A Scoping Review of Process Indicators for Measuring Quality of Care in Glaucoma

Flavio Iorio-Aranha, MD, MSc,* † Bárbara Peleteiro, MSc, PhD,* † §
Amândio Rocha-Sousa, MD, PhD, FEBO,¶ Ana Azevedo, MD, PhD,* † §
and João Barbosa-Breda, MD, PhD||¶#

Précis: There are no standardized process quality indicators (QIs) in glaucoma care. Although they can be inferred from guidelines and trials, they should be designed and standardized to allow better assessment of the quality of care.

Purpose: QIs are crucial for assessing the performance of any health care system. To allow efficiency, effectiveness, and patient-centeredness, there is a need for prompt acquisition of up-to-date information. Among the available QIs, process indicators have the highest sensitivity to frequent changes and could better reflect the implementation outcomes of novel ideas and technology. This study aimed to map the available information regarding process QIs in glaucoma care, identify the current development stage of these indicators, and systematically synthesize them.

Materials and Methods: We performed a scoping review of 4 electronic bibliographic databases for studies reporting on process QIs in glaucoma. We retrieved 7502 references and created a domain list reflecting the core idea underlying each indicator.

Results: We summarized information from 18 documents and listed 20 domains. The most mentioned domains were follow-up, optic nerve head assessment, visual field test, and intraocular pressure. Indicators regarding the quality of life assessment, patient assistance, or presence of written protocols were less frequently mentioned.

Conclusions: There are notable variations among process QIs in glaucoma and significant heterogeneity in their descriptions in published studies. Although novel indicators can be inferred from guidelines and trials, they should be designed and standardized for better assessment of performance in health systems to improve their quality.

Key Words: glaucoma, process quality indicators, scoping review, quality of care

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In the last 5 decades, there has been a global improvement in the trend of quality of health care.1–3 Currently, efforts in the health system are geared toward achieving major quality features, including effectiveness, efficiency, timeliness, safety, equity, and patient-centeredness,4 which could yield clinical and financial benefits. Physicians are required to provide optimal evidence-based treatments with high satisfaction levels. Governments and private organizations are being faced with increasing population demands and maintenance costs5 for the health system. To address these issues, numerous ideas and methods have been implemented, especially regarding better health system management with a focus shift from high volume to high value for patients.6,7

Health system performance is measured to deeply elucidate its operation and allow temporal among-institution comparison.8 Therefore, indicators known as quality indicators (QIs) are required for performance description and monitoring.3 Worldwide, there are initiatives for developing indicators and processes for performance assessment of health systems.10

The Agency for Healthcare Research and Quality has defined QIs as “standardized, evidence-based measures of health care quality that can be used to measure and track clinical performance and outcomes”11 that can be classified on the basis of 3 aspects regarding care: structure, process, and outcome.12 Structure indicators reflect the “possibility of action” (capacity and resources) of the health care provider while outcome indicators reflect the effects of the implemented care model on the patients' health status. Institutions frequently use process indicators to assess quality since they measure actions and procedures provided on a daily basis, which allows faster system evaluation than long-term outcome indicators.9

In ophthalmology, QIs in the glaucoma field remains in the early development stages.15 Several studies have attempted to synthesize and standardize outcome indicators; however, only a few studies have evaluated process indicators. To our knowledge, 3 studies have summarized clinical outcome measures used in glaucoma trials14–16; moreover, another study used a set of indicators for measuring the appropriateness (according to evidence-based guidelines) of eye care delivery in glaucoma practice.17 Furthermore, some governmental institutions have implemented actions regarding the quality of care in the glaucoma field. For example, in the United Kingdom, the National Institute for Health and Care Excellence (NICE), and the Royal College of Ophthalmologists have established their sets of quality standards in glaucoma.

