

# **The Role of Physician Assistants in Ophthalmology: A Literature Review**

Nilusha Wijewardana PA-S, BSc.  
7815096  
[wijewary@myumanitoba.ca](mailto:wijewary@myumanitoba.ca)

Supervisor:  
Dr. Ravi Dookeran, MD, FRCSC

Program Director:  
Rebecca Mueller, MPAS, CCPA, PA-C

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## **Dedication**

This capstone is dedicated in memory of my father,  
*Chanaka Wijewardana,*  
whose unwavering support and encouragement were the driving forces behind my academic journey. His guidance, belief in my potential, and constant motivation were important in my undergraduate studies and my path to becoming a physician assistant. I am grateful for his influence, and I strive to honour his legacy as I enter the field of medicine as a physician assistant.

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## Abstract

**Introduction:** Physician assistants (PAs) are trained medical professionals who work under the supervision of physicians to assess, diagnose, and treat patients across various specialties. While their role is well-established in many areas of medicine, the responsibilities of PAs within ophthalmology remain underexplored and unclear.

**Objective:** This literature review examines the role of PAs in ophthalmology in North America. The objective is to identify and analyze primary research that explores their clinical responsibilities, integration into ophthalmic care teams, and the outcomes associated with their involvement.

**Methods:** A structured search was conducted using PubMed and Scopus databases. Mesh terms and key words related to physician assistants and ophthalmology were used to identify relevant primary research articles, with inclusion and exclusion criteria.

**Results:** Seven articles met the inclusion criteria and were reviewed. These studies focused on the practice of PAs in ophthalmology within the United States. Key findings centered around four main themes: the scope of PA roles, the integration into ophthalmic practice and the facilitations and limitations of PAs in practice.

**Conclusion:** Preliminary evidence suggests that PAs in ophthalmology contribute positively to both patient care and physician support. However, current research is limited and primarily focuses on their role within the United States. Further studies are needed to better understand the impact, scope, and potential of PAs in ophthalmology - particularly to explore how their role could be expanded and integrated within the Canadian healthcare system.

## **Introduction**

### **Background and Significance of Physician Assistants**

Physician assistants (PAs) are medically trained professionals who practice general medicine in collaboration with supervising physicians (1). Their responsibilities include conducting history-taking and physical examinations, ordering and interpreting diagnostic tests, assisting in and performing procedures, developing treatment plans, monitoring patient progress, and prescribing medications (1). PAs work alongside physicians and have been successfully integrated into a variety of medical specialties, contributing to improved continuity of care, efficiency, and patient satisfaction (1).

In Canada, the PA profession is relatively new but has seen steady growth in recent years. PAs now have the capability to work across a range of medical specialties, such as emergency medicine, internal medicine, family medicine, surgery, psychiatry and pediatrics. Additionally, PAs can practice in a variety of subspecialties, such as cardiology, dermatology, neurology, infectious disease and rheumatology (2). Currently, there is public information available that explores the role of PAs in ophthalmology in the United States. However, with further search, there is currently no information that explores the role of physician assistants within Canada. The integration into this specialty remains underexplored. Given the high patient volumes of aging population, the variety of ophthalmic cases, and procedural demands in ophthalmology, incorporating PAs could provide significant benefits for ophthalmology practices. However, due to the novelty of the profession in Canada and limited available research, their integration into ophthalmology is challenging and incur possible hesitancy of having a PA work for an ophthalmologist.

## **Practicing PAs in Ophthalmology in Northern America**

The speciality of ophthalmology faces challenges such as long wait times for consultations and delayed follow-ups (3,4). Introducing a PA could provide continuity of care, reduce wait times, and ensure more consistent follow-ups, ultimately improving patient outcomes and satisfaction (3,4). Based on public information, there are currently no registered physician assistants in ophthalmology in Canada. However, in 2023 the United States of America had 136 regulated physician assistants in ophthalmology (5).

The efficiency and productivity of PAs in ophthalmology across North America remain underexplored, particularly in Canada, where no primary research or public information exists. To evaluate their role, more information is needed on their responsibilities, scope of practice, and impact on patient care in this speciality. Therefore, this review aims to answer the following question: *What role, clinical responsibilities and overall impact do PAs have in ophthalmology practices?*

## **Methods**

A literature review of published primary research articles was conducted to examine the role of PAs in ophthalmology. To conduct this research, a specific search of primary literature was done to find articles related to the research question above.

