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Commentary on the Importance of Accurate Visual Acuity Measurements: Clinical and Programmatic Implications

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Introduction

Visual acuity (VA) measurement is the cornerstone of eye care, providing essential information for clinical diagnosis and guiding programmatic interventions. In both individual patient care and population-level health management, accurate VA measurements ensure appropriate decisions are made to prevent and manage vision loss Resnikoff, et al. 2021 [1]. In resource-limited settings, the accuracy of VA measurements becomes even more pivotal due to constrained diagnostic alternatives and treatment options Resnikoff et al., 2019 [2]. Here, healthcare systems must allocate scarce resources efficiently, hence the precision of these measurements has heightened importance Burton, et al. 2019 [3].

Inaccurate VA measurements can lead to misdiagnosis, inappropriate treatment plans, misallocation of resources, and erroneous epidemiological data, ultimately undermining efforts to prevent and manage blindness and visual impairment Resnikoff, et al. 2020 [4].

The visual acuity measurement is a critical indicator for both clinical decision-making and public health program planning. Clinically, VA measurements guide diagnosis and intervention strategies tailored to the individual patient. At the programmatic level, aggregated VA data inform public health strategies, resource allocation, and epidemiological understanding of vision impairment and blindness Bourne, et al. 2021[5]. Inaccurate VA assessments can thus lead to suboptimal care for individuals and flawed health policies, which underscore the necessity for standardized, precise VA measurements globally.

Inaccurate VA test results can arise due to multiple factors, including improper technique used by the VA examiner, poor cooperation by the person being tested, lighting and glare, and distance and position of the VA chart, using non-standard methods, and other human factors.

Errors in VA testing can lead to inappropriate prescriptions, misclassification of visual impairment in epidemiological studies, and inefficient allocation of eye health resources. Standardized training, adherence to evidence-based methodologies, and regular quality assurance checks can minimize these inaccuracies and improve the reliability of VA data for both individual and public health applications.

In their practices, most clinicians are familiar with the common signs of inaccurate VA test results, including inconsistencies between distance and near VA, poor correlation with retinoscopy or autorefraction results, VA that fluctuates widely with repeated measurements, and the various abnormal in-test patient behaviours (e.g. slow response, missing lines, etc.)

Recognizing these signs of inaccurate VA measurement is crucial for both clinical accuracy and programmatic planning.

Implications of inaccurate VA measurements

VA measurements are extremely important both for clinical and programmatic management of vision loss, especially in limited resources settings. On the clinical side, the measurements can lead the clinician to the diagnosis, which would inform the appropriate intervention on patient level. On the programme other side, the collated records of VA in a population can lead health service managers to the appropriate programmatic response to address the specific vision challenges encountered by the catchment population of the health service. For example, if a VA is measured as 6/18 and should be 6/12, it can mean the difference between a service user being referred for further services, or being "screened out", in other words, recorded as "normal vision". Programmatically, this will determine the health service response required, which in turn may have adverse health system effects.

The effect of inaccurate VA measurements can create similar distortions and implications in the measurement of the visual impairment categories (early, moderate, and severe), and the blind categories (counting fingers, hand movements, light perception, and no light perception) on both clinical, and programme. See examples in table below.

Table 1

Vision category	Clinical implications	Programmatic implications
1. Early Visual Impairment (VA: cannot see 6/12 but can see 6/18)	Over-prescription of spectacles may cause patients to distrust future medical advice.	Overestimation of refractive error prevalence affects resource allocation for optical services.
2. Moderate Visual Impairment (Cannot see 6/18 but can see 6/60)	Patients may be unnecessarily referred for surgical consultation if VA result is underestimated.	Surgical service may be overloaded with MVI patients while a surgery backlog exists in the SVI and blind categories
3. Severe Visual Impairment (Cannot see 6/60 but can see 3/60)	Inaccurate categorization can delay timely surgical interventions.	Service delivery models for low vision services may be improperly designed.
4. Blindness category (Cannot see 3/60)	Misjudging light perception (LP) or no light perception (NLP) status can affect decisions about surgery for conditions like dense cataracts.	Inaccurate blindness statistics may divert funds from preventive measures to curative ones unnecessarily.

Clinical Consequences

VA measurement serves as the initial diagnostic tool for eye care practitioners, guiding further investigations, treatment decisions, and referrals. A mismeasurement as subtle as recording 6/18 instead of 6/12 could mean the difference between prescribing spectacles and considering other interventions, such as medical treatment or surgical correction Elliott 2021 [6]. This inaccuracy can result in unnecessary interventions, financial burdens on patients, and compromised clinical outcomes.