However, there remains no established international consensus regarding the optimal indicators for standardization, benchmarks, and comparisons of health care providers. Since there are no widely accepted and validated process indicators, this scoping review aimed to identify core aspects underlying indicators (domains), which could be used to define specific QIs for measuring glaucoma health care performance.
MATERIALS AND METHODS

We conducted a scoping review of process QIs used for local-level performance assessment of a glaucoma unit. First, we identified studies on the creation, implementation, and analysis (reliability and feasibility) of established indicators. Specifically, we searched for peer-reviewed articles and guidelines from ophthalmology societies, including 2 organizations with established QIs for glaucoma (NICE and Royal College of Ophthalmologists).

Scoping reviews are a relatively new instrument for examining emerging concepts and trends in health literature lacking sound evidence and consensus. We could not obtain sufficient data regarding glaucoma process indicators to allow analysis and summary in a systematic review. Therefore, we performed a scoping review to map the available information, provide a topical overview, and determine the current development stage of process indicators.

In January 2019, we performed a search on 4 electronic databases: MEDLINE, COCHRANE Library (Reviews and Protocols), NICE, and G-I-N (Guidelines International Network) databases18 based on the criteria of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews19 and following the methodological framework proposed by Arksey and O’Malley.20

In MEDLINE databases, we used the following search terms: “(Outcome and Process Assessment Health Care OR quality indicators, health care OR process indicator OR performance indicator OR quality measurement OR productivity OR quality assurance program OR quality indicator OR quality indicators OR quality measure OR quality measures OR quality improvement OR quality metric OR quality metrics OR quality criteria OR indicator OR guideline adherence) AND glaucoma.” In the NICE, COCHRANE, and G-I-N databases, we used the broad term “glaucoma.” Moreover, to identify more articles, we performed backward (examining the source document’s reference list) and forward (searching for more recent documents that cited the source document) citation tracking.

We reviewed articles on the basis of the following inclusion criteria: all papers mentioning measuring processes that could be considered similar to process QIs. Moreover, the exclusion criteria were as follows: published before January 1990; not written in English, Portuguese, or Spanish; not involving humans; case reports; articles only citing the selected guidelines; and articles only addressing other outcomes or diseases.

The initial search on the 4 databases yielded 7499 records with 3 additional records being identified through alternative search methods (backward and forward citation tracking). First, studies were automatically excluded on the basis of the language and date, and case reports and nonhuman studies. Subsequently, 1 author (F.I.A.) performed title and abstract screening, followed by a full-text review of articles considered relevant for eligibility assessment. Finally, 18 documents were included for analysis (Fig. 1) with subsequent extraction and classification of information regarding process QIs (or their domains). Data extraction was performed by 1 author (F.I.A.), with subsequent complete verification by a senior team member (J.B.B.). Disagreements were resolved through consensus. The aforementioned extraction approach has been reported to be as accurate as double independent data analysis/extraction.21

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FIGURE 1. PRISMA-ScR flow diagram for study selection. G-I-N indicates Guidelines International Network; NICE, National Institute for Health and Care Excellence; PRISMA-ScR, Preferred Reporting Items for Systematic Reviews and Meta-Analysis Extension for Scoping Reviews.
Given the significant among-article heterogeneity in QI nomenclature, we classified each indicator on the basis of the main underlying concept (eg, “Proportion of patients that have done a visual field test in the last year” was classified under “Visual field test”). Here, we accounted for the broader aspect or domain without specifying the metric or slight variations in indicators. We developed a system of topics a posteriori to group the identified domains according to the following areas: (1) tests and procedures; (2) disease progression and follow-up; (3) patient-centeredness; and (4) health services management.

**RESULTS**

Among the 18 selected documents, 9 were articles published in specialized journals; 22–30 7 were major guidelines31–37 developed by nationally or internationally recognized organizations, and 2 were sets of quality standards38,39 provided by NICE and the Royal College of Ophthalmologists. Two documents (1 guideline37 and 1 quality standard28) were both developed by NICE; therefore, these were analyzed as a single item since they contained repeated information. Table 1 summarizes the included documents and describes their characteristics.

