SYSTEMATIC REVIEW

Direct observation of procedural skills (DOPS) in ophthalmology education: a systematic review of learner outcomes, perceptions, and implementation considerations

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Background: Direct observation of procedural skills (DOPS) is a workplace-based assessment format that combines direct observation with feedback. This systematic review examined ophthalmology-specific studies reporting learner outcomes, perceptions, and implementation characteristics associated with DOPS.
Method: We searched PubMed, Scopus, Web of Science Core Collection, and ERIC through April 2025, with backward and forward citation tracking. Eligible studies were controlled or uncontrolled quasi-experimental studies and methodological comparisons of DOPS-related activities in ophthalmology trainees. Two reviewers independently screened records, extracted data, and assessed methodological limitations. Outcomes included procedural performance, learner and assessor perceptions, and implementation characteristics. Heterogeneous findings were synthesized narratively.
Results: Six studies met the inclusion criteria: one controlled pre–post comparison with alternating allocation, three uncontrolled quasi-experimental studies, and two methodological comparisons. The controlled comparison reported higher post-test OSCE scores after a DOPS-based teaching package than after traditional instruction (ophthalmic torch examination: 6.80 vs. 5.35; fundoscopy: 6.50 vs. 4.70; both p = 0.001). The uncontrolled studies reported higher scores or more favorable perceptions after programs that included DOPS; one program also included Peyton's four-step teaching method, supervised practice, and feedback. The methodological comparisons found score correspondence between Video Observation of Procedural Skills (VOPS) and DOPS in small single-assessor samples; these findings do not establish validity or interchangeability. Several studies described assessor preparation and standardized forms.
Conclusion: Current evidence suggests that DOPS is a promising formative assessment strategy in ophthalmology education; however, the certainty of evidence is limited by small samples, single-center designs, lack of controls, heterogeneous interventions, and insufficient psychometric evaluation.
Keywords: Direct Observation of Procedural Skills, Competency-based Medical Education, Workplace-based Assessment, Ophthalmology, Ophthalmology Education

مشاهده مستقیم مهارت‌های رویه‌ای (DOPS) در آموزش چشم‌پزشکی: مروری نظام‌مند بر پیامدها برای فراگیران، ادراکات و ملاحظات اجرایی

زمینه و هدف: مشاهده مستقیم مهارت‌های رویه ای (DOPS) در آموزش پزشکی مبتنی بر شایستگی برای ارزیابی و بهبود عملکرد تکنیکی به کار گرفته شده است. هدف این مرور نظام‌مند بررسی شواهد موجود درباره تأثیر DOPS بر کسب مهارت، ادراک فراگیران، و امکان‌پذیری اجرای آن در آموزش چشم‌پزشکی است.
روش: جست‌وجوی جامعی در پایگاه‌های PubMed، Scopus، Web of Science و ERIC تا آوریل ۲۰۲۵ انجام و با جستجوی دستی منابع تکمیل گردید. مطالعات واجد شرایط شامل کارآزمایی‌های تصادفی‌شده کنترل‌شده طرح‌های شبه‌تجربی و مطالعات مقایسه‌ای روش‌شناختی بودند که DOPS را در دستیاران یا فراگیران چشم‌پزشکی ارزیابی کرده بودند. دو مرورگر به‌طور مستقل غربالگری، استخراج داده‌ها و ارزیابی کیفیت مطالعات را انجام دادند. پیامدهای اصلی شامل شایستگی پروسیجرال، مانند نمرات آزمون بالینی ساختارمند عینی یا OSCE و امتیازهای DOPS، رضایت فراگیران و ارزیابان، و امکان‌پذیری اجرا بود. به دلیل ناهمگونی مطالعات، یافته‌ها به‌صورت روایی سنتز شدند.
یافته‌ها: شش مطالعه معیارهای ورود را داشتند: یک مطالعه کنترل‌شده پیش‌آزمون–پس‌آزمون با تخصیص متناوب، سه مطالعه شبه‌تجربی بدون گروه کنترل، و دو مطالعه مقایسه‌ای روش‌شناختی. در مطالعه کنترل‌شده بسته آموزشی مبتنی بر DOPS در مقایسه با آموزش سنتی با نمرات بالاتر OSCE پس‌آزمون همراه بود (معاینه با چراغ‌قوه: ۶٫۸۰ در برابر ۵٫۳۵؛ فوندوسکوپی: ۶٫۵۰ در برابر ۴٫۷۰؛ در هر دو مورد p= ۰٫۰۰۱). مطالعات شبه‌تجربی بدون گروه کنترل، افزایش نمرات یا ادراکات مطلوب‌تر را پس از برنامه‌هایی گزارش کردند که DOPS یکی از اجزای آن‌ها بود؛ یکی از این برنامه‌ها همچنین شامل روش چهارمرحله‌ای پیتون، تمرین تحت نظارت و بازخورد بود. دو مطالعه مقایسه‌ای روش‌شناختی، همخوانی نمرات بین مشاهده ویدئویی مهارت‌های رویه‌ای (VOPS) و DOPS را در نمونه‌های کوچک با یک ارزیاب گزارش کردند؛ این یافته‌ها اعتبار یا قابلیت جایگزینی دو روش را اثبات نمی‌کنند. چند مطالعه نیز آماده‌سازی ارزیابان و استفاده از فرم‌های استاندارد را گزارش کردند.
نتیجه گیری: DOPS راهکاری نویدبخش برای ارزیابی تکوینی در آموزش چشم‌پزشکی محسوب می‌شود؛ با این حال، قطعیت این شواهد به دلیل عواملی همچون حجم نمونه کوچک، طراحی‌های تک‌مرکزی، فقدان گروه کنترل، ناهمگونی مداخلات و ارزیابی‌های روان‌سنجی ناکافی، محدود است.
واژه های کلیدی: مشاهده مستقیم مهارت‌های پروسیجرال، آموزش پزشکی مبتنی بر شایستگی، ارزیابی مبتنی بر محیط کار، چشم‌پزشکی، آموزش چشم‌پزشکی

