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Data intelligence and value management in ophthalmological services: indicators, care capacity, and clinical governance.

Data Intelligence and Value-Based Management in Ophthalmology Services: Indicators, Care Capacity, and Clinical Governance

Data Intelligence and Management Based on Values in Ophthalmology Services: Indicators, Clinical Care and Governance Capacity

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Summary

Ophthalmological services face increasing demand, chronic conditions, high-volume procedures, and inequalities in access. This article discusses how data intelligence and value management can support decisions without reducing quality, productivity, or value, or containing costs. Through a structured narrative review of World Health Organization documents, indexed literature, and ophthalmology quality instruments, a measurement architecture is proposed that connects population need, access, processes, clinical and functional outcomes, patient experience, and costs. The analysis highlights data quality, risk adjustment, interoperability, transparency, and governance. It concludes that dashboards and business intelligence are useful when they answer explicit clinical and operational questions, allow stratification, and produce improvement cycles. Isolated indicators, without context or intervention capacity, can distort priorities and deepen inequalities.

Keywords: ophthalmology; data intelligence; value management; quality indicators; clinical governance; access.

Abstract

Ophthalmology services face growing demand, chronic conditions, high-volume procedures, and unequal access. This article discusses how data intelligence and value-based management can support decisions without reducing quality to productivity or value to cost containment. Through a structured narrative review of World Health Organization documents, indexed literature, and ophthalmic quality frameworks, it proposes a measurement architecture linking population needs, access, processes, clinical and functional outcomes, patient experience, and costs. Data quality, risk adjustment, interoperability, transparency, and governance are emphasized. Dashboards and business intelligence are useful when they answer explicit clinical and operational questions, enable stratification, and lead to improvement cycles. Isolated indicators without context or capacity for action may distort priorities and deepen inequities.

Keywords: ophthalmology; data intelligence; value-based care; quality indicators; clinical governance; access.

1. Introduction

The demand for eye care increases with aging, diabetes, and the persistence of...

Barriers to the treatment of preventable conditions. The World Health Organization estimates that

At least 2.2 billion people live with visual impairment, of which at least 1

One billion presents a situation that is preventable or has not yet been addressed. This situation cannot be explained solely

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due to lack of technology. Fragmentation, queues, unequal distribution of professionals and absence
Lack of operational information prevents existing resources from reaching those who need them most.
Ophthalmology services generate a large volume of data: scheduling, examinations, diagnoses,
visual acuity, image, procedure, complication, return, experience, and billing.
Accumulating these records does not equate to intelligence. Intelligence emerges when data
reliable organizations are organized to answer questions about access, security, effectiveness,
equity and cost, and when the response leads to a decision that is followed over time.
(ABUBAKAR et al., 2024).
Value management proposes linking results that are relevant to the individual to the necessary resources.
to achieve them. In ophthalmology, this approach needs to consider visual function, quality
of life and continuity, avoiding a narrow definition based solely on the number of
immediate procedures or expenses. The review by Abubakar and colleagues identified
Positive experiences, but concluded that the full implementation of the value agenda
remains incomplete in the field.
This article analyzes how business intelligence, indicators, and clinical governance can...
to contribute to more responsive services. The goal is not to prescribe a platform, but rather
To establish principles for transforming records into auditable decisions. This has been discussed since...
managerial questions and data quality, including capacity, queues, outcomes, costs, and equity.
Ethical limits of performance comparison (SOLOMON et al., 2022).

2 Methodology

A structured narrative review was conducted, without primary data collection. The question
The guiding principle was: how can data intelligence systems support value management and...
Improving the quality of ophthalmological services? The method was chosen to integrate
implementation studies, health system documents and indicator frameworks, without
The attempt to estimate a single effect or to classify overall certainty, as in a systematic review.
(ABUBAKAR et al., 2024).
Publications from the World Health Organization and the American Academy of Sciences were prioritized.
Ophthalmology and articles indexed in PubMed. Conceptual terms included
ophthalmology, value-based healthcare, quality indicators, access, waiting time, registry,

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Outcomes, costs, dashboards, and health information systems. Sources were selected by direct relevance, traceable bibliographic identification, and ability to support definitions or model components.

