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Patterns of Intravitreal Injection Utilisation, Treatment Burden, and Cost Implications in a Public Ophthalmology Service: A Retrospective Audit.

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ABSTRACT

Background: The global rise of intravitreal treatment has impacted ophthalmic service delivery, workforce demands, and healthcare cost. Public ophthalmology services must strike a balance between increasing clinical demand and sustainable resource usage. The aim of this study was to assess intravitreal injection patterns, temporal trends, as well as associated drug procurement costs in a public ophthalmology service.

Methods: A retrospective clinical audit was undertaken to analyze all intravitreal injections administered between June 2023 & September 2025. The data were taken from intravitreal therapy registers & comprised injection volume, agent selection, laterality, & monthly utilization trends. Drug procurement costs were determined using institutional pharmacy records. The data were anonymized & analyzed descriptively. Formal ethical approval was not necessary because this was a service evaluation audit.

Results: A total of 1,446 intravitreal injections were delivered during the audit period. Anti-VEGF therapy accounted for most of the activity, with aflibercept formulations representing 55.2% of all injections. Introduction of high dose aflibercept (8 mg) was associated with rapid adoption and displacement of alternative agents. The total drug acquisition cost was €697,504.90, with aflibercept contributing the greatest proportion of expenditure. Lower-cost agents accounted for a smaller proportion of injections.

Conclusion: Intravitreal therapy represents a substantial and growing clinical and economic burden within public ophthalmology services. Clinical effectiveness and treatment durability appear to be more important than cost when determining prescribing trends. Continuous auditing and service-level evaluation are required to guide sustainable service delivery, workforce planning, and policy development.

Keywords: *Intravitreal injections, Anti-VEGF therapy, Ophthalmology services, Health economics, Clinical audit.*

INTRODUCTION

Intravitreal injection therapy has become one of the most frequently performed ophthalmic procedures globally. The introduction of anti-vascular endothelial growth factor, also known as anti-VEGF medicines, has improved results for individuals with neovascular age-related macular degeneration (nAMD), diabetic macular edema (DMO), retinal vein occlusion, and inflammatory retinal diseases.[1-3] As treatment indications have expanded, so too has the procedural workload placed on ophthalmology services.

In many healthcare systems, intravitreal injections are delivered in high-throughput injection suites that function at the interface of outpatient care & procedural medicine.[4] These treatments involve substantial collaboration between clinical professionals, theatre-related institutions, pharmaceutical assistance, & infection prevention methods. The cumulative operational & financial burden of intravitreal therapy is increasingly viewed as a key issue to ophthalmic care sustainability.[5]

Intravitreal therapy aligns closely with broader themes in global surgery & perioperative care, including efficiency, access, workforce optimisation, & cost containment, from a health systems perspective.[6] Despite this, real-world audit data examining utilisation patterns & expenditure within public services remain limited. Audit and service evaluation provide an essential mechanism for understanding evolving practice & informing local & national policy.[7]

This study aimed to examine intravitreal injection activity over a 27-month period within a public ophthalmology service, focusing on agent utilisation, temporal trends, laterality, and drug-related costs. By contextualising findings within existing clinical and health systems literature, this audit seeks to inform sustainable service planning and innovation in intravitreal therapy delivery.

METHODS

Study Design and Rationale

This study was conducted as a retrospective clinical audit and service evaluation. Audit methodology was selected to assess real-world practice against emerging clinical and operational considerations, rather than to test a predefined hypothesis.[8] The audit timeframe was chosen to capture changes in prescribing behaviour associated with the introduction of newer intravitreal agents.

The 27-month audit period was chosen to capture baseline prescribing patterns as well as changes related with the introduction of newer intravitreal drugs, such as high-dose aflibercept (8 mg), allowing for the examination of temporal trends as well as service adaptability across time.

Setting and Scope

The audit was undertaken at a public ophthalmology service that provided routine intravitreal treatment. The program provides a specialized intravitreal injection pathway, which is supported by interdisciplinary teams.

Data Collection

Intravitreal therapy registers were reviewed for the period June 2023 to September 2025. Variables extracted included: Total number of injections administered, Intravitreal agent used, Injection laterality and Monthly injection volume.

Drug acquisition costs were obtained from institutional pharmacy procurement records and reflected direct costs to the ophthalmology service.

Injections were counted per eye & administration episode. Bilateral shots administered at the same appointment were documented as two injections and priced accordingly. Repeat injections in the same patient were classified as separate events, reflecting service workload rather than patient-specific long-term outcomes.

