

Preoperative visual acuity of cataract patients at a tertiary hospital in sub-Saharan Africa: a 10-year review

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Abstract

Purpose: To determine the preoperative visual acuity of cataract patients over a 10-year period in a tertiary facility as a means of auditing the cataract surgical services.

Methods: A retrospective study of patients with age-related cataracts who had cataract surgery performed between January 2007 and December 2016 at the University College Hospital, Ibadan. Systematic random sampling and probability proportionate to size were used to recruit a representative sample. Information on sociodemographic characteristics, preoperative visual acuity, ocular and systemic comorbidities were retrieved and analysed.

Results: Of the 499 patients studied, males were 268 (53.7%) and their mean age was 67.69 (± 9.51) years. The predominant visual acuity was hand motion 184 (36.9%) and yearly mean preoperative visual acuity was in the range of 0.0037–0.04 decimal.

Conclusion: The mean preoperative visual acuity of patients in this facility did not change over the 10-year study period. Mean value of preoperative visual acuity remained within the range of blindness and did not improve over the decade. This could either be a reflection of visual impairment at which our patients seek care or an indication of the range of visual acuities at which surgeons are willing to offer cataract surgery in our environment. This trend has negative implications on the burden of cataract blindness as it reflects poor coverage of surgery for other levels of visual impairment due to cataract.

Keywords: cataract, Nigeria, preoperative, surgery, visual acuity

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Introduction

Cataract has been identified as the leading cause of blindness globally and in Nigeria.¹ Ten years ago, it was projected that the number of Nigerians aged 40 years and above with cataract blindness will increase to 1.4 million by the year 2020.¹ Control of avoidable blindness from cataract is a priority of the Vision 2020, an initiative of the International Agency for Prevention of Blindness (IAPB). This has led to global efforts to eliminate blindness through effective cataract surgical services. Several indicators were developed for monitoring of cataract services such as cataract surgical rate (CSR), cataract surgical coverage (CSC) and cataract surgical outcomes (CSO).² The CSR and CSC are population-based

indicators and at best require national data for their calculation, and hence, they are calculated infrequently in developing countries where such country-wide databases are nonexistent. The most recent CSR calculated for Africa is over a decade old,³ and may not reflect the current surgical rates.

Visual acuity, a simple eye examination, performed routinely has the potential to be used as an indicator for the state of cataract surgical services in institutions and countries.⁴ Visual acuity evaluation preoperatively is clinically important as it provides information on the degree of visual impairment before surgery in addition to serving as medicolegal evidence. In addition, the

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preoperative visual acuity (PVA) can routinely be used by eye care facilities to evaluate the status of cataract surgical services they provided to communities they serve.

PVA is affected by several factors, among which are time of presentation, waiting time for surgery, co-existing ocular and systemic comorbidities and anticipated postoperative visual outcome.^{5,6} It has been demonstrated that different levels of visual acuity at cataract surgery reflect different CSRs.⁷ It has also been shown that, PVA of cataract patients is related to countries' state of development, willingness of surgeons to offer surgery and outcome of cataract surgeries.^{4,8} It has also been reported that PVA is at levels of blindness and severe visual impairment in most low-income countries.^{4,7,9}

Nigeria has low CSRs of 300/million population/year.³ This is far below the expected rate of 3000/million which would reduce the burden of blindness due to cataract.⁵ Many factors are responsible for this. A factor which plays a major role is the PVA at which surgery is performed. The PVA depends on the point at which patients ask for surgery as well as the stage at which surgery is offered to them. It has been reported that to attain a high CSR, the case mix of patients receiving cataract surgery should reflect a better PVA as this reflects efficient cataract surgical services.^{4,7,9}

There is a dearth of studies conducted in Nigeria to assess the trend of PVA as an indicator of cataract surgical services. Similarly such a study has not been conducted at the University College Hospital (UCH), Ibadan; therefore, the aim of this study is to determine the trend in PVA of patients undergoing cataract surgery at the hospital over a 10-year period and information obtained from this study will be useful in auditing the cataract surgical services at this facility.

Methods

A retrospective study of patients with age-related cataracts who had surgery over a 10-year period (2007–2016)

The UCH, Ibadan, is an 850-bedded tertiary hospital, comprising 60 departments. It is a tertiary hospital that provides specialized care in several specialities including eye care services. The hospital cater to a mix of clientele and patients mostly from south-west Nigeria as well as other parts of the country.