The analysis was divided into six axes: value architecture; data quality and governance; access, demand and capacity; results and experience; costs and efficiency; dashboards, Comparison and improvement cycles. Indicators were evaluated according to validity, Actionability, reliability, comparability, and risk of misuse. The proposal acknowledges The appropriate set varies according to the line of care, population, and purpose. (McCORMICK et al., 2022).

Limitations include international heterogeneity, infrastructure dependency, and rapid growth. Evolution of digital systems. Implementation studies tend to describe contexts. specific and do not always isolate the effect of the panel from other interventions. Therefore, the article It presents an analytical structure, not a universal list of goals nor a model of Remuneration applicable without local validation (SOLOMON et al., 2022).

3 Value in ophthalmology: concept and measurement architecture

Value should not be confused with lower cost. A reduction that postpones diagnosis or Worsening visual function destroys value, even if it reduces expenses in the short term. The unit of The analysis needs to consider the patient's journey and the results achieved in relation to the resources used. used. This requires combining clinical and functional measures, experience, safety, and time. (ABUBAKAR et al., 2024).

Ophthalmological conditions require distinct architectural approaches. Cataracts can be monitored. based on visual acuity, perceived function, complications, and postoperative stability; glaucoma requires Longitudinal control and visual field preservation; retinal disease activity, regimen therapeutic and adherence. A generic productivity panel does not represent these differences and can reward volume without benefit (JEON; TUUMINEN, 2024).

The scoping review by Abubakar et al. examined 1,081 records and included 12 articles, eight empirical. The studies focused on measuring results and costs, and the authors pointed out positive impact on the experiences described, but lack of complete implementation of value agenda. This finding suggests caution: projects often adopt parts visible indicators, without reorganizing care, funding, and information.

The WHO proposes integrated, person-centered eye care, linked to health systems.

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This guideline broadens the scope of measurement beyond specialized services, incorporating
Coverage, referral, and continuity. Indicators should reveal whether the population is able to access,
to complete and benefit from the care pathway, and not only if the internal unit fulfills it.
times or volumes (McCORMICK et al., 2022).
A useful architecture connects five layers: population needs, access, and process.
Safety, outcome, and resources. Each layer should contain a few actionable indicators, with
Definition and responsible party. The relationship between them allows us to interpret causes: an increase in the queue may
resulting from incidence, inadequate response, low resolution, or insufficient capacity.
Without this breakdown, the panel displays symptoms without guiding intervention (ABUBAKAR et
al., 2024).

4. Data quality, interoperability and governance

The World Health Organization's Eye Care Indicator Menu (2022) highlights that indicators
They need to be integrated into information systems and used to track objectives.
defined. This recommendation depends on a basic premise: the decision is as reliable as possible.
as well as the data that supports it. Duplicate identifiers, nonspecific diagnoses, absence
Inconsistent data and laterality lead to misleading conclusions. Before visualizations
For sophisticated service, a data dictionary, validation rules, and reconciliation between data is required.
Medical records, scheduling, imaging, surgical center, and billing.
Interoperability is a clinical property because it allows for the reconstruction of the patient's trajectory. If the
The procedure is not connected to the diagnosis and outcome; cost and result remain.
Separate. Consistent semantic standards and terminologies reduce manual work, but
They need to preserve details specific to ophthalmology, such as the eye, segment, technique, and measurement.
functional (McCORMICK et al., 2022).
Governance defines who can create, correct, access, and interpret information. A committee should
to bring together assistance, management, technology, privacy and, where possible, representation of
patient. Changes in definitions need to be versioned so that historical series are not
Compare different measures under the same name. Access audit and response plan to
Incidents protect confidentiality (JEON; TUUMINEN, 2024).
Completeness is not randomly distributed. Patients with fragmented trajectories or those who have been seen
Outside the network, there may be more missing data. Deleting these records may be beneficial.
Artificially manipulate results and hide inequality. Analytical strategies should describe

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losses, test sensitivity and avoid imputations that create false accuracy (WORLD HEALTH) ORGANIZATION, 2022).