الملاحظة المباشرة للمهارات الإجرائية (DOPS) في تعليم طب العيون: مراجعة منهجية لنتائج المتعلمين، وتصوراتهم، واعتبارات التنفيذ

الخلفية: تُعد الملاحظة المباشرة للمهارات الإجرائية (DOPS) صيغةً للتقييم القائم على مكان العمل، حيث تجمع بين الملاحظة المباشرة وتقديم التغذية الراجعة. وقد بحثت هذه المراجعة المنهجية في الدراسات الخاصة بطب العيون التي تناولت نتائج المتعلمين، وتصوراتهم، وخصائص التنفيذ المرتبطة بـ DOPS.
الطريقة: شمل البحث قواعد بيانات PubMed وScopus و Web of Science Core Collection وERIC حتى شهر أبريل ٢٠٢٥، مع تتبع المراجع (الاستشهادات) السابقة واللاحقة. وتضمنت الدراسات المؤهلة: دراسات شبه تجريبية (سواء كانت مضبوطة أو غير مضبوطة) ومقارنات منهجية للأنشطة المتعلقة بـ DOPS لدى المتدربين في مجال طب العيون. قام اثنان من المراجعين بشكل مستقل بفحص السجلات، واستخراج البيانات، وتقييم القيود المنهجية. وشملت النتائج: الأداء الإجرائي، وتصورات المتعلمين والمقيمين، وخصائص التنفيذ. كما تم تجميع النتائج المتباينة (غير المتجانسة) وعرضها بأسلوب سردي وصفي.
النتائج: استوفت ست دراسات معايير الإدراج: دراسة مقارنة مضبوطة (قبل وبعد التدخل) مع توزيع تبادلي، وثلاث دراسات شبه تجريبية غير مضبوطة، ودراستان للمقارنة المنهجية. وأظهرت الدراسة المقارنة المضبوطة درجات أعلى في اختبار المهارات السريرية الموضوعي المنظم (OSCE) بعد استخدام حزمة تعليمية قائمة على DOPS مقارنة بالتعليم التقليدي (فحص العين بالمصباح اليدوي: ٦٫٨٠ مقابل ٥٫٣٥؛ فحص قاع العين: ٦٫٥٠ مقابل ٤٫٧٠؛ وكلاهما بقيمة p = 0.001). وأفادت الدراسات غير المضبوطة بوجود درجات أعلى أو تصورات أكثر إيجابية بعد البرامج التي تضمنت DOPS؛ كما تضمن أحد البرامج طريقة "بيتون" (Peyton) التعليمية المكونة من أربع خطوات، والممارسة تحت الإشراف، والتغذية الراجعة. ووجدت المقارنات المنهجية توافقاً في الدرجات بين الملاحظة بالفيديو للمهارات الإجرائية (VOPS) وDOPS في عينات صغيرة مع وجود مقيّم واحد؛ إلا أن هذه النتائج لا تؤكد الصلاحية أو إمكانية التبادل بين الطريقتين. كما وصفت عدة دراسات عملية إعداد المقيمين واستخدام نماذج موحدة.
الخلاصة: تشير الأدلة الحالية إلى أن DOPS استراتيجية واعدة للتقييم التكويني في تعليم طب العيون؛ ومع ذلك، فإن اليقين بشأن هذه الأدلة محدود بسبب صغر حجم العينات، وتصاميم الدراسات التي تقتصر على مركز واحد، وغياب مجموعات الضبط، وتفاوت التدخلات، وعدم كفاية التقييم السيكومتري (القياس النفسي والمهاري).
الكلمات المفتاحية: الملاحظة المباشرة للمهارات الإجرائية، التعليم الطبي القائم على الكفاءة، التقييم القائم على مكان العمل، طب العيون، تعليم طب العيون

امراضِ چشم کی تعلیم میں طریقہ کار سے متعلقہ مہارتوں کا براہِ راست مشاہدہ (DOPS): سیکھنے والوں کے نتائج، تاثرات اور نفاذ سے متعلق امور کا ایک منظم جائزہ