In total, the included documents reported process QIs 173 times in a pool of 20 different domains (Table 2). The 7 guidelines had the most domain mentions,31–33 and the 2 sets of quality standards and the articles by Fremont et al29 and Winkler et al.28 had the most referred domains,4 involved the most crucial examinations used for glaucoma diagnosis and follow-up: “Optic nerve head assessment” (16/18), “Visual field test” (15/18), “Intra-ocular pressure - IOP” (12/18), and “Gonioscopy” (12/18).

The most frequently referred domains (“Follow-up interval” and “Optic nerve head assessment”) were mentioned in 16 of the 18 documents. The former refers to the frequency that an appointment is scheduled for patient re-evaluation rather than the frequency of each test or procedure. Regarding a topical grouping system, topic 1 [tests and procedures (12/20)] was comprised of the most domains.

**Table 1.** Description of Documents Included in This Scoping Review—Process Indicators for Quality of Care in Glaucoma

| References | Country | Subject Addressed in the Document |
|------------|---------|-----------------------------------|
| Royal College of Ophthalmologists (RCO)22 | UK | Quality Standard Self-Assessment Tool—Evaluation of a small number of key areas of service provision, not outcomes, to support learning and improvement |
| Batra et al.22 | UK | A tool to evaluate the quality and capacity of a glaucoma service |
| National Institute for Health and Care Excellence (NICE)—QS738 | UK | Glaucoma in adults: quality standards—describes markers of high-quality and cost-effective care that should contribute to improving the effectiveness, safety and experience of glaucoma care |
| National Institute for Health and Care Excellence (NICE)—NG8137 | UK | Guidelines—glaucoma: diagnosis and management |
| Elam et al.23 | USA | Comparison in receipt glaucoma care between Medicaid and a commercial health insurance throughout a set of indicators |
| Liang et al.26 | China | Theoretical developing of new indicators |
| Winkler et al.28 | USA | Assessment of a team-based model for glaucoma care |
| American Academy of Ophthalmology (AAO)12 | USA | Guidelines—preferred practice pattern |
| Scottish Intercollegiate Guidelines Network (SIGN)—14435 | Scotland | Glaucoma referral and safe discharge: a national clinical guideline |
| European Glaucoma Society (EGS)31 | Europe | Terminology and guidelines for glaucoma |
| Fung et al.24 | UK | Frequency of visual field test as an indicator of performance |
| Castejón-Cervero et al.27 | Spain | Assessment of compliance with EGS guidelines in Spain, using a set of indicators identified and chosen by the authors |
| National Health and Medical Research Council (NHMRC)34 | Australia | Guidelines for the screening, prognosis, diagnosis, management and prevention of glaucoma |
| Canadian Ophthalmological Society (COS)33 | Canada | Evidence-based clinical practice guidelines for the management of glaucoma in the adult eye |
| Friedman et al.25 | USA | Glaucoma management within an insurance plan |
| Finnish Medical Society Duodecim (FMSD)36 | Finland | Finnish current care guideline for glaucoma |
| Fremont et al.29 | USA | Describe current patterns of care for glaucoma in managed care plans |
| Lee et al.30 | USA | Rates of annual eye examinations in Medicaid as a proxy to deliver good care |