Analytical Framework

The Donabedian paradigm for medical care quality evaluation supervised data collection, analysis, & interpretation while conceptualizing service performance in three interconnected domains: structure, procedure, & outcomes. Structured elements of this audit included the availability of intravitreal agents & procurement costs; process elements included dosage patterns, injection volume, and laterality distribution; & outcome-related considerations focused on service workload, treatment burden, and cost implications rather than patient-level clinical outcomes. Structural factors consisted of intravitreal agent availability and acquisition costs; process variables involved agent selection, injection quantity, laterality, and spatial utilisation patterns; and outcome-related service indicators included treatment burden, workload, and total drug costs. These mappings directly influenced data extraction, processing, and interpretation.

Data analysis

The data was anonymized and compiled using Microsoft Excel. Descriptive statistics were employed to summarize utilization patterns. Temporal trends were analyzed using a graphical representation of monthly injection volumes.

Cost Analysis

The cost analysis was restricted to direct drug procurement expenses derived from institutional pharmacy records. Reported costs are list procurement prices exclusive of VAT, and do not include confidential rebates or bargained discounts. Staffing, equipment, consumables, and operating expenses were excluded. This method was chosen to provide a transparent and reproducible assessment of pharmaceutical-related financial burden, while noting that total service costs are likely underestimated.

Ethical and Governance Considerations

This study was classed as a service evaluation audit that included a retrospective analysis of anonymized data. Formal ethical approval and informed consent were not necessary, as stated in institutional governance principles and international recommendations.[9] Data handling conformed with GDPR regulations.
Although this study was carried out as a clinical audit/service evaluation, it fits the journal's unique Research requirements by producing original, thoroughly analyzed real-world evidence on service delivery, treatment burden, and cost implications of intravitreal therapy. The audit did not compare current practices to predetermined norms but rather sought to characterize them to enhance service planning, policy, and sustainability, in line with observational health services research.

RESULTS

The total number of intravitreal injections administered throughout the audit period was 1,446. Injection activity was constantly high, indicating a continued demand for retinal care.
The laterality patterns of the total injections showed that 32.9% were given to the left eye, 30.7% to the right eye, and 18.3% were bilateral. Most left-eye injections were not clinically significant, but it did reflect the variability inherent in in-service activities.

Table 1: Distribution Of Intravitreal Injections by Agent During the Audit Period, June 2023 to September 2025.

Intravitreal Agent	Number of Injections	Percentage (%)
Aflibercept 2 mg	518	35.8
Aflibercept 8 mg	281	19.4
Lucentis (Ranibizumab)	328	22.7
Avastin (Bevacizumab)	197	13.6
Dexamethasone implant (Ozurdex)	95	6.6
Faricimab	13	0.9
Triamcinolone	14	1.0
Total	1,446	100

Percentages may not total exactly 100 due to rounding.

Table 1 presents the distribution of intravitreal injections by agent across the audit timeframe. Aflibercept formulations accounted for more than half of all injections, with lower-cost and corticosteroid-based medications being utilized more selectively. Bilateral injections are operationally significant because they increase chair time, personnel demand, and operational workload per clinic session. Intravitreal agent distribution Anti-VEGF therapy constituted many injections.

Table 2: Drug Acquisition Costs by Intravitreal Agent During the Audit Period.

Intravitreal Agent	Unit Cost (€)	Number of Injections	Total Cost (€)
Aflibercept 2 mg	721.60	518	373,788.80
Aflibercept 8 mg	721.60	281	202,769.60
Ranibizumab	741.00	328	243,048.00
Bevacizumab	245.51	197	48,366.47
Dexamethasone implant (Ozurdex)	1,217.00	95	115,615.00
Faricimab	800.00	13	10,400.00
Triamcinolone	180.51	14	2,527.14
Total	-	1,446	697,504.90

Costs represent direct drug acquisition costs only and exclude VAT, staffing, infrastructure, consumables, and overheads.

Table 2 shows the unit and total drug acquisition expenses by intravitreal agent. Anti-VEGF therapy accounted for most of the total expenditure, demonstrating high utilization and higher unit prices when compared to other agents.