پس منظر: طریقہ کار کی مہارتوں کا براہ راست مشاہدہ (DOPS) کام کی جگہ پر مبنی تشخیص کا فارمیٹ ہے جو براہ راست مشاہدے کو تاثرات کے ساتھ جوڑتا ہے۔ اس منظم جائزے نے DOPS کے ساتھ منسلک سیکھنے والے کے نتائج، تاثرات، اور عمل درآمد کی خصوصیات کی اطلاع دینے والے امراضِ چشم سے متعلق مخصوص مطالعات کا جائزہ لیا۔
طریقہ: ہم نے پب میڈ، اسکوپس، ویب آف سائنس کور کلیکشن، اور ERIC کو اپریل ۲۰۲۵ تک، پسماندہ اور آگے حوالہ جات سے باخبر رہنے کے ساتھ تلاش کیا۔ اہل مطالعات کو کنٹرول یا بے قابو نیم تجرباتی مطالعہ اور ماہر امراضِ چشم کے تربیت یافتہ افراد میں DOPS سے متعلقہ سرگرمیوں کا طریقہ کار موازنہ کیا گیا تھا۔ دو جائزہ لینے والوں نے آزادانہ طور پر ریکارڈز کی اسکریننگ کی، ڈیٹا نکالا، اور طریقہ کار کی حدود کا اندازہ کیا۔ نتائج میں طریقہ کار کی کارکردگی، سیکھنے والے اور جائزہ لینے والے کے تاثرات، اور نفاذ کی خصوصیات شامل ہیں۔ متضاد نتائج کو بیانیہ کے ساتھ ترکیب کیا گیا تھا۔
نتائج: چھ مطالعات نے شمولیت کے معیار کو پورا کیا: متبادل مختص کے ساتھ ایک کنٹرول شدہ پری-پوسٹ موازنہ، تین بے قابو نیم تجرباتی مطالعات، اور دو طریقہ کار موازنہ۔ کنٹرول شدہ موازنہ نے روایتی ہدایات کے مقابلے DOPS پر مبنی تدریسی پیکج کے بعد پوسٹ ٹیسٹ OSCE کے اعلی اسکور کی اطلاع دی ہے (آنکھوں کے مشعل کی جانچ: ۶٫۸۰ بمقابلہ ۵٫۳۵؛ فنڈوسکوپی: ۶٫۵۰ بمقابلہ ۴٫۷۰؛ دونوں p = 0.001)۔ غیر کنٹرول شدہ مطالعات نے ان پروگراموں کے بعد زیادہ اسکور یا زیادہ سازگار تاثرات کی اطلاع دی جن میں DOPS شامل تھا۔ ایک پروگرام میں پیئن کا چار قدمی تدریسی طریقہ، زیر نگرانی مشق، اور تاثرات بھی شامل تھے۔ طریقہ کار کے موازنے میں ویڈیو آبزرویشن آف پروسیجرل اسکلز (VOPS) اور DOPS کے درمیان چھوٹے سنگل اسسر کے نمونوں میں اسکور کی خط و کتابت پائی گئی۔ یہ نتائج درستگی یا تبادلہ کی اہلیت کو قائم نہیں کرتے ہیں۔ متعدد مطالعات میں تشخیص کار کی تیاری اور معیاری شکلیں بیان کی گئیں۔
نتیجہ: موجودہ شواہد بتاتے ہیں کہ DOPS امراضِ چشم کی تعلیم میں ایک امید افزا ابتدائی تشخیصی حکمت عملی ہے۔ تاہم، شواہد کا یقین چھوٹے نمونوں، واحد مرکز کے ڈیزائن، کنٹرول کی کمی، متضاد مداخلتوں، اور ناکافی نفسیاتی تشخیص سے محدود ہے۔
کلیدی الفاظ: طریقہ کار کی مہارتوں کا براہ راست مشاہدہ، اہلیت پر مبنی طبی تعلیم، کام کی جگہ کی بنیاد پر تشخیص، امراضِ چشم، امراضِ چشم کی تعلیم

INTRODUCTION

Contemporary medical education is undergoing a significant paradigm shift, moving from traditional content-heavy curricula towards Competency-based Medical Education (CBME). This learner-centric approach emphasizes the acquisition of observable and measurable clinical competencies within authentic practice settings (1). Such a transition inherently necessitates robust, valid, and context-specific assessment strategies capable of evaluating performance in the workplace and providing actionable feedback to guide learning (2). Workplace-based Assessment (WPBA) has emerged as a pivotal educational innovation to meet these demands, integrating direct observation, realistic clinical judgment, and formative feedback, thereby aligning with the 'Does' level of Miller's pyramid by assessing actual performance in the clinical environment (3, 4).

Among the array of WPBA tools, Direct Observation of Procedural Skills (DOPS) is prominent, offering a structured format for recording procedural performance and delivering timely, evidence-based feedback (5). Initially developed by the Royal College of Physicians of England for specialty training, DOPS has gained traction across various medical disciplines, including general medical education, nursing, dentistry, and more recently, ophthalmology (6, 7). This tool is valued not only for assessing technical proficiency but also for evaluating complementary aspects such as communication, clinical decision-making, and professionalism (8).

The field of ophthalmology, characterized by its reliance on fine motor skills, high precision, and mastery of sophisticated technologies, presents unique educational challenges where effective skill development is paramount (9). Procedures ranging from fundamental examinations like slit-lamp use and tonometry to complex surgical interventions demand practical proficiency and continuous, targeted feedback. DOPS, by its nature as an observational tool coupled with structured feedback, appears well-suited to address these educational needs, potentially serving not just as an assessment method but as an active educational intervention that fosters self-reflection and enhances clinical performance (10).

Previous research across medical fields has reported the effectiveness of DOPS in enhancing clinical skills, improving Objective Structured Clinical Examination (OSCE) scores, boosting learner confidence, and enhancing feedback quality (6, 7, 11, 12). Its ease of implementation and acceptability have further supported its adoption (13, 14). However, despite these general advantages and the increasing emphasis on competency by bodies like the Accreditation Council for Graduate Medical Education (ACGME), the specific application and evidence base for DOPS within ophthalmology training warrant closer examination. As indicated by the limited number of studies identified in preliminary searches for this review, and acknowledged in existing literature, challenges such as a paucity of ophthalmology-specific research, questions regarding its reliability for subspecialty skills, and potential barriers to implementation persist (15).

Given the critical need for effective skill development in ophthalmology and the potential of DOPS, a systematic synthesis of the existing evidence is crucial. Therefore, this systematic review aims to critically analyze and synthesize the available literature on the use of DOPS in ophthalmology education. Specifically, this review will evaluate the impact of DOPS on trainee skill acquisition and clinical competence, learner and assessor perceptions (including satisfaction and motivation), and its feasibility within ophthalmology training programs. It will also explore the benefits and challenges associated with its implementation, including comparisons with other assessment modalities where available. Ultimately, this review seeks to determine whether DOPS can serve as an effective, valid, and reliable tool for training and assessing ophthalmology skills and to identify strategies for its optimized and widespread integration into ophthalmology curricula.

METHODS

This systematic review was conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and the checklist is provided (16) (Supplementary 1). The review protocol, including the PICO framework, was established prior to the commencement of the study.

Eligibility Criteria

Studies were deemed eligible for inclusion if they focused on ophthalmology trainees, including medical students, interns, specialty residents, and individuals in ophthalmology training courses or rotations (Population). The core intervention of interest was the use of the DOPS tool, either as an educational intervention or for assessing practical skills in a clinical setting; studies employing DOPS alongside other WPBA tools were considered if the independent effect of DOPS could be clearly discerned (Intervention). Comparisons could be made against traditional teaching or assessment methods, no specific intervention (as in pre-post designs), or other assessment modalities like Video Observation of Procedural Skills (VOPS) (Comparison). Eligible studies needed to clearly assess the effect of DOPS on outcomes such as practical skills, clinical competence, knowledge, attitude, trainee motivation or satisfaction, or the feasibility and acceptability of the DOPS tool

(Outcomes).