Each document is referenced at the end of the article, through the numbers in superscript.
| Domains                                                                 | COS | AAO | NHMRC | NICE Q81/N| NICE G81 | EGS | FMSD | Fremont et al 29 | Winkler et al 28 | RCO | SIGN-144 R | Castejón-Cervero et al 27 | Friedman et al 25 | Fung et al 24 | Elam et al 23 | Batra et al 22 | Liang et al 26 | Lee et al 30 |
|------------------------------------------------------------------------|-----|-----|-------|-----------|-----------|-----|------|-----------------|-----------------|-----|-----------|------------------|-----------------|--------------|---------|---------|---------|---------|---------|
| Follow-up interval according to guidelines                             | x   | x   | x     | x         | x         | x   | x    | x               | x               | x   | x         | x                 | x               | x            | x       | x       | x       | x       | x       |
| Optic nerve head assessment                                            |     |     | x     | x         | x         | x   | x    | x               | x               | x   | x         | x                 | x               | x            | x       | x       | x       | x       | x       |
| Optic nerve head image                                                 | x   | x   | x     | x         | x         | x   | x    | x               | x               | x   | x         | x                 | x               | x            | x       | x       | x       | x       | x       |
| Optic nerve head/retinal nerve fiber layer structural examination       |     |     | x     | x         | x         | x   | x    | x               | x               | x   | x         | x                 | x               | x            | x       | x       | x       | x       | x       |
| Fundus examination                                                     | x   | x   | x     | x         | x         | x   | x    | x               | x               | x   | x         | x                 | x               | x            | x       | x       | x       | x       | x       |
| Visual field test                                                      | x   | x   | x     | x         | x         | x   | x    | x               | x               | x   | x         | x                 | x               | x            | x       | x       | x       | x       | x       |
| Visual field tested 6 times in the first 2 y                           | x   | x   | x     | x         | x         | x   | x    | x               | x               | x   | x         | x                 | x               | x            | x       | x       | x       | x       | x       |
| IOP                                                                   | x   | x   | x     | x         | x         | x   | x    | x               | x               | x   | x         | x                 | x               | x            | x       | x       | x       | x       | x       |
| IOP daily curve                                                        |     |     | x     | x         | x         | x   | x    | x               | x               | x   | x         | x                 | x               | x            | x       | x       | x       | x       | x       |
| Gonioscopy                                                             | x   | x   | x     | x         | x         | x   | x    | x               | x               | x   | x         | x                 | x               | x            | x       | x       | x       | x       | x       |
| Monitor disease progression                                            | x   | x   | x     | x         | x         | x   | x    | x               | x               | x   | x         | x                 | x               | x            | x       | x       | x       | x       | x       |
| Monitor rate of visual field progression                               | x   | x   | x     | x         | x         | x   | x    | x               | x               | x   | x         | x                 | x               | x            | x       | x       | x       | x       | x       |
| Monitor rate of structural progression                                 |     |     | x     | x         | x         | x   | x    | x               | x               | x   | x         | x                 | x               | x            | x       | x       | x       | x       | x       |
| Central corneal thickness                                              | x   | x   | x     | x         | x         | x   | x    | x               | x               | x   | x         | x                 | x               | x            | x       | x       | x       | x       | x       |
| Surgical and laser therapy available                                  | x   | x   | x     | x         | x         | x   | x    | x               | x               | x   | x         | x                 | x               | x            | x       | x       | x       | x       | x       |
| Target IOP documented                                                  | x   | x   | x     | x         | x         | x   | x    | x               | x               | x   | x         | x                 | x               | x            | x       | x       | x       | x       | x       |
| Visual acuity measurement                                              | x   | x   | x     | x         | x         | x   | x    | x               | x               | x   | x         | x                 | x               | x            | x       | x       | x       | x       | x       |
| Stage of disease severity documented                                   | x   | x   | x     | x         | x         | x   | x    | x               | x               | x   | x         | x                 | x               | x            | x       | x       | x       | x       | x       |
| Medical history and risk factors                                      |     |     | x     | x         | x         | x   | x    | x               | x               | x   | x         | x                 | x               | x            | x       | x       | x       | x       | x       |
| Information available to patients                                     | x   | x   | x     | x         | x         | x   | x    | x               | x               | x   | x         | x                 | x               | x            | x       | x       | x       | x       | x       |
| Slit lamp biomicroscopy                                                | x   | x   | x     | x         | x         | x   | x    | x               | x               | x   | x         | x                 | x               | x            | x       | x       | x       | x       | x       |
| Assessment for relative afferent pupillary defect                      |     |     | x     | x         | x         | x   | x    | x               | x               | x   | x         | x                 | x               | x            | x       | x       | x       | x       | x       |
| Vision-related quality of life assessment                              |     |     | x     | x         | x         | x   | x    | x               | x               | x   | x         | x                 | x               | x            | x       | x       | x       | x       | x       |
| Remind patient to adhere to treatment                                  |     |     | x     | x         | x         | x   | x    | x               | x               | x   | x         | x                 | x               | x            | x       | x       | x       | x       | x       |
| Written protocol for glaucoma unit                                     | x   | x   | x     | x         | x         | x   | x    | x               | x               | x   | x         | x                 | x               | x            | x       | x       | x       | x       | x       |
| Audit                                                                  |     |     | x     | x         | x         | x   | x    | x               | x               | x   | x         | x                 | x               | x            | x       | x       | x       | x       | x       |
| Social assistance to patients available                                | x   | x   | x     | x         | x         | x   | x    | x               | x               | x   | x         | x                 | x               | x            | x       | x       | x       | x       | x       |