### **Search Strategy**

With consultation with the University of Manitoba librarian, Margaret Banka, a search was conducted for primary research articles. The search was conducted on PubMed and Scopus. It

involved a search related to PAs in ophthalmology. The initial search was done on October 25, 2024.

The search on PubMed included key terms listed in the Appendix as Table 1. The search on PubMed was as follows: ("physician assistant\*" OR "physician associate\*" OR (physician assistant[MeSH Terms]) OR (physician extenders[MeSH Terms])) OR "physician extender" AND ((ophthalmolog\*) OR (ophthalmology[MeSH Terms]) OR ("ocular care")). This initial search had 130 results.

A similar search was done on Scopus, without the use of MeSH Terms. The following was searched on Scopus: "physician assistant\*" OR "physician associate" OR "physician extender" AND ophthalmolog\* OR "ocular care". This search had a total of 106 articles.

### **Article Inclusion and Exclusion Criteria**

Due to the extensive list based on the initial search strategy, further inclusion and exclusion criteria was used to narrow the number of articles found. The selection criteria for this literature review focused on primary research articles published in English, conducted within North America, and published within the last 10 years (2015 - 2025). With the inclusion and exclusion criteria. The number of articles found on PubMed and Scopus were 48 and 30, respectively.

The abstracts of all the articles were analyzed. To be included in this literature review, the articles had to specifically examined the role of physician assistants (PAs) in ophthalmology. Variations of the term “physician assistant” were used to include relevant literature. Studies that

combined PAs with other healthcare professionals, such as “advanced practice providers” and nurse practitioners (NPs) were considered if a PA role could be clearly identified.

To ensure an organized approach, the selected articles were reviewed using a selection process. A review matrix (Appendix Table 2) provided by the University of Manitoba library was used. The matrix was used to assess and identify recurring themes, with key takeaway points extracted from each study. A second table (Appendix Table 3) was developed to organize the study objectives, methods and PA responsibilities in ophthalmology. The studies selected were to directly address the roles, responsibilities, and impact of PAs in ophthalmology to be analyzed and reviewed for this literature review.

## **Results**

Using the initial search strategy and the inclusion and exclusion criteria, the selection was narrowed down to five primary research articles, one editorial article and one review article. The key points recurring themes and study objectives are listed in the Appendix as Table 2 and Table 3, respectively. Table 3 provides an overview of the articles, including the type of design, the study method, conclusion and limitations. The research articles found were all conducted in the United States of America.

The goal of the search was to find articles that could be categorized into the following thematic areas: PA roles in ophthalmology, integration of PAs into ophthalmology practice, factors facilitating PA involvement, and challenges and limitations associated with PA practice in

ophthalmology. These themes are further outlined in Table 2, which organizes the four themes with the included articles.

### **PA Ophthalmology Roles**

Many of the articles discussed the role of PAs in ophthalmology. In an article published in the American Journal of Ophthalmology, a study conducted a cross-sectional survey that evaluated the role, training and interested of physician assistants (PAs) in ophthalmology (6). In terms of their responsibilities, PAs worked independently to perform their primary clinical duties in ophthalmic care. Many were involved in consenting patients for ophthalmic surgeries and procedures and assisting in ophthalmic surgeries and minor procedures (6). There were fewer PAs that work independently performed procedures such as intravitreal injections and minor lid procedures (6).

A study investigated the role and training of PA in ophthalmology through qualitative interviews with 17 PAs practicing in the United States (7). The research identified that PAs play a crucial role in assisting ophthalmologists during surgery, performing autonomous procedures, and independently evaluating and treating patients (7). In another study, PAs were surveyed to examine the characteristics, training and self-assessed competencies of PAs who do not specialize in ophthalmology but are involved in vision and ocular care (8). The survey collected data on the PAs' involvement in eye care, their training background, and their self-reported skills and abilities in eight specific domains related to vision and ocular health (8). The results found that PAs report to engage in eye care, such as providing patient information, answering questions and initiating discussions about vision care, more than once per month. Majority of the PAs indicated they had training in vision care either during PA education or outside of PA school (8).