The review considered original research articles, specifically Randomized Controlled Trials (RCTs), quasi-experimental studies (e.g., pre-test/post-test, controlled before-after), observational studies (cross-sectional or cohort), and methodological comparison studies. Only articles published in English or Persian, appearing in peer-reviewed journals up to April 2025, were included.

Conversely, studies were excluded if they did not directly address DOPS assessment in ophthalmology education, such as those examining DOPS in other disciplines or its non-educational applications. Review articles, editorials, letters to the editor, commentaries, case reports, conference abstracts, or theses not published as full articles in peer-reviewed journals were also excluded.

Information sources and search strategy

A comprehensive systematic search was performed across four electronic databases: PubMed, Scopus, Web of Science, and ERIC, to identify all relevant studies published up to April 2025. This electronic search was supplemented by manual screening of the reference lists of all included studies and pertinent review articles (backward and forward citation tracking) to capture any potentially eligible articles missed by the initial search.

The search strategy was developed iteratively and pilot-tested to ensure comprehensive retrieval of relevant literature. It combined keywords and, where applicable, Medical Subject Headings (MeSH terms) related to the intervention (DOPS), the population/context (ophthalmology education), and the outcomes of interest. Core keywords included terms such as "Direct Observation of Procedural Skills", "DOPS", "workplace-based assessment", "WPBA", "Ophthalmology education", "Ophthalmology training", "Ophthalmology resident", "Ophthalmology intern", "medical student", "impact", "effectiveness", "outcomes", "assessment", "procedural skills", and "clinical competence". These terms were combined using Boolean operators (AND, OR) and adapted to the specific syntactic rules of each database. Full search queries for each database are presented in supplementary 2.

Study Selection

All records identified through the database searches were imported into EndNote X9 (Clarivate Analytics, Philadelphia, PA, USA) reference management software, where duplicate records were systematically removed. Following this, two reviewers independently screened the titles and abstracts of the unique records against the pre-defined eligibility criteria. The full texts of articles deemed potentially relevant were then retrieved and independently assessed for final inclusion by the same two reviewers. Any disagreements regarding study eligibility, whether at the screening or full-text review stage, were resolved through discussion and consensus. If consensus could not be achieved, a third reviewer was consulted to make a final decision.

Quality assessment and risk of bias

Two reviewers independently appraised the four controlled or uncontrolled pre–post/repeated-measures studies using he Joanna Briggs Institute (JBI) Critical Appraisal Tools (17). The controlled pre–post comparison was classified as non-randomized because students were ranked by prior examination marks and then assigned by an even/odd sequence. The paired VOPS–DOPS methodological comparisons by Hassanpour et al. (18) and Ghiasian et al. were assessed with a structured method-comparison matrix covering participant selection, paired measurement, assessor independence, reference-standard appropriateness, reproducibility, agreement analysis, completeness, and precision; they were not treated as diagnostic-accuracy studies. Disagreements were resolved through discussion and consensus, with a third reviewer consulted when needed. Item-level judgments are provided in Supplementary File 3, Tables S3A–S3C. No global numerical quality score or formal certainty rating was assigned.

The item-level judgments use Yes, No, Partly, Unclear, and Not applicable categories; they identify design-specific concerns and are not combined into a global numerical score.

Open-ended written feedback was obtained from all 30 randomly selected students and analyzed using thematic analysis. Two independent reviewers read through all responses multiple times, performed open coding, and grouped similar codes into categories. These categories were then refined into broader themes that represented the collective experiences and perceptions of the students. Any discrepancies in coding were resolved by discussion until consensus was reached. Representative excerpts were retained to illustrate key themes.

RESULTS

This systematic review aimed to assess the impact of DOPS on ophthalmology education. The results are presented in the following sections: study selection, characteristics of included studies, quality assessment of included studies, and synthesis of findings regarding the impact of DOPS.

Study selection

The systematic search across four databases yielded 231 records initially. Following the removal of duplicates, 156 unique records were screened based on title and abstract, leading to the exclusion of 133 records. The full texts of the remaining 23 articles were reviewed for eligibility against pre-defined criteria, resulting in the exclusion of 17 articles. Consequently, six studies, published between 2016 and 2021, met the inclusion criteria and were

included in this systematic review for qualitative synthesis (Figure 1).

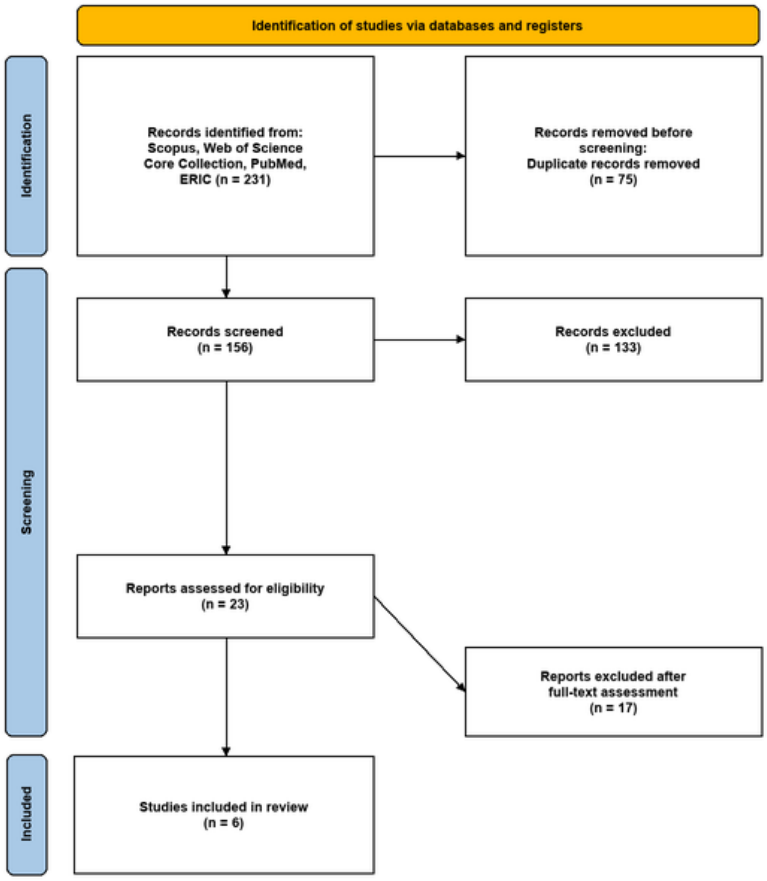

Figure 1. PRISMA flowchart

Characteristics of included studies (table 1)