The Ophthalmology department provides patient care in seven subspecialties including community eye health. The department runs two clinic types: the eye outreach clinic and the subspecialty (main) clinic. Both offer cataract surgical services, though surgeries for patients from the eye outreach are performed at a subsidized fee. High-volume cataract surgeries commenced in 2006 and continued till date. Both extracapsular cataract extraction and small incision cataracts are performed. The other eye care facility providing high-volume cataract surgeries in Ibadan is a missionary hospital located some 30-min drive from the UCH, Ibadan.

The study population were adults aged 50 years and above who had cataract surgery performed between 2007 and 2016 in UCH, Ibadan. Patients referred to the specialist clinic, walk-in patients to the outreach clinic or patients brought in for surgery from communities by the eye outreach department who met the eligibility criteria were recruited into the study.

Excluded were patients with complicated cataracts and patients who had a previous cataract surgery performed in this facility prior to the year of study as these patients must have sought care earlier.

WINPEPI,¹⁰ computer software for sample size calculation was used to derive sample size using the calculation for single mean, where Z_{α^2} , the standard normal deviate at 95% confidence interval was 1.96, assumed standard deviation (SD) in population of 0.5 from a previous study¹¹ and assumed error was 0.05. This gave a minimum sample size (n) of 384. Considering an attrition rate of 20% to account for incomplete data $= (0.2 \times 384) + 384 = 480$. Target sample size was thus rounded up to 500 patients' records.

Recruitment of patients was done by systematic sampling using these steps: a list of the number of cataract surgeries performed annually in adults aged 50 years and above in the facility during the study period was obtained from department's records and theatre surgery records. This gave a total population of 7297 patients.

The population of patients that had surgery were stratified by year of surgery. This gave 10 clusters. Each cluster represented total population of patients that had surgery each year.

The total sample size calculated for the study was 500, thus further sampling was done to select representative proportion of patients from each cluster by proportional allocation to size. After determining the number of participants to be selected in each year of the study period, further stratification was done by clinic of entry in each cluster. This gave the proportion of patients to be studied from the main clinic and outreach clinic in each year.

For each cluster by year and clinic of entry, the sampling interval (k) was then calculated, every k th number patient was then selected until the sample size calculated for the year was attained. The first participant ($k1$) was recruited by balloting and subsequent case notes of participants were selected using the sampling interval calculated per year.

Visual acuities were recorded in Snellen's Chart notation and converted to decimal and Logmar units using Holladay's conversion charts.¹² Values for light perception (LP) and no perception of light (NLP) were converted to decimal notation using values according to Grover and colleagues.¹³ These values were used to analyse for trend in visual acuity change over the decade.

Data were collected, entered, cleaned and analysed using the Statistical Package for Social Sciences (SPSS). The status of the operated and unoperated eyes was analysed and reported. Tests of association were performed using the nonparametric Mann-Whitney U test due to the skewed distribution of the PVA. Measure of significance was set at $p < 0.05$ at 95% confidence interval.

Ethical approval was obtained from the University of Ibadan/University College Hospital Instructional Review Board (UI/UCH IRB UI/EC/17/028).

Individual informed consent was not obtained due to the nature of the study which was a retrospective review of case notes. This was permitted by the institutional review board.

Results

A total of 7297 cataract surgeries were performed during the study period. Of these, the medical records of 499 patients were reviewed: 318 (63.7%) were from the eye outreach clinic and 181 (36.3%) were from the subspecialty clinics of the department. The number of males were 268

Table 1. Sociodemographic characteristics of participants ($n=499$).

Variables	Categories	Frequency	Percentage
Gender	Male	268	53.7
	Female	231	46.3
Age at presentation (years)	50–59	91	18.2
	60–69	180	36.1
	70–79	165	33.1
	80–89	53	10.6
	90–100	10	2
Age at surgery (years)	50–59	89	17.8
	60–69	180	36.1
	70–79	167	33.5
	80–89	53	10.6
	90–100	10	2
Marital status	Married	340	68.1
	Widowed	93	18.6
	Separated	2	0.4
	Divorced	11	2.2
	Not stated	53	10.7
Religion	Christian	243	54.7
	Islam	203	45.3
Employment status	Employed	353	73.5
	Unemployed	127	26.5

(53.7%) and females were 231 (46.3%). The mean age of participants at time of surgery was 67.7 (± 9.5) years. At time of presentation, 353 (73.5%) were employed in economic activities. The patients were predominantly of Yoruba ethnicity 475 (96.5%) (Table 1).