A case study explored the integration of a PA into an academic ophthalmology consult service at a U.S. hospital, with the goal to assess the impact of the PA on workflow efficiency, ophthalmology resident workload and patient care outcomes (9). The PA performed consults, histories and physicals, fluorescein eye dye and Wood's lamp exams, intraocular pressure measurements, and visual acuity testing. The PA handled emergency room, inpatient, and outpatient consults and was responsible for communicating findings and treatment plans with the on-call ophthalmology team. The PA played a key role in interfacing with primary teams and facilitating follow-up, contributing to consult note completion and documentation (9).

### **Integration of PAs in ophthalmology**

A few of the studies discuss how PAs were implemented in ophthalmology and what improvements could be made to allow for an easier transition in this speciality. A survey study asked participants about their education in terms of ophthalmology. Some PAs considered a postgraduate program in ophthalmology to be beneficial to their work in the field. Others expressed a desire to expand their roles within ophthalmologist-led teams to gain more autonomy (7). Based on the responses from the participants, the authors suggested a policy change aimed to increase the number of qualified PAs in ophthalmology (7).

PAs in ophthalmology undertake a range of clinical and some procedural roles. However, due to gaps between education and workforce in ophthalmologic care, it was suggested to develop a formal post-graduate training program for PAs in ophthalmology to expand the number of qualified professionals (6). In the survey, the PAs expressed an interest in additional training in vision and ocular care (6). In addition, 87.5% of PAs would continue their career in

ophthalmology and 88.1% would consider joining a speciality organization for PAs in ophthalmology to further their knowledge (6).

In a case study, a PA underwent four weeks of onboarding and shadowing with ophthalmology residents and attending physicians, including direct instruction on ophthalmic exams and procedures (9). Integration was supported by residents and attending physicians, who encouraged feedback and adjusted the PA's responsibilities based on workflow needs (9). The integration effort was possible with the leadership of the ophthalmologists and residents, which allowed for smoother coordination of roles and expectations for the PA in training (9). Integration allowed for delegation of initial consults to the PA in training, with escalation to residents and attendings if needed, which streamlined operations in the consult service (9).

### **Facilitations of PAs in ophthalmology**

The articles that were analyzed discussed many advantages of the implantation of PAs. An article, published in the Current Opinion in Ophthalmology, explores the benefits of integrating physician extenders, including physician assistants (PAs) and nurse practitioners (NPs), in ophthalmology care (10). This narrative review discussed the potential roles and benefits of integrating PAs or NPs in ophthalmology care. The article uses existing literature articles and incorporates the information to the author's insights to provide an overview. This article does not involve original research, however the authors discussed recent trends to provide a summary of findings from various sources to support their perspectives on the evolving role of physician assistants in ophthalmology (10). The inclusion of PAs and NPs in retina care team has been shown to increase patient access for ongoing care, therefore enhancing the overall ophthalmologist practice efficiency (10).

In addition, there are proven benefits of having a PA work in ophthalmology. Median consult notes completion time decreased from 65 minutes to 35 minutes after the PA joined the team (9). Residents reported increased satisfaction, reduced workload, and improved ability to focus on surgical and educational responsibilities (9). There were no significant differences in patient follow-up or emergency department returns observed, suggesting the quality of care was maintained or improved when seen by a PA. In this study there was also a positive view on team dynamic between the PAs, residents and the ophthalmologists. Residents viewed the PAs integration as highly beneficial, indicating successful role delineation and collaboration (9).

In an analysis study that examines the cost-benefits of PAs, one of the conclusions is that subspecialty training does not always give high financial returns, such as with residents. Therefore, integrating PAs into clinical roles can aid in the growing need for cost-effective care models (11). The article shows that some ophthalmology subspecialties (like neuro-ophthalmology, uveitis, and pediatrics) offer low financial returns for physicians after many years of expensive training (11). This may discourage new ophthalmologists from pursuing these areas, creating gaps in care. PAs, with targeted and shorter training pathways, can be strategically integrated into these underserved subspecialties to improve access to care. With guidance from their supervision physician, they can assist with routine and follow-up appointments and support patient education and coordination (11).