The six included studies examined DOPS-related activities in ophthalmology training programs in India, Pakistan, and Iran/USA. Designs differed: one controlled pre–post comparison ranked students by prior examination marks and then assigned them by even/odd sequence; the publication described this as randomized (Inam ul Haq et al. 2018) (19). Three studies were prospective, uncontrolled quasi-experimental studies (Moudgil et al., 2019; Sethi & Badyal, 2019; Padgul & Choppara, 2017) (8, 20, 21), and two were prospective methodological comparisons of VOPS and DOPS (Hassanpour et al., 2016; Ghiasian et al. 2021) (18, 22). Participants were fourth-year undergraduate medical students (n = 40), interns undergoing ophthalmology rotations (n = 100, n = 15, and n = 50), and PGY4 ophthalmology residents (n = 10 and n = 6). All studies were conducted within single institutions. The included-study publication years were 2016 (n = 1), 2017 (n = 1), 2018 (n = 1), 2019 (n = 2), and 2021 (n = 1).

All six investigations used DOPS as an assessment; it formed part of a broader educational program in some. Moudgil et al. combined Mini-CEX with at least one DOPS for refraction (20); Padgul and Choppara combined DOPS with Peyton's four-step teaching, supervised practice, and feedback (21); the controlled study compared a DOPS-based teaching package with traditional methods (19); Hassanpour et al. compared VOPS and DOPS scores for trabeculectomy (18); and Ghiasian et al. compared masked VOPS with DOPS during phacoemulsification (22). Skills assessed included Mini-CEX clinical encounters, refraction, ophthalmic torch examination, fundoscopy, visual acuity, ocular movements, intraocular pressure measurement using Schiotz tonometry, trabeculectomy, and phacoemulsification.

Most outcomes were measures of learner performance or competence, quantified with rating scales, objective structured clinical examination (OSCE) scores, or categorical achievement levels. Secondary outcomes included learner and assessor

satisfaction or acceptability, self-reported knowledge or motivation, and qualitative feedback. Hassanpour et. al.,' comparison reported score correlation, intraclass correlation, and Bland–Altman results (18); Ghiasian et. al.'s comparison reported paired VOPS–DOPS correlations and Bland–Altman limits (22); these measures describe score correspondence and do not establish validity of either assessment method. One study reported a pilot raw alpha for its assessment tools (20), and Padgul and Choppara's study described the DOPS forms as validated but did not report validation statistics (21).

Quality assessment of included studies

Methodological limitations were present in all six studies. In the controlled comparison, students were ranked by prior examination marks and then assigned by even/odd serial numbers; allocation concealment and blinding were not reported. This remains the only controlled comparison identified (19). Hassanpour et. al.'s methodological comparison involved 10 residents and one assessor, while Ghiasian et. al.'s comparison involved six residents, 71 phacoemulsification surgeries, and one assessor; both comparisons therefore left inter-rater reproducibility untested and DOPS without an established reference standard (18, 22). Item-level appraisal judgments for every included study are provided in Supplementary File 3 (Tables S3A–S3C); they were not combined into a global numerical score.

The three uncontrolled quasi-experimental studies lacked control groups and measured outcomes alongside repeated practice, feedback, or other teaching (8, 20, 21). We therefore interpret observed changes as program-associated. All studies were single-center, and DOPS-specific inter-rater reliability was generally not reported.

Synthesis of findings

We grouped findings into four domains: procedural-skill outcomes, learner perceptions and self-reported outcomes, implementation characteristics, and the VOPS methodological comparisons.

Procedural-skill outcomes

All six studies reported performance outcomes from activities that included DOPS. In the controlled comparison, the DOPS-based teaching package had higher post-test OSCE scores than traditional instruction for the ophthalmic torch examination (6.80 vs. 5.35) and fundoscopy (6.50 vs. 4.70), both $p = 0.001$) (19). Because the package included structured teaching, observation, and feedback, this comparison does not isolate DOPS. Moudgil et al. reported higher Mini-CEX scores across encounters and 62.5% satisfactory DOPS ratings for refraction, but did not provide a DOPS pre–post effect estimate (20). Sethi and Badyal reported an increase in mean overall DOPS ratings from 3.70 ± 0.82 to 4.93 ± 1.65 across repeated encounters (overall $p < 0.001$) without a control group (8). Padgul and Choppara reported higher achievement levels after Peyton's teaching, supervised practice, feedback, and DOPS; the change cannot be attributed to DOPS alone (21). Hassanpour et al. found positive associations between DOPS and VOPS scores and prior surgical experience (18); Ghiasian et al. found correspondence between total task-specific and global VOPS–DOPS scores during phacoemulsification (22); neither methodological finding establishes that either method differentiates competence.

Learner perceptions and self-reported outcomes

The intervention studies reported positive perceptions after programs that included DOPS. Padgul and Choppara reported increases in self-reported intraocular pressure knowledge (2.0 to 4.1), ease of tonometer use (1.7 to 4.2), and motivation (3.32 to 4.42), all $p < 0.001$, after a program combining Peyton teaching, practice, feedback, and DOPS (21). The study reported that 82% of interns had a positive inclination towards choosing ophthalmology as a career option. Moudgil et al. reported satisfaction scores for Mini-CEX (8.0/9 for interns and 7.7/9 for faculty); these scores do not represent DOPS-specific satisfaction (20). Sethi and Badyal reported an overall satisfaction difference across DOPS encounters ($p = 0.001$) (20). Because some outcomes were self-reported and co-interventions were present, they describe program-associated perceptions rather than isolated DOPS effects.