The cataracts occurred bilaterally in 316 (63.3%) and unilaterally in 183 (36.7%) of the participants. The left eye was operated in 254 (50.9%) of the participants and the right eye in 245 (49.1%) of the participants. In the unoperated eye, 42 (8.4%) were pseudophakics and 7 (1.4%) were aphakic (first surgeries performed elsewhere). Co-existing ocular morbidities were found in 110 (22.0%) of participants. The commonest ocular

Table 2. Preoperative visual acuity in operated eyes ($n=499$).

Preoperative visual acuity in Snellen's Chart	Frequency	Percentage
6/6–6/18	6	1.2
6/24	7	1.4
6/36	19	3.8
6/60	12	2.4
3/60	1	0.2
CF	114	22.8
HM	184	36.9
LP	158	31.3
Total	499	100

CF, counting fingers; HM, hand motion; LP, light perception.

Table 3. Best-corrected visual acuity in unoperated eyes.

Visual acuity	Frequency	Percentage
6/6 or better	98	19.6
6/9	77	15.4
6/12	53	10.6
6/18	46	9.2
6/24	24	4.8
6/36	29	5.8
6/60	8	1.6
CF	63	12.6
HM	56	11.2
LP	29	5.8
NLP	16	3.2
Total	499	100

CF, counting fingers; HM, hand motion; LP, light perception; NLP, no perception of light.

comorbidity was glaucoma in 56 (50.9%) followed by pterygium in 17 (15.5%). Of the other anterior segment pathologies which were zonular dialysis, cornea scars and dystrophies, iridodialysis made up 16 (14.5%) of the ocular comorbidities,

while other retinal pathologies which comprise retinal scars, retinal detachment, macular hole, diabetic retinopathy, hypertensive retinopathy, cytomegalovirus retinitis made up 12 (10.9%).

Systemic comorbidities were present in 195 (39.1) of the patients. Of these, 139 (71.3%) had hypertension, 10 (5.1%) had diabetes, 8 (4.1%) had both diabetes and hypertension. Other systemic comorbidities comprising asthma, peptic ulcer disease, cough, skin lesions and HIV infection accounted for the remaining 38 (19.5%) of the participants with systemic diseases.

Extracapsular cataract surgery (ECCE) with posterior chamber intraocular lens was performed in 308 (61.7%), small incision cataract surgery (SICS) with posterior chamber intraocular lens in 157 (31.5%), ECCE with anterior chamber intraocular lens in 13 (2.6%), small incision cataract surgery with anterior chamber intraocular lens in 7 (1.4%) and cataract surgery without intraocular lens was performed in 14 (2.8%).

The predominant PVA recorded was hand motion (HM) in 184 (36.9%) followed by LP in 156 (31.3%) (Table 2).

The best-corrected visual acuity (BCVA) in the unoperated eye at time of surgery was worse than 6/12 in 271 (54.4%) of the patients (Table 3).

The annual mean preoperative visual acuity (MPVA) was between 0.0037 and 0.04 decimal (2.05 and 2.64 Logmar) which is worse than 6/120 over the 10-year period. MPVA at surgery was at level of severe visual impairment or worse in the 10-year period (worse than 6/120). The MPVA improved in 2011 and 2012, however, these values were still in the range of severe visual impairment (Figure 1).

The yearly mean BCVA in the unoperated eye was 0.32–0.05 decimal (0.55–1.13 Logmar) (Figure 2).

The overall MPVA of patients from the main clinic was 0.052 decimal and outreach 0.007 decimal.