### **Limitations of PAs in ophthalmology**

A few of the articles discussed some disadvantages or limitations of PA implementation in ophthalmology. An article outlines logistical challenges that limit the broader implementation of

PAs in ophthalmology (12). These include varying scope-of-practice laws across states, which can restrict what PAs are authorized to do, and inconsistent reimbursement models that may not support services provided by PAs (12). The article also highlights a cultural hesitancy within the specialty, where some ophthalmologists express concerns about the quality of care and patient acceptance of non-physician providers, such as PAs or NPs (12). To address these issues, the article recommends further research into the outcomes and cost-effectiveness of utilizing PAs in ophthalmology, along with the development of pilot programs to explore new models of care or non-physician providers (12). The article emphasizes that overcoming these challenges, there could be significant improvement in the integration of PAs and enhance the accessibility of ophthalmic care delivery (12).

One of the studies found that current training programs were reported as inadequate by the participants (7). The study found that PAs expressed satisfaction with their careers but emphasized the need for formal postgraduate training programs to acquire the necessary skills for their roles in ophthalmology (7). The researchers concluded that implementing such specialized training programs could significantly enhance PAs' ability to fulfill their responsibilities effectively in the field of ophthalmology (7).

### **Discussion**

Physician assistants (PAs) have long been recognized for the value they bring to the healthcare system (13). While their presence in the United States is longstanding and well-established, the PA role in Canada is still developing. In recent years, Canadian PAs have demonstrated a positive impact on healthcare delivery, including improvements in patient satisfaction and

reductions in physician burnout and wait times (13). Unfortunately, none of the articles reviewed for this literature review explored the specific role of PAs in ophthalmology in Canada.

Despite this, the articles reviewed reflect a positive role for PAs within ophthalmology. Although relatively underrepresented in this specialty, the literature emphasizes the contributions PAs can make in enhancing ophthalmic care. With proper guidance and education, PAs can provide beneficial roles, and positive patient access and workflow support. This discussion connects to the original research question by exploring how PAs currently function in ophthalmology in the United States and what their role could look like in Canada.

The studies discuss how PAs developed broad scopes of practice in ophthalmology, often despite having limited formal training in PA school or prior exposure before working in the speciality. In the national survey, many PAs reported managing ophthalmic patients independently, assisting in surgeries, and expressing interest in further training after graduation (6). This shows that with mentorship and support, PAs can become valuable members in ophthalmology teams.

In Manitoba, the Misericordia Health Centre (MHC) provides a wide range of specialized ophthalmic care (14). The integration of a PA into this setting could be practical to improve access and reduce wait times. In a case study, a PA successfully integrated into a hospital-based ophthalmology consult service, where they took on initial assessments and procedural support, ultimately reducing pressure on residents and improving the efficiency of care (9). Similarly, these examples show that with intentional planning, PAs can fill the gaps in service delivery at MHC and allow ophthalmologists and residents to focus on more complex care and residency

education. This integration would align with Manitoba's regulation of PAs, where they are capable to perform medical tasks under the physician supervision (14).

Another way to enhance PA training in ophthalmology is to provide students with the option of completing an early clinical exposure (ECE) in a subspecialty of their choosing during their first year of PA school. In the Master of Physician Assistant Studies program at the University of Manitoba, ophthalmology-specific training is limited to a one-hour lecture on common eye diseases and a two-hour clinical skills session at the Misericordia Health Centre. This session educates students on basic ocular examinations, such as pupil dilation, administering ocular drops, performing visual acuity tests and performing slit lamp examinations. While the PA program introduces key concepts in ophthalmology, it's limited compared to the depth of knowledge gained for a resident in ophthalmology. However, Lee et al. discussed that expanding ophthalmology content in PA school may not be relevant to all students (9). Rather, offering additional ophthalmology-focused opportunities to those interested may be impactful. This could include optional lectures for students or post-graduate individuals or consider specialized rotations during clinical year or shadowing opportunities.

Looking at these examples from a Canadian point of view, the U.S. offer valuable insight. With the aging population and increasing rates of chronic eye conditions, such as glaucoma and diabetic retinopathy, there may be increase pressure on the limited ophthalmologists in Canada. Despite this, PAs remain underutilized in ophthalmology, this may be due to regulatory constraints or limited public awareness of what PAs can offer and their capabilities. If structured

training pathways, such as optional ophthalmology-specific rotations or post-graduate certificates, were introduced, Canadian PAs could help in this specialty.