NICE Q81/N81 represents a guideline and a quality standard from the same institution (NICE), grouped in one item.

AAO indicates American Academy of Ophthalmology; COS, Canadian Ophthalmological Society; EGS, European Glaucoma Society; FMSD, Finnish Medical Society Duodecim; IOP, Intraocular pressure; NHMRC, National Health and Medical Research Council; NICE Q81/N81, National Institute for Health and Care Excellence—Quality Standard 81/NICE Guideline 81; RCO, Royal College of Ophthalmologists; SIGN-144, Scottish Intercollegiate Guidelines Network-144.
Topic 4 (health service management) had 2 domains: “written protocol for glaucoma unit” and “audit.” The audit indicates the glaucoma care unit having a regularly running audit process for assessing the system’s operation.

DISCUSSION
Regarding health care quality, assessing the performance and quality of a health system is crucial for determining, elucidating, classifying, comparing, and implementing changes in that system. To achieve this, there is a need for reliable and appropriate indicators. Moreover, there is a need for a wide scope of indicators to assess and deeply understand each peculiarity, dimension, and step in the health care process.

Glaucoma is a chronic disease involving late-onset and slow-onset of signs and symptoms. Moreover, its diagnosis often relies on a series of examinations performed over years. Consequently, the time required for diagnosis and detecting progression impedes the assessment of implemented treatments and changes in care actions. Indicators involving analysis of process data are often more efficient and sensitive quality measures than those involving outcome data analysis. This is because compared with structure and outcome indicators, process indicators allow prompt reflection of implemented activities and changes in the health care system on a daily basis, which enables fast and accurate performance assessment.

We identified few specific studies involving the use of process QIs to assess the performance of a glaucoma unit. Most of the identified documents were guidelines from international and national medical associations that contained information useful for indicator formulation. Although these guidelines involve fundamental concepts of glaucoma to present evidence-based conclusions, they are not intended for standardizing and creating valid and feasible QIs.

In this review, there was significant among-article variability in the indicators and their descriptions. There is a need for standardized indicators since variations among measurement instruments impede performance evaluation and comparison, and mutual understanding among researchers. Given the aforementioned inconsistencies, we chose to address QIs according to “domains” with a subsequent grouping of the domains to 4 broader “topics.”

In our study, topic 3 (patient-centeredness) contained only 4 indicator domains, which were mentioned 14 times (total mentions: 173). Given the importance of this subject demonstrated by the international trend toward the patient-centered approach, this low mention rate is indicative of the large margin for improvement in translating theory into practice to this effect.