Figure 3 shows the trend of PVA from both clinics over the decade. There is almost a flat pattern

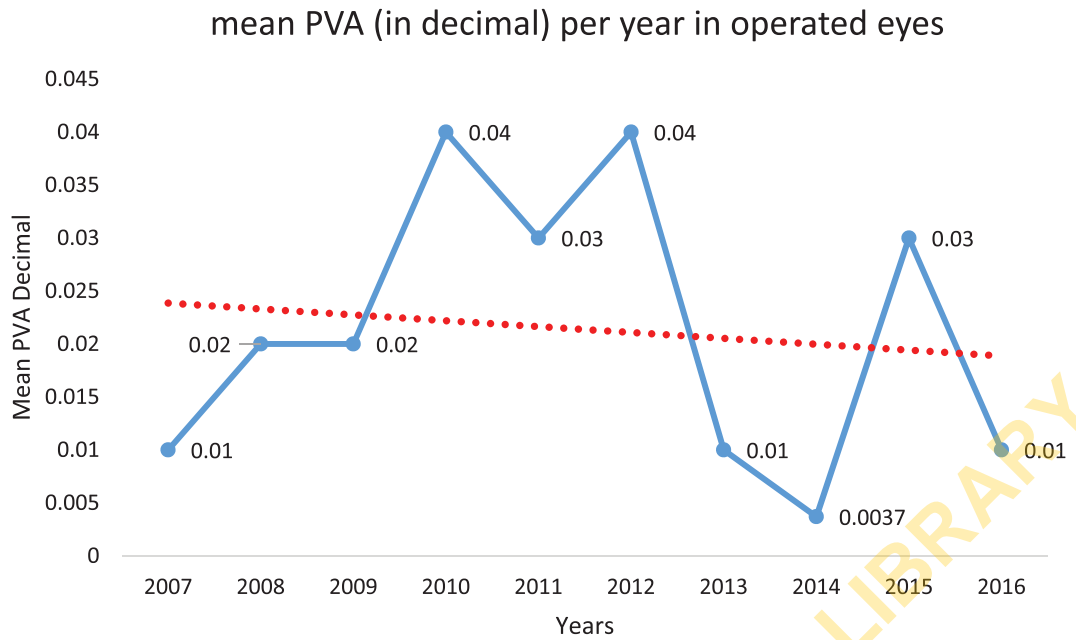


Figure 1. Annual mean preoperative visual acuity in all operated eyes from 2007 to 2016.

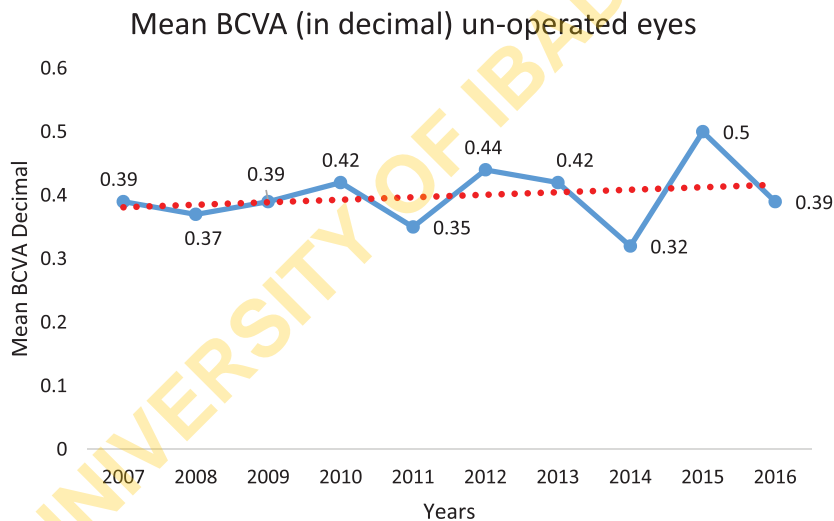


Figure 2. Annual mean best-corrected visual acuity (BCVA) in unoperated eyes.

in the PVA of outreach patients with no significant change in pattern. The MPVA from main clinic had no sustained rise or dip in values; however, it was 0.098 (6/60) in 2010 and remained persistently below 0.1 decimal over the other years reviewed. The mean preoperative value for the year 2014 from the main clinic is missing as there was difficulty retrieving data from the main clinic for that year.

The MPVA of females (0.029) was worse than males (0.085), that of participants with ocular comorbidity (0.0428) was worse than those without ocular morbidity (0.068), and also worse in participants who were currently married (0.0272) compared to those not currently married (0.171) at the time of the study; however, these differences were not statistically significant (Table 4).