An example of PA capability comes from Joel Ciolek, a PA in California who manages his own ophthalmology patient load, conducts eye exams, orders imaging, performs intravitreal injections, and assists in vitreoretinal surgeries (15). He demonstrates how PAs can support comprehensive ophthalmic care, especially in high-volume practices. In Canada, this idea aligns with the Manitoba government's recent commitment to expand the PA program to help fill gaps in rural and northern healthcare services (16). For example, a PA could shadow an ophthalmologist in a rural community like Dauphin, Manitoba, learning procedures such as intravitreal injections. Over time, the PA could take on routine follow-ups and injections in more remote northern communities while the ophthalmologist remains in urban areas, to focus on the case load in the city, including surgeries and follow ups. This model aligns with findings from the study that demonstrated that a PA, once properly integrated and supervised, could take on a large share of patient responsibilities without compromising quality or patient safety (9).

The inclusion of PAs also appears to have benefits financially as well. In the same study, PA integration showed a positive return on investment, especially when they managed lower-acuity patients and routine follow-ups (9). Similar financial models have proven effective in other areas of medicine where PAs are well established in Manitoba (13). In Canada, where healthcare is publicly funded, using PAs strategically could improve efficiency and patient outcomes while minimizing the need for costly specialist expansion.

However, as discussed in the articles, this path may have challenges. The national survey study pointed to limited exposure to ophthalmology during PA education and uncertainty from supervising physicians as barriers to work in the speciality (6). This reflects a hesitation around integrating PAs into highly specialized fields. To address this, there could be a start to targeted pilot programs, interprofessional collaboration, and mentorship opportunities within ophthalmology clinics. The Canadian Association of Physician Assistants (CAPA) could play a role by advocating for curriculum development and publicly sharing data on specialty PAs, including those currently working in ophthalmology. At present, there is no public database outlining the number of practicing PAs in Canada in ophthalmology. CAPA could help address this to increase transparency and support future planning for all medical specialities.

Although there's limited Canadian research, findings from the U.S. suggest that PAs can help improve access in ophthalmology. One example comes from a conference abstract, which looked at adding a retina-trained PA to a clinic (17). Over nine months, the PA increased patient volume by 27% and was available more days than the retina specialist, improving same-day access (17). The PA did not perform procedures like intravitreal injections or lasers, but patients still reported satisfaction and were open to continuing care with the PA (17). While this model focused on non-procedural care, other studies have shown that intravitreal injections performed by non-physicians can be safe and effective. For example, a systematic review found comparable complication rates between nurses and physicians performing injections (18). This suggests that with proper training, expanding the PA's scope could be a safe way to further support ophthalmology teams.

Across the articles reviewed, what stood out the most was the adaptability and capability of PAs in this specialty. With limited education in PA school in ophthalmology, there are practicing PAs who took on new challenges in this specialty to build their skills. Like other sub-specialties in medicine, PAs can show just how much potential for their role in ophthalmic care. Canada has an opportunity to expand that potential, as collaborators in delivering high-quality, accessible eye care across the country.

### **Study Limitations**

While this literature review provides valuable insights into the role, integration, and potential benefits of physician assistants in ophthalmology, there are several limitations to be addressed. First, the reviewed studies in this literature review doesn't include any data from Canada. All the articles found within North America, only included information from the U.S.A, and none of the reviewed studies were conducted in Canada. Unfortunately, this poses a limit of findings to the Canadian healthcare system. The primary research examined was conducted in the United States, where the regulation and funding of healthcare differ significantly from Canada. As a result, the findings may not fully reflect the feasibility or implications PA integration into ophthalmology in Canada.

Additionally, the sample sizes in a few studies were relatively small. In the national survey study, there were only 47 respondents. This is a relatively small sample size, considering there were 94 registered physician assistants in ophthalmology at the time (6). This small pool of participants may not accurately represent the full scope of experiences or capacities of PAs in ophthalmology. Also, some surveys had optional questions, leading to inconsistent responses and

gaps that made it difficult to draw strong conclusions about certain procedures, training methods, or practice barriers.