Quality also involves opportunity. Perfect data received months later is not enough.
They help manage queues or incidents. Each indicator should have a frequency compatible with the
Decision-making: capacity may require daily updating; outcomes, clinical windows; planning.
Population size, longer cycles. Governance balances accuracy, latency, and collection cost.
(McCORMICK et al., 2022).

5. Access, demand, waiting lists and care capacity

Access is multidimensional. The systematic review by Solomon et al., which included 196 publications, identified barriers related to transportation, coverage, language, education,
Proximity and recommendation of primary care. Reducing the problem to the number of available slots.
It bypasses the steps involved in need, scheduling, attendance, diagnosis, and treatment.
Queues should be segmented by clinically acceptable risk and time. Chronological order.
Pure rules can be unfair when diseases progress at different rates.
Prioritization processes need to be transparent, reviewed, and monitored to avoid favoring certain groups.
It has greater capacity to navigate the system. Delays should be measured from the indication and not just from the formal entry on the agenda (WORLD HEALTH) ORGANIZATION, 2022).

Capacity includes people, equipment, rooms, supplies, beds, and coordination. The bottleneck may
Migrate: expanding consultations generates exams; expanding triage generates referrals; expanding surgery generates...
Returns. Flow modeling should follow the entire line to avoid local solutions that overload another stage. Occupancy rate very close to the limit reduces resilience to emergencies and demand variation (McCORMICK et al., 2022).

Absences are not a homogeneous category. Reminders, transportation, prior instruction, schedule.
Indirect costs and other factors influence attendance. A helpful dashboard distinguishes between cancellations and...
patient, communication failure, clinical impediment, and institutional cancellation. This Classification guides interventions and avoids interpreting every absence as a lack of adherence. (SOLOMON et al., 2022).

Equity should be integrated into access analysis. Average times may improve as groups
Vulnerable groups remain lagging behind. Stratify by territory, age, language, and health status.
and other justifiable factors allow for the identification of differences; however, data collection must adhere to

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The purpose is to ensure consent and protection against stigmatization. The measure is only ethical when There is the intention and capacity to act (WORLD HEALTH ORGANIZATION, 2022).

6. Clinical outcomes, visual function and experience

Jeon and Tuuminen (2024), when discussing quality indicators for compensation models Based on value in ophthalmology, they reinforce the need for clinically sound measures. Relevant. Processes are easier to measure than results, but they cannot replace them. Performing surgery, administering an injection, or completing a consultation describes the activity; the required value is required. to know if the person gained or preserved visual function, faced complications, received information and managed to maintain care.

Visual acuity is central, but insufficient. Visual field, contrast sensitivity, Symptoms, independence, and quality of life can be significant depending on the condition. Patient-reported measurements add to the functional perspective, but need... Validated instruments and data collection at comparable time points. Long questionnaires without Integration into care generates fatigue and incomplete data (ABUBAKAR et al., 2024).

Risk adjustment is necessary for responsible comparison. Services that receive cases Complex models may produce worse raw results despite high quality. Age, Severity, comorbidities, and contralateral ocular condition can modify the prognosis. The model must be transparent, clinically justifiable, and tested; opaque adjustments may hiding inequality or turning legitimate differences into misleading rankings (WORLD) HEALTH ORGANIZATION, 2022).

Safety requires measures to address complications and detect signs early. Very low rates. These should also be examined, as they may reflect underreporting. Learning systems They encourage reporting without automatic punishment, and differentiate between adverse events and expected variations. and they perform root cause analysis. Safety indicators serve to improve and hold people accountable. just (JEON; TUUMINEN, 2024).

Experience is not synonymous with generic satisfaction. Communication, understanding, participation In decision-making, respect, accessibility, and coordination are the most actionable dimensions. Reports These should be analyzed in conjunction with population outcomes and characteristics. A service can be well-regarded for its friendliness, but still lacking in continuity; it may also face... Negative transitional evaluations when correcting inadequate practices (ABUBAKAR et al., 2024).

