culture, staff retention, and client satisfaction, ultimately leading to increased productivity. These can be seen as positive externalities that enhance the overall value proposition of VPA integration.

Several limitations should be acknowledged. First, the model is based on data from a prototype practice, which limits the generalizability of the quantitative findings. Second, the model assumes that client demand is not a limiting factor, which may not hold true in all markets. Third, the model focuses on direct financial impacts and does not fully account for all potential costs and benefits, such as training costs, implementation

costs, and intangible benefits like job satisfaction and client loyalty. These unquantified factors could influence the overall assessment of VPA integration. Fourth, the sample selection for this study may introduce bias. Interviewees primarily included Lincoln Memorial University College of Veterinary Medicine Advisory Board members and industry leaders, many of whom a priori support the concept of mid-level practitioners. This selection process likely resulted in a sample more favorably inclined towards VPA integration than the broader population of veterinary practice owners and managers. Consequently, the projected benefits, particularly the qualitative assessments of workflow improvements and client satisfaction, may be overstated. While this potential bias warrants consideration, it is unlikely to significantly alter the core finding that VPA integration has the potential to substantially enhance practice financial performance. However, it does suggest that the magnitude of these benefits may vary across different practice settings and depending on various factors, including the openness to change among veterinary practice owners.

CONCLUSION

This study analyzes the economic implications of integrating Veterinary Professional Associates (VPAs), a mid-level practitioner role, into general companion animal veterinary practices. Motivated by the growing veterinarian labor shortage and its impact on access to care, we investigate the potential of VPAs to enhance practice capacity, efficiency, and financial performance. Employing a mixed-methods approach, we combine qualitative insights from over 40 semi-structured interviews with industry leaders and practice owners with a quantitative analysis using a partial budget model. This model, grounded in the microeconomic theory of firm behavior, simulates the integration of one full-time equivalent (FTE) VPA into a 3.5 FTE DVM general practice. We assess the incremental changes in revenue, costs, and profitability resulting from the task-shifting strategy facilitated by VPA integration. Our findings indicate that integrating a VPA can significantly increase practice throughput and profitability. The prototype model projects an annual revenue increase of $566,500 and a net profit increase of $177,850. This is achieved by optimizing labor allocation, shifting routine tasks to the VPA, and enabling veterinarians to focus on higher-value activities, such as complex cases and new patient consultations. Qualitative data from interviews further suggest that VPAs can enhance client satisfaction, team dynamics, and overall practice efficiency, thereby contributing to the long-term sustainability of the practice. This study provides empirical evidence for the economic benefits of introducing mid-level practitioners in a specialized healthcare setting, offering insights into workforce optimization and resource allocation in labor-constrained markets.

ACKNOWLEDGEMENT

This research was funded by Lincoln Memorial University's College of Veterinary Medicine. The college recently launched a mid-level provider degree, a Master of Veterinary Clinical Care (MVCC) (Lincoln Memorial University).

ENDNOTES

1. A recent Bureau of Labor Statistics release reports a 5.6 percent increase in the nominal prices of veterinary services year over year, more than twice the rate of inflation (US Bureau of Labor Statistics, 2025).
2. For this study, a full-time equivalent (FTE) was standardized as 2,000 annual work hours (40 hours per week, 50 weeks per year). This metric quantifies workload, not individuals. Unlike a full-time employee, whose work hours and time off fluctuate, FTE assumes a consistent, year-round schedule. Therefore, individual employee variations are not reflected in FTE calculations.
3. For purposes of this study and report, all suggested VPA activities are restricted to those that comply with the relevant legislative practice act(s).
4. Sensitivity analysis revealed that the model is particularly sensitive to fee structures (ACT) and appointment fill rates. This implies that practices with lower fee structures or lower client demand may experience less pronounced financial benefits from VPA integration. Conversely, practices with higher fees or high client

demand may see even greater gains. The sensitivity to VPA supervision time identified in the scenario analysis highlights the importance of efficient delegation and supervision strategies. If DVMs spend excessive time supervising, the productivity gains from VPA integration may be diminished. An interactive version of the model is available here: https://tinyurl.com/vpamodel.

REFERENCES

AAVMC. (2022). *AAVMC Statement on US Veterinary Workforce*. American Association of Veterinary Medical Colleges. Retrieved from https://www.aavmc.org/wp-content/uploads/2022/07/AAVMC-Statement-on-Workforce-July-2022.pdf.