Another limitation was the lack of outcome-based studies evaluating the impact of PAs on patient care, efficiency, or cost-effectiveness in ophthalmology. Much of the available literature focused on descriptive data, case studies, or observational benefits, which shows the importance of evidence-based research. Moreover, questions about why PAs have not been integrated into ophthalmology in Canada, despite their presence in other specialties, remain unanswered. This could be due to lack of formal training programs, limited exposure during PA education, or resistance from ophthalmologists unfamiliar with the PA role.

### **Future Considerations**

To address these limitations and bridge the knowledge gap, future research should focus on Canadian-based pilot programs, collaborative models, and outcome studies to assess the true impact of PAs in ophthalmology. A similar study of integrating a physician assistant into an ophthalmology consult service could be done in Canada (9). A similar study could be conducted in Manitoba, integrating a PA into the consult service at the Misericordia Health Centre could serve as a valuable starting point, allowing them to gain hands-on experience and learn directly from ophthalmologists and residents. Understanding the systemic differences between the U.S. and Canadian healthcare systems may also shed light on why PAs in ophthalmology are more prevalent in the U.S. and how Canada can adapt similarly.

Future research should be conducted to explore strategies to effectively integrating physician assistants into ophthalmology teams within Canada. Key areas of investigation could include scope of practice regulations, models of physician supervision, and approaches to

interprofessional collaboration. It would also be important to assess the impact of PAs on patient outcomes, continuity of care, and service accessibility, including in rural communities where ophthalmic care is often limited. Evaluating whether PAs can contribute to reduced wait times and improved efficiency may provide valuable evidence to support the profession. However, given the current absence of publicly documented PAs practicing in ophthalmology in Canada, such implementation would likely be a long-term future consideration.

Another important area of research is the cost-effectiveness of employing PAs in ophthalmology. An economic analysis can help determine whether they can reduce healthcare costs while maintaining and improving the quality of care delivered. Exploring the educational pathways and training needs for Canadian PAs is also essential. It may be necessary to develop specialized training opportunities, such as speciality-focused electives or postgraduate training, to ensure PAs are well-prepared for work in this field.

Drawing comparisons with the U.S. model of integrating PAs into ophthalmology could offer further insight. The U.S. perspective may help inform the development of similar strategies in Canada, although these would need to be adapted to align with differences in healthcare policy, funding models, and regulations. In addition, research should investigate potential policy barriers that may be limiting the expansion of PA roles in ophthalmology in Canada and propose strategies for professional advocacy.

By addressing these considerations, future research can provide valuable insights into the feasibility, benefits, and implications of integration of PAs into ophthalmology practices in

Canada. These findings could support workforce planning and policy development aimed at improving access to quality eye care services across the country.

### **Conclusion**

This literature review examined the evolving role of PAs in ophthalmology, with a focus on their scope of practice, integration to clinical environment, and the potential benefits they bring. The studies consistently demonstrated that PAs can effectively support ophthalmologists by enhancing patient access, improving workflow efficiency, and performing a variety of clinical and procedural tasks in the specialty.

Despite these positive findings in the U.S., there remains a significant gap in Canadian research regarding PAs in ophthalmology. No primary studies were identified that evaluate their role, integration, or impact within Canada. This absence of data limits the ability to generalize international findings and apply them in Canada.

The findings demonstrate the need for Canadian-based research to assess the feasibility and value of implementing PAs into ophthalmology practices nationwide. Investigating how PAs can be successfully integrated into ophthalmic care teams, particularly in underserved areas, could contribute to addressing the growing demand for eye care services. Furthermore, defining their role through policy development and professional training opportunities will be crucial in supporting a sustainable healthcare model.

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## Appendix

**Table 1: Search Strategies.**

<b>Physician assistant*</b>	<b>Ophthalmology</b>
Physician associate	Ophthalmolog*
<b>Physician extender</b>	Ocular care

The words in the columns were searched as AND, while the words in rows were searched as OR. The bolded terms were MeSH terms used in PubMed search. The asterisk was used for truncation for Scopus search.