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7. Costs, efficiency, and allocation decisions

The review by Abubakar et al. (2024) identified that value-based care experiences
In ophthalmology, attention has focused on the relationship between outcomes and costs, although none
The analyzed implementation fully encompassed the entire value agenda. Therefore, costs
They should be associated with the care cycle and not just with the cost of a single procedure. Materials,
Professionals, exams, rework, complications, travel, and patient time make up the project.
distinct perspectives, which need to be stated methodologically.
Technical efficiency asks whether a given result could be achieved with less.
resources; allocative efficiency questions whether resources are directed to the needs of the greatest
benefit. The first can optimize the operating room; the second decides between expanding the
Tracking, treatment, or rehabilitation. Business intelligence supports both, but not all.
replaces ethical criteria and health priorities (JEON; TUUMINEN, 2024).
Activity-based and time-based costing can bring resources closer to the actual cost, provided that...
Data collection should not become more expensive than the information produced. Samples and time studies
They may be preferable to intrusive, minute-by-minute monitoring. Costs should be considered.
compared with outcomes and adjusted for the case, avoiding rewarding the selection of low-risk patients.
risk (WORLD HEALTH ORGANIZATION, 2022).
Waste includes unnecessary repetition, avoidable cancellations, expired inventory, and delays.
This creates complications and requires the use of a specialist for a task that can be safely delegated. However,
Deliberate redundancy can protect against failures. The distinction depends on clinical analysis.
Linear cuts ignore this difference and may reduce responsiveness (ABUBAKAR)
et al., 2024).
Investment decisions must consider scenarios and uncertainty. Equipment, automation and
Integration promises gains, but requires maintenance, training, and process change.
Post-implementation evaluation should compare expectations with performance and include costs of
transition. Projects that do not define a baseline rarely demonstrate benefit (JEON;
TUUMINEN, 2024).

8 Panels, benchmarking and improvement cycles

A panel discussion should not begin with the bank's availability, but with the decision it needs to make.
support. Each visualization should have a question, an assignee, a threshold, and a possible action. Excess of

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Indicators create noise and favor opportunistic selection. Hierarchy between strategic measures,
Tactical and operational information allows each level to view information compatible with its...
responsibility (McCORMICK et al., 2022).

The WHO developed the Eye Care Indicator Menu to support national systems of
monitoring. The international prioritization process described by McCormick et al. started
Out of 200 indicators, 95 were submitted to a second round, narrowing it down to 22, of which seven were...
classified as central. The result illustrates that mature measurement selects a core.
comparable without eliminating additional measures necessary for the context.

Benchmarking can identify variations and opportunities, as clinical records demonstrate.
on a large scale. Records allow for comparison of processes and results between services, provided that
The definitions, population, and quality of completion are known. Scale, however,
This does not eliminate bias from participation, coding, case selection, or lack of context, which is the reason.
whereby quantitative comparisons need to be subjected to clinical interpretation.
(ABUBAKAR et al., 2024).

Comparisons should serve as a starting point for investigation. Differences may
Reflecting population, process, resources, or record quality. Rigid goals without validation.
They encourage manipulation, exclusion of cases, and attention to what is measured at the expense of what...
It matters. Peer review and qualitative analysis complement the panel (McCORMICK et al.,
2022).

Improvement cycles link data, hypothesis, intervention, and reassessment. Small tests allow...
Learn before expanding. The dashboard should show whether the change improved the outcome without creating new problems.
adverse effects in another dimension, such as reduced time accompanied by increased
Cancellations. Governance decides when to maintain, adapt, or abandon the intervention.
(WORLD HEALTH ORGANIZATION, 2022).