Chadderdon, L.M., Lloyd, J.W., & Pazak, H.E. (2014). New directions for veterinary technology. *Journal of Veterinary Medical Education*, *41*(1), 96–101.

Cobb, C.W., & Douglas, P.H. (1928). A Theory of Production. *The American Economic Review*, *18*(1), 139–165. JSTOR.

Elements of Successfully Integrating a Mid-Level Provider Into Practice. (2005). *Journal of Oncology Practice*, *1*(3), 93–94. https://doi.org/10.1200/jop.2005.1.3.93

Fults, M.K., Yagi, K., Kramer, J., & Maras, M. (2021). Development of advanced veterinary nursing degrees: Rising interest levels for careers as advanced practice registered veterinary nurses. *Journal of Veterinary Medical Education*, *48*(1), 242–251. https://doi.org/10.3138/jvme.2019-0041

Gitter, R., & LaFayette, B. (2024). *Demand and Supply of Veterinarians in the US to 2030* (p.15). Unpublished manuscript.

Grzybicki, D.M., Sullivan, P.J., Oppy, J.M., Bethke, A.-M., & Raab, S.S. (2002). The economic benefit for family/general medicine practices employing physician assistants. *The American Journal of Managed Care*, *8*(7), 613–620.

Hamermesh, D.S. (1993). *Labor Demand*. Princeton University Press; JSTOR. https://doi.org/10.2307/j.ctv17ppcqn

Hooker, R.S., Klocko, D.J., & Larkin, G.L. (2010). Physician assistants in emergency medicine: The impact of their role. *Academic Emergency Medicine*, *18*(1), 72–77.

Htay, M., & Whitehead, D. (2021). The effectiveness of the role of advanced nurse practitioners compared to physician-led or usual care: A systematic review. *International Journal of Nursing Studies Advances*, *3*, 100034. https://doi.org/10.1016/j.ijnsa.2021.100034

Kogan, L.R., & Stewart, S.M. (2009). Veterinary Professional Associates: Does the profession's foresight include a mid-tier professional similar to physician assistants? *Journal of Veterinary Medical Education*, *36*(2), 220–225.

Lincoln Memorial University. (n.d.). *Master of Veterinary Clinical Care*. Master of Veterinary Clinical Care. Retrieved from https://www.lmunet.edu/college-of-veterinary-medicine/graduate-programs/master-of-veterinary-clinical-care

Lloyd, J.W. (2021, August). *Pet healthcare in the US: Are there enough veterinary nurses/technicians? Is there adequate training capacity?* Mars Veterinary Health.

Lloyd, J.W. (2022, February). *Pet healthcare in the US: Are there enough veterinary specialists? Is there adequate training capacity?* Mars Veterinary Health.

Lloyd, J.W. (2023). *Pet healthcare in the US: Another look at the veterinarian workforce*. Mars Veterinary Health.

Medical Economics. (2014, April 8). *Use objective measures to incentivize midlevel providers for increased productivity.* Retrieved from https://www.medicaleconomics.com/view/use-objective-measures-incentivize-midlevel-providers-increased-productivity

Penn State Extension. (2023, January 17). *Partial budgeting for agricultural businesses.* Retrieved from https://extension.psu.edu/partial-budgeting-for-agricultural-businesses

Raphael, M. (2021, February 8). *Four key trends for animal hospitals in 2021*. Retrieved from https://indevets.com/blog/four-key-trends-for-animal-hospitals-in-2021/

US Bureau of Labor Statistics. (2025, July 7). *Consumer Price Index for All Urban Consumers.* Retrieved from https://www.bls.gov/news.release/cpi.t02.htm.
Weldon, D. (2014, May 28). Non-physician providers: An unexpected route to revenue increases. *Healthcare Finance.* Retrieved from https://www.healthcarefinancenews.com/news/non-physician-providers-unexpected-route-revenue-increases
Willis, N.G., Monroe, F.A., Potworowski, J.A., Halbert, G., Evans, B.R., Smith, J.E., . . . Bradbrook, A. (2007). Envisioning the future of veterinary medical education: The Association of American Veterinary Medical Colleges Foresight Project, final report. *Journal of Veterinary Medical Education*, *34*(1), 1–41.
World Health Organization. (2017). *Mid-level health workers: A review of the evidence.* UHC Technical Brief, Health Systems Department. WHO Regional Office for South-East Asia and WHO Country Office for India.
Yagi, K., & Fults, M. (2021). NAVTA Corner: Perspectives on the creation of advanced veterinary nurse degrees. *Today's Veterinary Nurse*, pp. 8–9.