**Table 2: Main Themes of the articles**

Article	Role of PAs	Integration of PAs	Facilitations of PA	Barriers of PAs
Gutierrez et al. (2024)	<p>Assisting ophthalmologists in surgery, independent ophthalmic procedures.</p> <p>Managing and evaluating patients autonomously in clinics.</p> <p>Running lasers and administering injections</p> <p>Some PAs work independently, while others have limited roles due to physician preferences.</p>	<p>PAs in speciality are underrepresented. Integration has been slow due to limited training in</p> <p>PA school and resistance from ophthalmologists.</p> <p>NPs have been more successfully integrated into ophthalmology.</p> <p>Ophthalmologists prefer PAs due to their surgical training but hesitate to hire them due to training costs and limited education</p>	<p>PAs reduces burden on ophthalmologists by taking on patient evaluations and minor procedures.</p> <p>Improve access to care, especially in areas with ophthalmologist shortages.</p> <p>PAs increase efficiency in practices by handling tasks that allow ophthalmologists to focus on complex cases</p>	<p>PA school provides minimal ophthalmology exposure</p> <p>Costly or time-consuming for ophthalmologists</p> <p>Few ophthalmology positions are available for PAs</p> <p>Physician doubt PAs' ability</p> <p>Some states have restrictions limiting their scope of practice.</p> <p>Ophthalmology practices have never worked with PAs</p>
Lee et al. (2020)	<p>Provide primary clinical ophthalmic care independently.</p> <p>Assist in surgeries and minor procedures.</p> <p>Consenting patients for surgeries and procedures</p> <p>Independently performing procedures like intravitreal injections and minor lid procedures.</p>	<p>Allowed to handle various clinical responsibilities, including assisting in surgeries and performing certain procedures</p>	<p>Ability of PAs to perform independent clinical duties and assist in procedures suggests a potential positive impact on patient care and practice efficiency</p>	<p>No previous experience in vision and ocular health before becoming a PA, indicating a potential barrier in prior specialized training</p> <p>Limited number of PAs performing certain procedures independently may suggest barriers related to training or scope of practice regulations.</p>
Ehlers et al. (2023)	<p>Manage chronic retinal diseases and triage acute cases</p> <p>Supporting ophthalmologists</p>	<p>Work with retinal specialists, focusing on medical management while MD handle procedure</p>	<p>Increases patient access to care and enables specialists to treat more high-acuity cases</p>	<p>Ensuring consistent training and defining appropriate roles between PAs and MDs</p>
Lee et al. (2022)	<p>Provide patient education, addressing inquiries, and discussing ocular health</p> <p>Involvement based on training and interest</p>	<p>PAs with specialized training in vision/ocular care are more actively involved in eyecare services</p>	<p>PA enhance patient access to services and allow ophthalmologists to focus on complex case</p>	<p>Limited training opportunities restrict PAs' involvement</p> <p>Barrier requires collaboration between ophthalmologists and PA educational institutions to develop comprehensive training programs</p>
Lee et al. (2018)	<p>PAs enhance resident education</p>	<p>PAs aide residents by handling consults, allowing residents to focus on complex cases and procedure</p>	<p>PA reduces consult wait times - improving patient satisfaction and care efficiency</p>	<p>Financial considerations are crucial of PAs to be considered</p> <p>Require adequate patient load for cost-effective PA integration.</p>
Moore et al. (2018)	<p>PAs serve as a cost-effective alternative to faculty ophthalmologists</p>	<p>PAs optimize financial efficiency without significantly compromising patient care quality</p>	<p>While residents do not directly generate revenue, their training is essential for future patient care</p> <p>PAs enhance patient care efficiency by providing services at a lower cost compared to faculty ophthalmologists</p>	<p>Financial constraints may limit the ability to hire additional PAs or other advanced providers</p> <p>Balancing cost savings with maintaining high-quality patient care is ongoing challenge</p>
Browning et al. (2018)	<p>Perform various tasks in ophthalmology, including patient evaluations, pre- and postoperative care, and assisting in surgeries</p>	<p>PA integration requires clear role definitions, appropriate training, and collaboration with ophthalmologists to ensure quality care</p>	<p>Inclusion of PAs may increase patient access to services, reduce wait times, and allow ophthalmologists to focus on more complex cases, potentially improving overall efficiency</p>	<p>Challenges include defining the scope of practice, ensuring adequate training, integrating into existing healthcare teams, and addressing regulatory and reimbursement issues</p>