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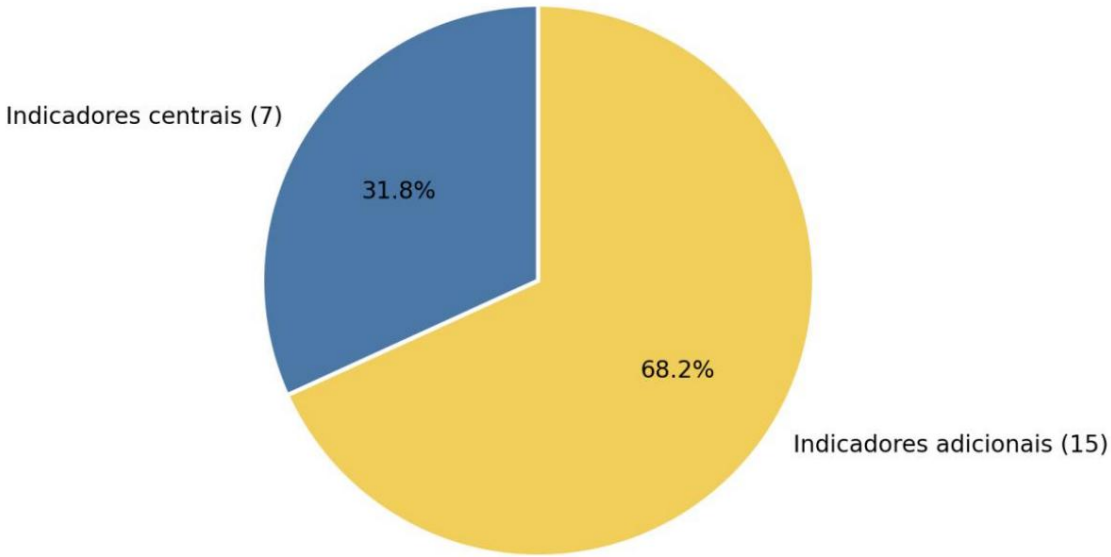

Figure 1 – Composition of the international menu of eye health indicators

Source: prepared by the author based on McCormick et al. (2022): 22 indicators, of which seven central and 15 additional.

Conclusion

Data intelligence can make visible bottlenecks, variations, and inequalities that routine operations reveal.
Fragmented functionality doesn't reveal its value. Its value lies not in the number of screens, but in its ability to...
Connecting need, access, process, outcome, and resource. This connection requires questions.
clear and responsible action (ABUBAKAR et al., 2024).
Value management in ophthalmology is not a cost-cutting project. It seeks results.
Relevant to the person throughout the care cycle. Economy that deteriorates function,
Security or access should be recognized as a loss of value, while investments may
They can be justifiable when they prevent damage and rework (McCORMICK et al., 2022).
Indicators need to be few enough to guide and broad enough to avoid mistakes.
One-sided view. Production, time, quality, experience, equity, and cost must be...
interpreted together. The WHO menu offers a reference, but local selection needs to be made.
consider clinical guidelines and responsiveness (SOLOMON et al., 2022).
Data quality precedes analytical sophistication. Definitions, laterality, integration and
Completeness determines reliability. Governance with clinical, operational and [other] participation.

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Privacy reduces the risk of automated decisions or unfounded rankings (JEON;
TUUMINEN, 2024).

Access should be measured by the journey, not just by the availability of parking spaces. Time
Even the referral, scheduling, attendance, diagnosis, and treatment reveal where people are
lose. Responsible stratification allows us to assess whether favorable averages are hiding groups.
left behind (ABUBAKAR et al., 2024).

Clinical outcomes need to be complemented by function and experience. Risk adjustment.
It protects comparisons, but it can't be a black box. Security and complications must be...
recorded in a learning environment with fair accountability, without tolerating underreporting.
(McCORMICK et al., 2022).

Panels, records, and benchmarking generate hypotheses, not conclusions. Variation should lead to...
Investigation of causes and improvement cycles with evaluation of side effects. Metrics
Incentive-related practices require vigilance to avoid case selection and biased behavior.
only to the indicator (SOLOMON et al., 2022).

It is concluded that business intelligence can strengthen clinical governance when integrated with...
Practice and strategy. Mature service not only measures what it does: it understands for whom.
What does it do? What results does it produce, at what cost, and how is it distributed? Data becomes intelligence.
only when they support transparent, correctable decisions that are centered on vision and life.
of people (JEON; TUUMINEN, 2024).

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