This high satisfaction likely stems from the structured, immediate, and actionable feedback inherent in the DOPS process, which is known to foster self-regulated learning, enhance confidence, and improve learner reception (23, 24). Qualitative feedback highlighted the value of identifying strengths and weaknesses and improving interpersonal skills (20). While initial performance anxiety is a known phenomenon in observed assessments (25) the studies suggest subsequent encounters fostered increased confidence. However, the reliance on self-reported measures for outcomes like knowledge and motivation introduces potential bias.

Implementation characteristics and reported practical considerations

The studies described DOPS-related activities across undergraduate, intern, and resident settings. Several reported assessor preparation or sensitization and standardized forms. Sethi and Badyal described an expected DOPS observation time of approximately 15 minutes and feedback time of 5 minutes in their setting; Moudgil et al. reported 14.5 minutes of observation and 9.2 minutes of feedback for Mini-CEX, not DOPS (8, 20). Ghiasian et al. did not report a direct time or resource comparison between VOPS and DOPS.

Table 1. Characteristics of included studies

Authors and year	Moudgil et al. (2019) [20]	Inam ul Haq et al. (2018) [19]	Sethi & Badyal (2019) [8]	Padgul & Choppara (2017) [21]	Hassanpour et al. (2016) [18]	Ghiasian et al. (2021) [22]
Title	Clinical competence of interns using workplace-based assessment in ophthalmology	Learning ophthalmic procedural skills through DOPS or traditional methods	Clinical procedural skills assessment during ophthalmology internship	Intraocular pressure measurement skills in ophthalmology interns using DOPS	VOPS for trabeculectomy assessment by residents	Comparison of video-based observation and direct observation for assessing operative performance during phacoemulsification training
Country/setting	India (Punjab Institute of Medical Sciences)	Pakistan (Armed Forces Institute of Ophthalmology)	India (BPS Government Medical College for Women)	India (Kamineni Institute of Medical Sciences)	Iran (Farabi Eye Hospital); US collaboration (UCSF)	Iran (university-affiliated hospital; Iran University of Medical Sciences)
Study design	Single-group pre–post/repeated measures; quasi-experimental	Controlled pre–post; prior-mark ranking then even/odd allocation	Single-group repeated measures; quasi-experimental	Single-group pre–post; quasi-experimental	Prospective VOPS–DOPS methodological comparison	Prospective VOPS–DOPS methodological comparison
Aim/objective	Mini-CEX and DOPS implementation for intern competence	DOPS-based package versus traditional teaching for ophthalmic torch examination and fundoscopy	Repeated DOPS ratings of procedural performance in interns	IOP knowledge and measurement performance in a Peyton/practice/feedback programme with DOPS	VOPS–DOPS score comparison for trabeculectomy	Compare masked VOPS with real-time DOPS for phacoemulsification using the ICO-OSCAR rubric
Participants	Interns; n = 100; 15-day ophthalmology rotation	4th-year MBBS students; n = 40 (20 per group)	Interns; n = 15; purposive sample; 2-week rotation	Interns; n = 50; 15-day ophthalmology rotation	PGY4 ophthalmology residents; n = 10; 3 female, 7 male	PGY4 ophthalmology residents; n = 6; 71 phacoemulsification surgeries
Interventions	Four Mini-CEX encounters; ≥1 DOPS for refraction; feedback; trained assessors	DOPS-based teaching package; structured forms, feedback, group observation	Three DOPS encounters (2 days apart) for four skills; feedback; assessor sensitization	Peyton's four-step teaching; supervised practice before and between DOPS encounters; assessor feedback; two DOPS assessments	Recorded trabeculectomy VOPS (7 mini-skills; 1–10 scale)	Real-time DOPS and later anonymized, randomized, masked VOPS review by the same faculty assessor
Comparators	Mini-CEX 1 vs. 4; repeat DOPS until satisfactory; no control	Traditional teaching; alternating allocation; pre–post OSCE	DOPS 1 vs. 2 vs. 3; no control	Pre–post questionnaire; DOPS 1 vs. 2; no control	Real-time DOPS of same procedure; same assessor	DOPS of the same surgeries; VOPS recordings omitted audio and external operating-room information
Outcome measures	Mini-CEX; DOPS refraction; Mini-CEX satisfaction/feedback	Post-test OSCE: ophthalmic torch examination and fundoscopy; pre-test OSCE	Overall/per-skill DOPS scores; intern/assessor satisfaction/feedback	DOPS achievement; self-reported knowledge, tonometer use, motivation; assessor ratings	VOPS–DOPS correlation/agreement; VOPS reliability; experience association	ICO-OSCAR task-specific and global scores; paired comparisons, correlations, and Bland–Altman limits