**Table 3: Summary of research articles used.**

Study	Objective	Design/Method	Conclusion	Limitation
Gutierrez et al. (2024)	To analyze: role of PAs in ophthalmology, barriers and facilitators in PA training for ophthalmology, optimal training methods for PAs in ophthalmology.	Explanatory qualitative case study 17 out of 94 PAs in ophthalmology in U.S. Semi-structured qualitative interviews. Interpretational data analysis with thematic coding.	Roles include assisting surgeries, performing procedures, and evaluating patients autonomously. Current PA training for ophthalmology is insufficient. Formal postgraduate training program is suggested to enhance PA skills/integration	Small Sample Size Self-Reporting Bias Lack of ophthalmologist perspective Limited research on PA training
Lee et al. (2020)	Evaluate the scope of practice and training of current PAs in ophthalmology and assess their interest in further training and involvement in the field.	Cross-sectional survey study (anonymous survey) for PAs in ophthalmology within the AAPA database	PAs provide clinical and some procedural ophthalmic care. Development of PA postgraduate training program in ophthalmology may expand the pool of PAs qualified to practice in this specialty	Limited sample size Low response rate
Ehlers et al. (2023)	Explore the role of physician extenders (PAs and NPs) in ophthalmology, particularly in retinal care	Editorial review  Insights into integrating physician extenders within ophthalmology	Integrating physician extenders in retinal care enhances patient access and allows specialists to focus on complex cases and procedures	No empirical data, not primary research  Further studies are needed to assess impact.
Lee et al. (2022)	Assess the characteristics, training, and self-reported skills in vision and ocular care among PAs not specializing in ophthalmology	Survey was distributed to 5,763 randomly selected U.S.-based PAs  537 respondents completed the initial survey and were invited to a follow-up on vision and ocular care; 382 completed this secondary survey	~ 23% of PAs engage in eyecare activities, such as providing patient information and initiating discussions about vision and ocular health more than 1x/month Over 77% received vision and ocular care training during or outside their PA education. PAs involved in eyecare reported higher desired and current skill levels in several vision and ocular care domains compared to those not involved. There's a need for enhanced vision and ocular care training in PA programs and through continuing medical education.	The study relies on self-reported data, which may be subject to bias.  Respondents were limited to those who completed both surveys, potentially affecting the representativeness of the sample.
Lee et al. (2018)	Evaluate the impact of integrating a PA into an academic ophthalmology consult service on resident education, consult wait times, and financial feasibility	PA integration into ophthalmology consult service to enhance resident education  Retrospective analysis on first-year resident annual surgical logs before and after the introduction of the PA reviewed  Residents were surveyed for their perspectives regarding impact of PA integration on resident experience	PA integration freed approximately 28 days annually per first-year resident for alternative clinical assignments, resulting in increase in annual surgical volume  93% of residents reported improved ophthalmic education and service-to-education balance  PA consults had 28 minutes shorter median wait times compared to residents  Financially, a PA would need to see 8-12 patients daily to be cost-neutral to the service.	Study conducted at a single institution and a single PA - results may not generalize universally.
Moore et al. (2018)	Compare the direct financial costs and benefits of ophthalmology residents with those of advanced practice providers (APPs), optometrists, and faculty ophthalmologist	Single-center cost-benefit analysis at the University of Kentucky during the 2016–2017 academic year  Data collection on annual salaries and benefits, weekly costs based on hours worked	Ophthalmology residents have the lowest annual salaries and benefits and hourly costs  Residents do not directly generate revenue, resulting in negative net annual revenues APPs and optometrists are more cost-effective than faculty ophthalmologists  Faculty ophthalmologists have the highest earnings but also the highest hourly costs	Data based from a single institution - may limit generalizability.
Browning et al. (2018)	Discuss the potential roles and integration of PAs and NPs in ophthalmology to address the anticipated shortage of ophthalmologists	Editorial commentary exploring the costs and benefits of incorporating PAs and NPs into ophthalmic practice	Incorporating PAs and NPs into ophthalmology could help mitigate the projected shortage of ophthalmologists, potentially improving access to care and efficiency in ophthalmic services	As an editorial, it provides a perspective without original research data; further studies are needed to evaluate the impact

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