“Target IOP documented” and “stage of disease severity documented” reflect a crucial aspect—documentation—and require prompt recording of complete clinical notes. The inclusion of complete clinical notes in medical records could facilitate automatic extraction and analysis of indicators. This further confirms that well-structured systems for electronic health records (EHR) could improve monitoring and evaluation of the unit operation. Moreover, appropriate EHR could facilitate safety and error minimization since the clinicians are requested to register and account for all variables considered essential when designing the EHR, rather than simply allowing a free text registry.

The domain “monitor glaucoma progression” is a composite indicator derived from the analysis of visual field tests, optic nerve head assessment, and IOP variation. Its underlying concept is the most important aspect in glaucoma assessment; moreover, it could be a relevant QI in glaucoma health care evaluation. However, there have been few systematic efforts to standardize a set of basic indicators regarding this aspect or develop an objective and simple indicator that reflects this crucial element in glaucoma evaluation. There are electronic tools for glaucoma progression analysis that provide visual and graphical comparison across functional and structural tests involving replicable and standardizable mathematical calculations. These tools can improve glaucoma management through better temporal comparison of examination results, which could further allow automatic processes that alert the physician to increased disease progression.

This review met several challenges mainly because it is a novel theme in literature. The key terms “glaucoma” and “process quality indicators” retrieved very few articles through classic medical search engines, which prompted a broader search. Consequently, we used complementary strategies by expanding the search to all types of QIs—outcome, structure, and process—and articles regarding other aspects of care, including quality improvement and guidelines adherence.

Moreover, we met difficulties in identifying the topic of interest within the identified documents. Specifically, there was scarce explicit information regarding process QIs, which indicates the poor investigation of this theme. Most articles were descriptive studies regarding current clinical practice and guideline compliance; however, there were no peer-reviewed studies involving structured design, validation, and implementation of glaucoma process indicators within the health care system. Consequently, there was possible bias during the selection and extraction method, which increases the subjectivity degree when identifying appropriate information within documents. To reduce this bias, we performed an extensive search with forward and backward citation tracking, moreover, we used a nonrestrictive approach to include documents mentioning this topic from different perspectives.

Although there is information regarding process QIs in public agencies and private organizations, we initially intended to search for information regarding the creation and analysis of QIs in real-world settings with respect to their reliability and feasibility. Therefore, to obtain this information, we chose to focus on peer-reviewed journals and guidelines.

However, there is a need to mention a comprehensive document on quality standards in glaucoma, which was published after the literature search by a government agency in Ontario, Canada (Health Quality Ontario). Although this document was not among the included articles, its information had been represented in this paper.

We found that the main domains of indicators mentioned in the included articles were within the guideline recommendations and best practices procedures. Moreover, we could establish a set of domains according to their specific common characteristics; specifically, their capacity to represent an important measurable care aspect that can be used to express the system’s performance.

To our knowledge, this is the first review to specifically address process QIs in glaucoma. Currently, there is a need to give “more for less but with the best quality;” moreover, instruments regarding the quality of care in health systems, including QIs, are necessary especially in difficult times such as the current COVID-19 pandemic.

Development and implementation of QIs could allow continuous monitoring of the system’s performance and
rapid assessment of changes upon the occurrence of unexpected events. During the COVID-19 pandemic, QIs could be used to evaluate changes in the function of health care systems (process indicators), results of implementing new treatment strategies (outcome indicators), and resources available for addressing the disease (structure indicators). This could allow fast and prompt assessment of the pandemic effects and the applied interventions.

Notably, it is possible to create novel indicators in response to unexpected events. Moreover, a “new normality” is expected to emerge from the pandemic crisis and developed concepts should be applied when creating and implementing novel strategies for measuring and monitoring the system’s performance, and temporal evaluation and comparison.

Finally, this review is just a means to an end. Process, outcome, and structure indicators are excellent instruments for assessing the quality of care within a health system. This review can facilitate a broader consensus in the field and continuity of efforts toward the structured development of indicators.

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