For example, consider a patient misclassified as having moderate visual impairment (6/18-6/60) instead of early visual impairment (6/12-6/18). Such an individual might unnecessarily receive low-vision services rather than standard refractive correction, affecting their quality of life and economic productivity. Conversely, failing to identify individuals with progressive conditions, such as diabetic retinopathy or glaucoma, due to misclassification of VA status may delay sight-preserving treatments, leading to avoidable blindness.

Beyond the individual, inaccurate VA assessment also impacts surgical outcomes. Cataract surgery, the most frequently performed ophthalmic procedure worldwide, relies heavily on preoperative VA measurement for surgical indication, prioritization, and outcome evaluation Bourne, et al. 2017 [7]. Inaccurate baseline VA data may skew surgical success rates and complicate post-surgical visual rehabilitation plans.

Programmatic Consequences

On a broader scale, VA measurements feed into national and global epidemiological data on visual impairment and blindness. Public health interventions, including blindness prevention programmes and resource allocation, depend on reliable statistics to inform policies and funding decisions Pascolini & Mariotti 2012 [8]. If VA data is systematically mismeasured, the epidemiological profile of a region can be artificially distorted, leading to misdirected investments and inefficiencies in healthcare planning.

For instance, a national blindness survey that overestimates the prevalence of severe visual impairment may prompt an increase in low-vision rehabilitation services, while neglecting cost-effective interventions such as refractive services or cataract outreach programs. Conversely, underestimating the burden of blindness may lead to reduced policy attention and inadequate service provision, exacerbating disparities in eye care access Naidoo, et al. 2021.

Moreover, international frameworks such as the WHO's Universal Eye Health strategy rely on accurate VA assessments to track progress toward global targets for reducing avoidable blindness World Health Organization 2019 [9]. Systematic errors in VA classification can therefore undermine global advocacy efforts and the implementation of effective eye health policies.

Inaccurate individuals' VA measurements may place the records in a different category of vision altogether, artificially skewing the epidemiological pattern of vison status in the population. This in turn will affect how the programmatic intervention strategies will be structured, with wide-ranging effects on all elements of the health system.

Not only that, focus on the wrong category or classification of vision status may lead both parties, clinician and health service manager away from the most effective and appropriate intervention strategy. This is potentially a major source of wastage, inefficiency, and ineffective system design and implementation. See further examples in Appendix B.

Accurate VA measurement is indispensable for:

- Ensuring optimal clinical management: Correct diagnoses lead to appropriate interventions, improving patient outcomes.
- Guiding evidence-based public health planning: Reliable epidemiological data inform resource allocation and policy development.
- Reducing health system inefficiencies: Accurate data prevent wastage by aligning service provision with actual community needs.
- Enhancing global health equity: Standardized measurements enable cross-country comparisons, highlighting disparities and promoting targeted interventions.

How to prevent inaccuracy in VA measurement

Health service managers can assure competency for accurate VA measurement through several means:

1. Assign task to competent staff, in other words, recruit and assign the VA testing task to staff who possess the minimum required skills to perform the VA test. This includes communication skills, aptitude, willingness to be trained, and being meticulous in record-keeping.
2. Ensure that staff assigned to the VA testing task have access to adequate training, including refresher training and assessment from time to time. The training should also have been delivered by a competent trainer. See appendix C for an outline for a training course for VA testing.
3. Perform routine quality control to hone the skills of staff members assigned to VA testing. This can include using a co-worker to double-check (if resources allow it) or including volunteers with known VA test results in the patient list.
4. Ensure that the appropriate equipment is made available for the VA test. VA charts should be standard size (optotype) and colour. Do not use copies of the originals. Use proper pinhole occluders.
5. Ensure that the VA lane is set up according to standard specifications in terms of distance, height of chart, and light.
6. Standardise practices by following standard operating procedures (SOPs). See appendix D-F for examples of SOPs for common VA test methodologies.

Assuring Competency for accurate VA Measurement

The foundation of reliable VA measurement lies in the competency of the personnel conducting these assessments. Competency in VA testing encompasses theoretical knowledge, technical proficiency, and adherence to standard operating procedures (SOPs). Training programs must incorporate rigorous theoretical instruction, hands-on practice, assessment of technical skills, and ongoing quality assurance mechanisms to ensure that VA measurements are conducted accurately and consistently Leasher, et al. 2020.

In many low- and middle-income countries (LMICs), VA measurement is often delegated to undertrained personnel, including clerical staff, schoolteachers, and assistant nurses. While task-shifting strategies can improve service delivery, the lack of structured training, standardized protocols, and quality control mechanisms raises serious concerns about the reliability of VA assessments Palmer, et al. 2020.