Table 1. Continued

Authors and year	Moudgil et al. (2019) [20]	Inam ul Haq et al. (2018) [19]	Sethi & Badyal (2019) [8]	Padgul & Choppara (2017) [21]	Hassanpour et al. (2016) [18]	Ghiasian et al. (2021) [22]
Key findings	Mini-CEX improved; 76.25% satisfactory. DOPS refraction 62.5% satisfactory (mean 6.2/9). Mini-CEX satisfaction 8.0/9 interns, 7.7/9 faculty; DOPS time not reported	Post-test OSCE: torch 6.80 vs. 5.35; fundoscopy 6.50 vs. 4.70 ($p = 0.001$). Pre-test differences non-significant; alternating allocation limits causal inference	Overall DOPS 3.70→4.93 ($p < 0.001$); satisfaction $p = 0.001$; no control	Knowledge 2.0→4.1; tonometer use 1.7→4.2; motivation 3.32→4.42 (all $p < 0.001$); level ≥3 74%→98% ($p < 0.001$) after Peyton teaching, practice, feedback, and DOPS; 82% positive inclination	VOPS/DOPS $r = 0.89$ ($p = 0.001$); 8.4 vs. 8.9 ($p = 0.02$); ICC = 0.847; Bland–Altman –1.46 to 0.46; correspondence ≠ validity/interchangeability	Task-specific $r = 0.64$ ($p < 0.001$); global $r = 0.38$ ($p = 0.003$); Bland–Altman limits –5.84 to 6.87 and –4.78 to 4.86; one subscale differed ($p = 0.035$)
Quality assessment	Single center; no control; DOPS time/reliability not reported; Mini-CEX/DOPS co-use	Prior-mark ranking then even/odd allocation; no concealed allocation or blinding; n = 40	Single center; purposive n = 15; no control; DOPS reliability not quantified	Single center; no control; Peyton/practice co-interventions; validation/reliability not reported	n = 10; one assessor; no inter-rater reproducibility; DOPS not a reference standard	n = 6; one assessor; no inter-rater reproducibility; DOPS not an independent reference standard; no direct time/resource comparison

observation format used by Inam ul Haq et al. (19), may offer practical solutions to mitigate time pressures and potentially enhance peer learning. Maintaining assessor motivation and providing ongoing faculty development are also critical for sustained, effective implementation (21). These observations are study-specific and do not establish feasibility across ophthalmology training settings.

Methodological comparison: VOPS and DOPS

The two methodological comparisons assessed VOPS and DOPS. Hassanpour et al. compared scores for trabeculectomy in 10 PGY4 residents; one expert assessor rated both methods (18). VOPS and DOPS scores were correlated ($r = 0.89$, $p = 0.001$), VOPS scores were lower (8.4 vs. 8.9, $p = 0.02$), VOPS intra-rater reliability was reported as ICC = 0.847, and Bland–Altman limits of agreement were –1.46 to 0.46. Ghiasian et al. compared masked VOPS with DOPS for 71 phacoemulsification surgeries performed by six PGY4 residents using the ICO-OSCAR rubric (18). Total task-specific scores correlated ($r = 0.64$, $p < 0.001$) and total global scores correlated ($r = 0.38$, $p = 0.003$); Bland–Altman limits were –5.84 to 6.87 and –4.78 to 4.86, respectively. The methods differed significantly only for instrument insertion into the eye ($p = 0.035$). Both studies used one assessor and lacked an independently established reference standard. Their results described score correspondence in small, single-assessor samples; they did not establish validity, interchangeability, or comparative effectiveness.

These results align with literature exploring VOPS in surgical training, which highlights its potential benefits, such as enabling blinded assessment, asynchronous review, and detailed analysis (26, 27). However, findings on VOPS reliability and correlation with DOPS are mixed in the broader literature (28, 29). While VOPS emerges as a promising adjunct or alternative, particularly for complex procedures or where direct observation is logistically challenging, considerations regarding technological requirements, cost, and patient consent remain pertinent (18).

DISCUSSION

This review included one controlled pre–post comparison using rank-based even/odd allocation, three uncontrolled quasi-experimental studies, and two methodological comparisons (8, 18-22). The studies reported learner performance and perception outcomes after activities that included DOPS; co-interventions and study designs limit causal interpretation. The available evidence does not establish general feasibility, validity, or reliability.

Procedural outcomes and causal interpretation

The controlled comparison found higher post-test OSCE scores among undergraduates receiving a DOPS-based teaching approach than among those receiving traditional instruction (19). Because the package included teaching, direct observation, and feedback, the result supports an association with the package rather than an isolated DOPS effect.

In the uncontrolled studies, scores increased over repeated encounters or after pre–post program (8, 20, 21). These changes occurred alongside repeated practice, feedback, teaching, and temporal exposure and did not isolate the contribution of DOPS.

Without control groups in most studies and with co-

interventions present, observed changes could reflect several concurrent educational exposures. We therefore interpret them as program-associated changes, not evidence that DOPS alone caused skill improvement.

Methodological comparison: VOPS and DOPS

The two VOPS studies compared methods rather than testing DOPS effectiveness (18, 22). Hassanpour et al.'s correlation and agreement results were based on 10 residents and one assessor; Ghiasian et al.'s results were based on six residents, 71 phacoemulsification surgeries, and one assessor. Neither study used an independently validated reference standard. Ghiasian et al.'s anonymized video review was masked and randomized, but the same assessor rated both methods and the recordings excluded audio and external operating-room information. These studies provide preliminary information about score correspondence, not evidence that VOPS or DOPS is valid, interchangeable, or preferable for ophthalmology assessment.

Neither methodological comparison assessed inter-rater reproducibility or learner and assessor satisfaction. Ghiasian et al.'s masked video review reduced identification cues, but the same assessor rated DOPS and VOPS, so assessor memory and single-rater effects remain possible. These omissions limit interpretation of the method comparisons and their transferability to other ophthalmology settings.

Learner perceptions and self-reported outcomes

The studies reported knowledge, confidence, motivation, and satisfaction measures after programs that included DOPS. These measures describe perceptions associated with the programs and do not establish isolated DOPS effects.

Participants valued structured feedback and opportunities to identify areas for improvement. The studies did not isolate the contribution of DOPS from feedback or other educational components, and several outcomes were self-reported.

Implementation considerations

DOPS-related activities were implemented in single-center settings involving undergraduate students, interns, and residents (8, 18-22). Assessor preparation and standardized forms were reported, but the evidence is insufficient to determine DOPS-specific feasibility across settings. Sethi and Badyal described expected DOPS observation and feedback times of approximately 15 and 5 minutes in their local setting (8). Moudgil et al. reported Mini-CEX times, not DOPS (20). Hassanpour et al.'s study noted that assessing multiple trainees with DOPS can require substantial time (18); other resource requirements were not consistently reported. Successful implementation was facilitated by key factors identified in the broader WPBA literature: structured assessor training or sensitization and the use of standardized assessment forms or checklists (4, 20, 21, 30). These elements are crucial for ensuring consistency and reliability (31, 32).