Figure 1: Total cost per intravitreal agent over the audit period

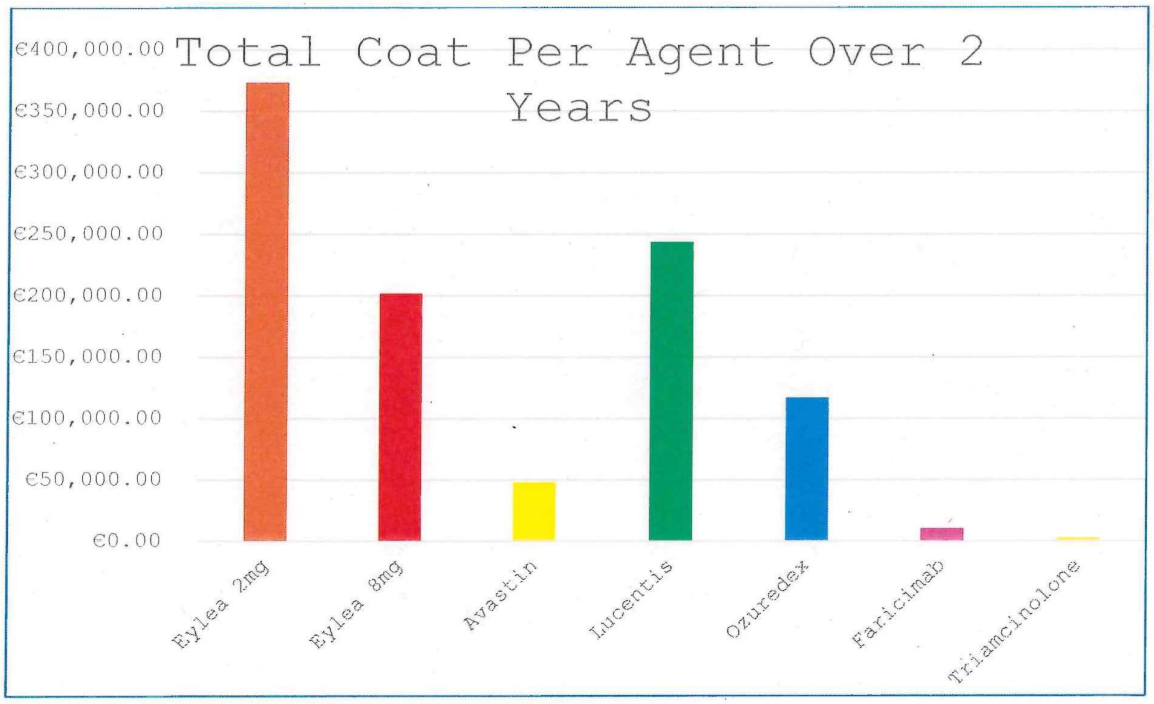

Figure 1 depicts the aggregate drug purchase cost per intravitreal agent over the audit period. Aflibercept preparations accounted for most total expense, indicating their high utilisation, while corticosteroid-based and lower-cost medicines contributed less.

Table 3: Comparison of Intravitreal Agent Use Before and After the Implementation of High-Dose Aflibercept (8 Mg).

Agent	Pre-Introduction*	Post-Introduction*	Direction of Change
Aflibercept (2 mg)	High	Moderate	↓
Aflibercept (8 mg)	0	High	↑↑
Ranibizumab	Moderate	Low	↓↓
Bevacizumab	Low	Low	↔
Corticosteroids	Low	Low	↔

**Pre-introduction, June 2023 - August 2024*
**Post-introduction, September 2024 - September 2025*

Table 3 shows changes in intravitreal agent use before and following the debut of high dose aflibercept (8 mg), indicating a shift in prescribing trends over time rather than an exclusive static pattern.

Temporal trends

Temporal analysis revealed a shift in intravitreal agent use over time, particularly after the introduction of a high dose aflibercept (8 mg) in late 2024 (Figure 2). Within four months, it had become the most administered agent. Meanwhile, Faricimab use fell dramatically.

Figure 2: Monthly Utilisation Trends of Intravitreal Agents Over the Audit Period, June 2023 - September 2025.