Common challenges include:

- Inconsistent training standards: Many auxiliary health workers receive informal or variable training, leading to discrepancies in technique and accuracy.
- Use of non-standardized equipment: Variability in lighting conditions, non-calibrated charts, and inconsistent testing distances compromise measurement accuracy.
- Lack of oversight and quality assurance: Many settings lack systematic audits, refresher training, or supervision, allowing errors to persist uncorrected.
- Minimal assessment of training outcomes: Trainers often fail to assess whether trainees have achieved competency, further propagating inaccuracies.

The cumulative effect of these challenges is a cycle of misclassification, inappropriate clinical and programmatic decisions, and inefficient use of health resources.

Consistency in VA measurements ensures reliable data at both patient and population levels. Additionally, it enhances diagnostic accuracy Elliott 2016 [10]. ensures comparability of data across geographic and temporal boundaries Resnikoff, et al. 2021 [1]. reduces wastage of limited health resources Gilbert & Foster, 2001 [11]. and improves patient trust and adherence to recommended interventions Dandona & Dandona, 2006 [12].

Discussion

The implications of VA measurement accuracy include clinicians' diagnostic precision and treatment decisions, where accurate VA measurements enable clinicians to differentiate between normal

vision and visual impairment on the one hand, and the categories of visual impairment according to the WHO ICD version 10.

Misclassification of visual impairment severity can misguide treatment pathways. For example, classifying a patient as severely visually impaired (VA = 6/60) instead of moderately impaired (VA=6/36) could lead to premature consideration of invasive procedures or low vision rehabilitation that may not be appropriate.

At a systems level, aggregated VA data inform programmatic responses to vision loss. If large numbers of individuals are misclassified, resource allocation becomes skewed. For example: Inflated prevalence of moderate visual impairment (MVI) may lead to over-prioritisation of surgery eligibility at lower VAs at the expense of patients more severely affected by vision loss due to cataract, for example.

Visual acuity measurements should be done correctly, in a standard manner, everywhere, and always, Accurate and standardized VA measurements form the bedrock of effective clinical care and robust public health interventions. Inaccuracies compromise patient care and misdirect health system planning, especially critical in resource-limited environments. Consistent adherence to SOPs ensures efficiency, accuracy, and improved patient outcomes.

Accurate VA measurement is vital for diagnosing conditions like refractive error, cataract, and age-related macular degeneration. A misclassification can lead to unwarranted interventions, such as unnecessary prescription of corrective lenses. Such misjudgments can have significant patient-level implications. Wearing glasses without a true refractive need may lead to economic burdens, social stigma, and self-image concerns Holden, et al. 2016 [13].

The issue of overprescription in some practices, where patients with VA of 6/7, 6/8, or 6/9 are provided with corrective lenses without justifiable need, raises concerns about cost-effectiveness and patient well-being Ehrlich, et al. 2018 [14]. Overprescription contributes to health system inefficiencies and patient dissatisfaction, underscoring the need for stricter adherence to clinical guidelines that define thresholds for corrective interventions WHO 2019 [19].

Country-level discrepancies are notable in sub-Saharan Africa, where high prevalence rates are reported due to limited access to corrective services Pascolini & Mariotti, 2012 [8]. Overestimating or underestimating blindness prevalence affects funding priorities and strategic planning at national and regional levels Resnikoff, et al. 2021 [1].

Inaccurate VA data compromise the development of targeted intervention strategies. Misclassification at the programmatic level can result in over-investment in refractive services at the expense of surgical capacity for cataracts, or vice versa Leasher, et al. 2017. Inefficiencies of this kind exacerbate the burden on already strained health systems in resource-limited settings. Furthermore, epidemiological data derived from VA records influence national health policies and international funding decisions. Inaccurate data can undermine efforts like the IAPB's 2030 InSight initiative.

For instance, in high-income countries (HICs) with robust screening protocols, a small margin of error may have minimal systemic impact. However, in sub-Saharan Africa or parts of Asia, even minor inaccuracies can skew national blindness registers, leading to misdirected policy efforts Flaxman, et al. 2017 [15].

Conclusion

Accurate VA measurement is not merely a technical requirement but a fundamental determinant of clinical and programmatic success in eye care. Inaccuracies at the individual level can lead to misdiagnosis and inappropriate treatment, while at the population level, they can distort epidemiological data, misguide resource allocation, and weaken policy implementation. The key to ensuring reliability in VA assessment lies in competency-based training, robust quality assurance mechanisms, and the implementation of standardized methodologies [16-18]. In an era where global eye health initiatives are striving to eliminate avoidable blindness, the importance of getting VA measurement right-everywhere and always-cannot be overstated.

Acknowledgement

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Conflicts of Interest

None.

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