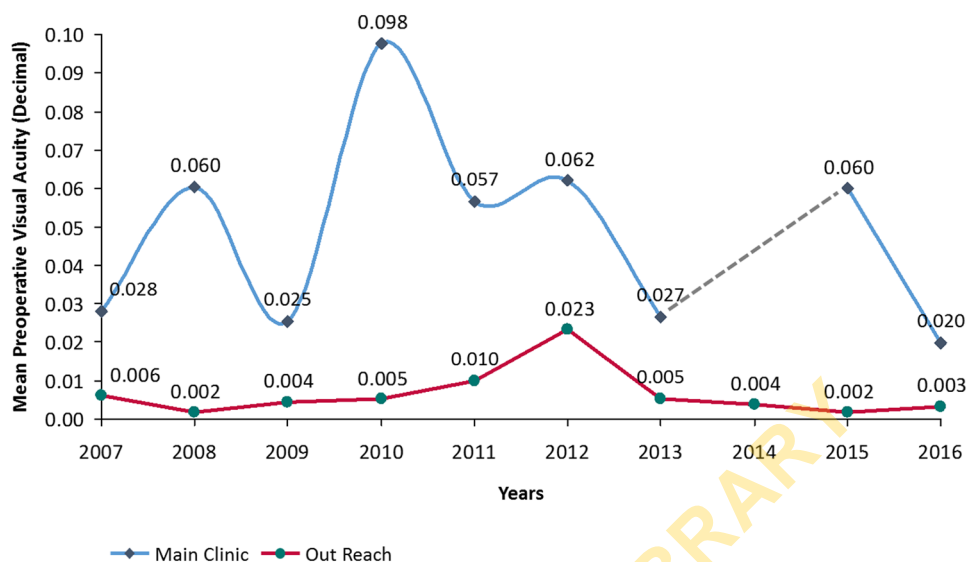


Figure 3. Annual trend of mean preoperative visual acuity (in decimal) from service points 2007 to 2016.

Table 4. Associations between demographic characteristics, ocular factors and preoperative visual acuities.

Variable	Median	Range	Mann-Whitney U	Standard error	p value	Mean (±SD)
Clinic type						
Main clinic	0.002	0.999	21,854.00	1476.36	≤0.001	0.068 (±0.023)
Outreach	0.002	0.249				0.052 (±0.135)
Employment status						
Employed	0.002	0.999	23,924.50	1268.07	0.144	0.019 (±0.079)
Unemployed	0.002	0.999				0.037 (±0.109)
Co-existing ocular morbidity						
Yes	0.002	0.999	20,011.00	1272.91	0.277	0.043 (±0.131)
No	0.002	0.9990				0.068 (±0.068)
Gender						
Male	0.002	0.999	13,499.00	784.89	0.282	0.085 (±0.056)
Female	0.002	0.999				0.029 (±0.141)
Marital status						
Currently married	0.0012	0.999	17,145.00	1103.52	0.428	0.027 (±0.096)
Currently unmarried	0.002	0.629				0.171 (±0.070)
Age at surgery						
64 years or less	0.002	0.629	30,368	1474.54	0.261	0.025 (±0.025)
65 years or more	0.002	0.999				0.022 (±0.076)

Discussion

The PVA spread over the decades was $<3/60$ in almost all of the study population with only three patients having surgery at mild visual impairment. The trend in MPVA over the decade remained low at less than 0.1 decimal (0.0037–0.004 decimal) over the 10-year period under review. By proxy, it may imply that this is the visual acuity at which most patients seek surgery or a reflection of surgeons' visual acuity threshold for offering cataract surgery. This was similar among both outreach clinic and subspecialty clinic patients. This trend does not reflect a cataract surgical service that is required to meet the needs of patients with moderate-to-severe visual impairment from cataract in our environment.

This study corroborates a global study which was conducted on PVA across different geographic areas and reported that countries with low human development index (HDI) had poorer PVA.⁴ On the contrary, studies from Malaysia,¹⁴ Finland,¹⁵ Australia⁷ and England¹⁶ showed an improving trend in PVA which was reported as a reflection of improved cataract surgical services in these countries which is also reflected by higher CSRs.