Methodological considerations and certainty of the evidence

The included studies had important design limitations: one small controlled pre–post comparison using rank-based even/odd allocation, three uncontrolled quasi-experimental studies, and two small single-assessor methodological comparisons (8, 18-22). The controlled study provides the only group comparison but did not use concealed randomization or blinding. The uncontrolled studies had no comparator and included co-interventions; the methodological comparisons did not validate DOPS as a reference standard. These features limit causal interpretation.

Direct psychometric evidence from ophthalmology studies was limited. Hassanpour et al. reported VOPS intra-rater reliability, whereas Ghiasian et al. reported paired correlations and Bland–Altman limits but no repeat-rater reliability estimate. The other studies did not report DOPS inter-rater reliability, content validity, response-process evidence, or relationships with independently established measures. Evidence from other specialties cannot establish the validity or reliability of DOPS in ophthalmology.

Strengths and limitations of the systematic review

This review's strengths include its focused question, comprehensive search strategy across multiple databases, adherence to systematic review methodology (including predefined criteria and quality appraisal), and synthesis of diverse study designs relevant to ophthalmology education.

However, the review is constrained by the limitations of the primary literature. The small number of included studies (n = 6) restricts the robustness of the conclusions. Heterogeneity in participant levels, skills assessed, DOPS implementation details, and outcome measures precluded quantitative meta-analysis, necessitating a narrative synthesis. The reliance on several moderate-quality quasi-experimental studies limits causal inference. As noted, the limited reporting of psychometric data within the included studies is a significant constraint. The geographical concentration of studies impacts generalizability, and the potential for publication bias cannot be entirely ruled out.

Implications for Ophthalmology Education

Despite limitations, the consistent positive trends identified in this review offer significant implications for ophthalmology training programs. DOPS should be considered for systematic integration into ophthalmology curricula as a valuable formative assessment tool, promoting learning through observation and feedback, not just as a summative measure. Achieving this effectively

necessitates robust faculty development; training should focus not only on using the DOPS tool and checklists consistently but, crucially, on delivering high-quality, structured, and actionable feedback (e.g., using models like Ask-Tell-Ask or Pendleton's rules) (25, 33). Furthermore, utilizing standardized, procedure-specific checklists is essential to enhance objectivity and reliability, meaning programs may need to develop or adapt checklists for common ophthalmic procedures. To maximize learning and improve assessment reliability, programs should plan for multiple DOPS encounters per trainee per skill, as evidence suggests learning occurs over repeated observations and feedback cycles, which also improves assessment reliability. DOPS should also be integrated within a broader framework of WPBAs (e.g., alongside Mini-CEX, case-based discussions) to provide a holistic view of trainee competence across multiple domains. Finally, programs could consider VOPS, exploring its use as a complementary tool, particularly for complex surgical skills assessment, while being mindful of its potential differences from DOPS, technological needs, and ethical considerations.

Implications for Future Research

This review highlights several critical areas for future research in ophthalmology education. There is a need to conduct multi-center RCTs with larger sample sizes comparing DOPS to other educational interventions (including simulation or different feedback strategies) for various ophthalmic skills. Longitudinal studies should be implemented to assess long-term skill retention following DOPS-based training and, crucially, investigate the correlation between DOPS performance and subsequent clinical performance or patient safety outcomes. Research should also focus on feedback optimization, exploring the effectiveness of different feedback models and delivery strategies within DOPS encounters in the ophthalmology context and examining the impact of explicitly incorporating action planning into the feedback process. Future studies implementing DOPS must rigorously assess and report psychometric properties, particularly inter-rater and intra-rater reliability, within their specific context. Further research on VOPS is needed, evaluating it across a wider range of ophthalmic procedures and learner levels, using larger samples and multiple assessors to establish robust reliability and validity data compared to DOPS and other methods (e.g., OSATS), and potentially exploring the potential of AI-assisted analysis for VOPS (VOPS Evaluation). Additionally, investigations should examine contextual factors, specifically the influence of learner characteristics (e.g., prior experience, anxiety) and environmental factors (e.g., clinical workload, institutional culture) on DOPS effectiveness and feasibility. Finally, it is important to analyze the cost-effectiveness and resource implications of implementing and sustaining DOPS and VOPS programs within ophthalmology training.

CONCLUSION

All in all, this systematic review provides compelling evidence suggesting that DOPS is a promising formative assessment strategy in ophthalmology education; however, the certainty of evidence is limited by small samples, single-center designs, lack of controls, heterogeneous interventions, and insufficient psychometric evaluation. The structured observation and feedback mechanism inherent in DOPS aligns well with competency-based medical education principles, facilitating skill acquisition in the authentic clinical environment. While VOPS emerges as a promising complementary tool, particularly for surgical skills, further validation is required. Key challenges related to implementation, such as faculty time and training, and methodological limitations in the current evidence base, particularly regarding reliability data and the predominance of single-center, non-controlled studies, must be acknowledged. Nonetheless, the integration of DOPS, supported by robust faculty development and potentially combined with other assessment methods within a programmatic approach, represents a significant step towards enhancing the quality and effectiveness of ophthalmology training. Future high-quality, multi-center research focusing on long-term outcomes, psychometric properties, and optimal feedback strategies is essential to further refine its use and maximize its educational impact.

Ethical Considerations:

This systematic review is based exclusively on publicly available published literature; therefore, direct ethical approval for primary data collection was not required. Nevertheless, ethical research conduct was rigorously maintained throughout the review process. In line with institutional requirements for scholarly projects, approval from the Research Ethics Committee and permission from the Vice-Chancellor for Research of Shahid Beheshti University of Medical Sciences were obtained before commencing the study (Code: IR.SBMU.SME.REC.1404.002). This systematic review was conducted without prior registration of the study protocol. All sources used in this review are cited according to established scientific-referencing principles. The entire research process, encompassing study selection, data extraction, and analysis, was documented transparently to ensure replicability and integrity.

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