APPENDIX: INTERVIEW INFORMATION AND SCRIPTS

Interview Background Information

Based on your vision for the anticipated contributions of MVCC graduates in companion animal practice, please comment on – and critique – the following outline of expected roles and responsibilities.

Expected Roles and Responsibilities

Subject to existing practice acts and state regulations, we envision this new professional (MVCC graduate) to contribute in two distinct roles: patient care and team leadership. For each of these, the most likely responsibilities are as follows:

- Patient care
    - Patient history taking
    - Physical examination
    - Advanced management of cases (in appropriate consultation with a veterinarian)
        - Diagnostic planning, procedures, and assessment
        - Treatment planning, procedures, and assessment
        - Nursing planning, procedures, and assessment
        - Client communication, including
            - Medical updates for existing cases
            - Client education at discharge
            - Case follow-up as appropriate
- Team leadership
    - Hospital operations
        - Provide staff leadership
        - Understand the financial dimensions of practice management
    - Advanced coordination of care – develop and implement systems to effectively coordinate the contributions of various staff members, optimizing their respective roles/responsibilities.
        - Receptionist
        - Veterinary assistant
        - Veterinary nurse/technician
        - Veterinary technician specialist
        - Veterinarian
        - Specialist veterinarians

- Internal
- External (referral)

LMU Board Members Interview Flow

Interviewees will have been sent a document titled "Interview Background Information" as orientation.
Appropriate introductions: (connections)
Background/Story
Were you able to review the document with suggestions of how an MVCC graduate might fit into a veterinary practice?

Part I

Let's start with the patient care role:

What are your thoughts on the activities listed?
What value do you see the skills of an MVCC graduate bringing to a practice in this role?
Are there additional attributes/skills that you think the MVCC grad should bring to add value to the practice?
*Potential Drill-down questions (secondary document)
Team leadership role (note that they might be separate in a given situation)

What are your thoughts on the activities listed?
What value do you see the skills of an MVCC graduate bringing to a practice in this role?
Are there additional attributes/skills that you think the MVCC grad should bring to add value to the practice?
Do you see this role as the same as a PM or OM or above or below those roles on an organization chart?
*Potential Drill-down questions (secondary document)
What other roles do you see this type of employee providing?

Part II

Now let's discuss the background document's suggestions for practice type.
Is there a specific type of practice that you see this mid-level trained person providing more value than other types?
Is there someone from a different sector of the profession you think we should talk with?

Secondary (In-Depth) Interviews

Interviewees will have been sent a document titled "Interview Background Information" as orientation.
Appropriate introductions: (connections)
Affirm that they've seen the briefing material – any questions or overall reactions?
If you had the opportunity to hire an MVCC graduate today, what would you ask them to do?

- List specific roles and responsibilities – minimal prompting (don't be leading)
- Describe the staffing levels of this practice's medical team prior to hiring the MVCC graduate:
  - Number of veterinarians
  - Number of credentialed nurses/technicians
  - Number of veterinary assistants
- Would the addition of an MVCC graduate impact/change optimal staffing levels for the medical team? If so, how would these levels be different than those provided above?
  - Number of veterinarians
  - Number of credentialed nurses/technicians
  - Number of veterinary assistants
- How will you determine how much to pay the MVCC graduate?

- If the roles/responsibilities listed above would include MVCC-specific office calls (clinical services?), would pricing for these be different than if provided by a veterinarian? If so, what would be your pricing strategy?
- What specific data would you collect/analyze (or, what KPIs would you calculate) to monitor the impact of the MVCC graduate? Potential prompts:
  - Workflow/cases/transactions
  - Productivity/revenue
  - Client satisfaction/compliance/wait times
- What impact would you expect the MVCC graduate to have on these data/KPIs?

Is there a specific practice that you have in mind? If so, is it possible for us to obtain financial data from that practice?