The proportion (91.2%) of blind patients $<3/60$ preoperatively in this study is similar to 96.8% observed in a study in Kano, Nigeria¹⁷ but higher than 45.5% reported from Nepal.¹⁸ Though the study methodology was different for these studies as this study was a retrospective study over a decade, Kano; retrospective over 1-year period while the Nepal study was a prospective study over a year, the settings are similar as they were conducted in low-income countries.

Patients with moderate visual impairment and blindness after correction in the nonoperated eye were higher than reported from Nepal.¹⁸ The trend in BCVA in the nonoperated eye over the decade in this study remained the same at an average of 0.3 decimal. Bilateral cataract was more predominant in this study and a third of the patients being bilaterally blind in both eyes before surgery also implies that cataract surgical services in this environment may not be meeting the needs of those with mild-to-moderate visual impairments. The Nigerian national blindness survey reports CSC to be higher at blindness from cataract compared to other levels of visual acuities.¹⁹ For an increase in surgical rates, it is expected that there should be improved CSC at all levels of visual impairment.

With increased longevity, the incidence of cataract is expected to increase and it is projected that by 2020, 1.4 million Nigerian will be blind from cataract.¹ In this study, about four of the patients were aged 100 years at first cataract surgery which shows that we are getting older patients at surgery in our environment already.

The predominantly available methods of surgery in Nigeria and this facility may also explain the poor PVA recorded consistently over a decade, as ECCE was performed in two-thirds of the patients. Phacoemulsification is not readily available and investing in this may make surgeons more willing to operate earlier once the patient complains of visual impairment from cataracts and not wait until they are blind from cataracts.

Similar studies from Finland¹⁵ and Malaysia¹⁴ reported that PVA was very low in majority of the patients when ECCE technique was the predominant surgery type but with transition to phacoemulsification, the proportion of people with severe visual impairment preoperatively significantly reduced. The need for investment in healthcare cannot be overemphasized as better infrastructures translate to better services and an improved quality of life.

Patients from the outreach clinic had worse PVA than patients from subspecialty clinic over the 10 years reviewed and this was statistically significant. Most of the patients from this outreach clinic are patients from poor communities who cannot afford the regular cost of cataract surgery and may be waiting for such outreach programmes to facilitate their access to surgery. Due to the retrospective nature of this study, no reasons were documented in the notes why the patients presented with such poor PVA. It will be noteworthy to state that due to the absence of waiting list in this clinic, the PVA profile of these patients may also reflect the time at which patients in underserved communities may be seeking cataract surgical services in our environment. This finding is similar to findings from Nepal where the proportion of operated blind eyes from the outreach services was higher than nonoutreach services.¹⁸ In addition, the presenting visual acuity was predominantly HM which suggest that the very poor PVA is mainly due to the visual acuity at which patients are presenting for surgery and not due to the effect of waiting time in the facility for surgery.

The CSRs for sub-Saharan Africa a decade ago was put at less than 500/million/per year.^{3,7} It has

been demonstrated that visual acuity threshold at surgery determined the CSR across demographic changes and operating at visual acuity of <3/60 places CSR at less than a 1000/per year/ million population.⁷ With some measure of confidence, it is possible to infer from the trend of PVAs over the decade in this study that the CSRs for south-west Nigeria and possibly Nigeria has not changed over the years as service delivery has basically remained the same at PVAs of 3/60 or worse.

Limitations

This study was conducted in only one health facility and thus may not be a true reflection of PVAs in Nigeria; however being a high-volume centre, with some measure of confidence we can state that it will be close to the true PVA. Missing data were encountered in this study as case notes of some participants recruited into the study could not be retrieved due to poor record keeping; or else case notes were found but the relevant information were not documented.

Conclusion

The trend in MPVAs in this facility has remained at levels of blindness with no significant change over the decade. This may be a reflection of the threshold of visual acuities at which patients seek care or at which surgeons are willing to offer cataract surgery in our environment. This trend has implication on cataract blindness as it reflects poor coverage of surgery for other levels of visual impairment due to cataract as well as a low cataract surgery rate.

Furthermore, qualitative studies should be conducted to evaluate the threshold of visual acuities at which surgeons in our environment are willing to offer cataract surgery as well as visual acuities at which people seek health interventions for cataracts.

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