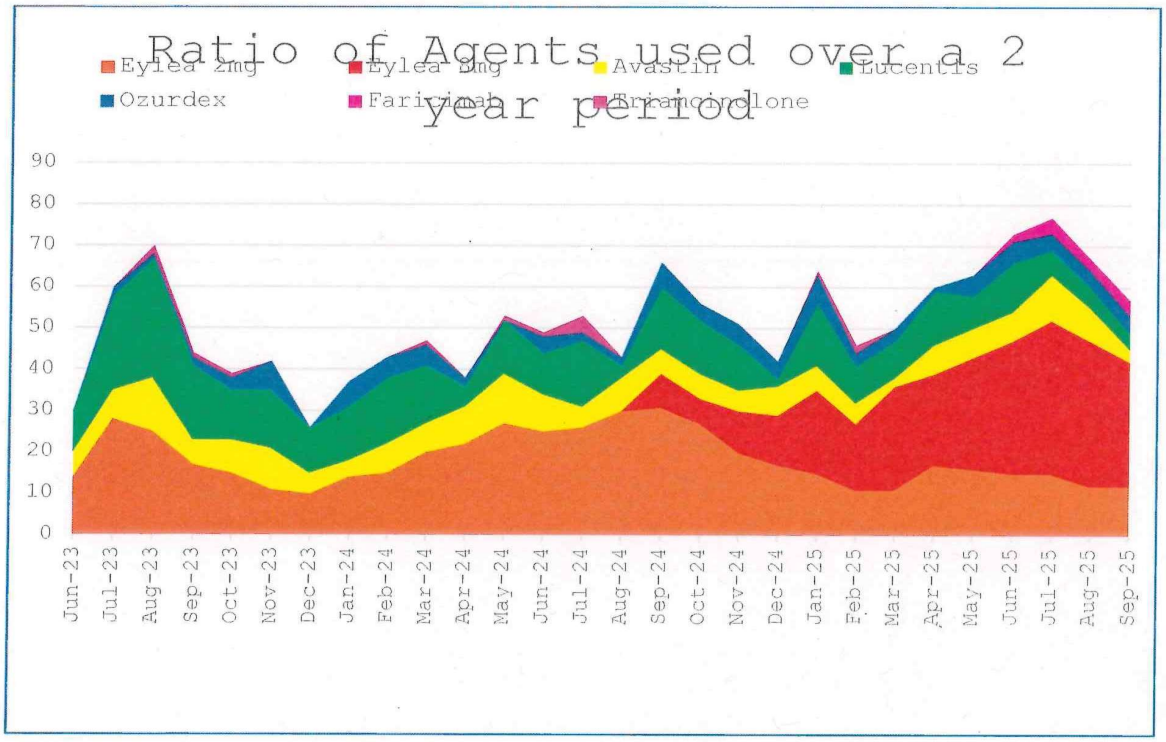

Figure 2 demonstrates dynamic changes in intravitreal agent utilisation over time. Use of aflibercept 2 mg predominated during the early audit period, with a gradual increase in aflibercept 8 mg following its introduction in September 2024. Concurrently, utilisation of Avastin and Lucentis declines while corticosteroid-based therapies remained relatively stable at lower volumes. The overall medicine acquisition cost throughout the audit period was €697,504.90. Anti-VEGF medications accounted for most of the spending. Despite lower unit costs, bevacizumab accounted for a relatively small share of total injections.

DISCUSSION

This audit illustrates the significant clinical and cost burden involved with administering intravitreal treatment in a public ophthalmology service. The prevalence of aflibercept-based therapy is due to evolving research supporting longer dose intervals & a lower treatment burden.[10-12] The data were evaluated using the Donabedian model, which conceptualizes healthcare quality as structural, process, & outcome dimensions. This audit's fundamental characteristics covered the availability & purchasing expenses of intravitreal agents, which indicate resource inputs to service delivery.[26] Process metrics included prescribing patterns, injection volume, laterality distribution, and temporal variations in agent use, which captured how care was delivered in practice. Outcome-related considerations were centred on service workload, treatment burden, and financial effect rather than patient-level clinical results, which is consistent with the objective of the service review. Using this approach allowed for a more structured understanding of intravitreal treatment delivery as a complicated, high-volume procedural service, highlighting the interrelationship of resource availability, clinical decision-making, & care sustainability.[26]

While this audit did not explicitly examine drivers of prescribing behavior, the observed trends indicate that outcomes, treatment duration, and service capacity concerns may have influenced agent selection more than purchase cost. Existing data supports this interpretation, emphasizing the relevance of reducing treatment burden and using extended dose intervals in real-world anti-VEGF use. Alternative explanations, such as local clinical preferences, formulary decisions, and purchasing practices should be examined.[13,14]

The vast volume of intravitreal injections highlights the importance of efficient injection pathways and interdisciplinary team support. Optimal workflow and task allocation may help to reduce procedural bottlenecks and increase patient throughput.[15] Relevance for Global Surgery and Innovation: Intravitreal treatment services represent the convergence of high-volume procedural care and outpatient medicine. Lessons from this audit can be used to broader concerns about surgical system strengthening, care delivery innovation, and sustainable resource utilization.[16]

LIMITATIONS

The retrospective nature of this audit and its focus on a single service limited its scope. Clinical results, patient demographics, and indirect expenses were not analyzed. Future research that combines outcome & cost-effectiveness data would provide additional insight.

IMPLICATIONS FOR PRACTICE AND POLICY

Regular audits of intravitreal treatment use can help influence procurement strategies, staff planning, & service redesign. Integrating audit findings into quality improvement activities could help sustain ophthalmic care.

CONCLUSION

Intravitreal injection therapy is a significant and growing component of ophthalmic service delivery. This audit reveals changed prescribing practices, increased dependence on newer medications, and significant financial implications. Continuous auditing & innovation are essential to deliver safe, effective, and long-lasting treatment.

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Supervision: Conall Hurley (C.H.)

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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