

## State of the nation survey on cataract surgery in India

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**Purpose:** To study the knowledge, attitudes, and practices of the ophthalmologists in India regarding cataract extraction practices. **Methods:** A prospective, online, descriptive study was conducted from January 2022 to April 2022 using a self-developed validated questionnaire attached which was administered through a generated link. **Results:** The mean age of these 153 respondents was 47.02 (SD = 11.53) years with a male preponderance (70.59%). The majority (52.9%) had completed a fellowship after their post-graduation, and 56.20% provided sub-specialty services. Comprehensive ophthalmology (69.93%) and anterior segment (50.32%) practice were the most popular. Although 76.47% of respondents used a mix of techniques, 11.11% surgeons used only phaco-emulsification and 9.8% used only manual small-incision cataract surgery (MSICS) as the lone cataract treatment modality. Roughly 38% felt that outcomes were comparable for phaco-emulsification and MSICS, whereas about 44% opined that the outcomes of phaco-emulsification were better. MSICS outcomes were reported to be better by approximately 15%. The frown incision (53.59%), the straight incision (19.60%), and the straight incision with back cuts (10.45%) were popular. The majority (71.24%) of the respondents were willing to train fellow ophthalmologists and youngsters in MSICS. Standalone practices and family practices (42.48%), private eye institutes (10.45%), medical colleges (12.41%), and government non-teaching hospitals (11.11%) were the major service providers. 4% were working in rural hinterland. **Conclusion:** The majority of the surgeons use a mix of cataract extraction operative techniques. A large, willing talent pool of manual small-incision cataract surgeons exists. India can be a global hub for MSICS delivery and training.

**Key words:** Cataract extraction, manual small-incision cataract surgery, techniques

India is a large and diverse country. In India, the elderly population has increased from 24.71 million in 1961 to 138 million elderly persons in 2021, comprising 67 million males and 71 million females.<sup>[1]</sup> Among ocular diseases, cataract is a major cause of blindness according to Global Burden of Disease, Injuries, and Risk Factors Study (GBD), stating that it is the second leading cause of moderate and severe vision impairment (MSVI). Phaco-emulsification, femto-laser-assisted cataract surgery (FLACS), and manual small-incision cataract surgery (MSICS) are the established surgical modalities for treatment. Extra-capsular and intra-capsular cataract extraction are also available to the ophthalmic surgeons.<sup>[2-4]</sup> Small-incisions and faster visual rehabilitation have shifted the community focus to the first three modalities as popular alternatives. A literature search was conducted using heterogeneous data sources of Scopus, Embase, PubMed, MEDLINE, and Cochrane databases without a date range using the terms 'manual small-

incision cataract surgery (300 citations), small-incision cataract surgery (1,341 citations), manual small-incision cataract surgery and phacoemulsification (151 citations), phacoemulsification and femto laser assisted cataract surgery (18 citations), femto laser assisted cataract surgery and manual small-incision cataract surgery (1 citation), and finally a combination of all three, phacoemulsification and femto laser assisted cataract surgery and manual small-incision cataract surgery (1 citation)' in the title and abstract. Duplicate entries were removed electronically. If English translations were available, then non-English studies were included, but no contact with any author was made for this purpose or otherwise. Relevant studies were hand-sorted. Multiple randomized-controlled clinical trials have proven that the techniques are safe and effective for visual rehabilitation from cataract.<sup>[5-9]</sup> MSICS is an established surgical option where machines are not used. The literature is scanty regarding the prevalence of different modalities and facilities in use and more soon the use of the latter. We conducted a survey to understand the knowledge, attitude, and practices of the ophthalmologists in India regarding surgical treatment of cataract and the facilities for it in India. To the best of our knowledge, there is no information

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available on the aforementioned subject in the established literature with reference to India.

## Methods

A questionnaire was developed and validated on 12 doctors before being administered in the form of a prospective, online, descriptive study from January 2022 to April 2022 using a self-developed validated questionnaire. The survey was shared with respondents electronically using e-mail and WhatsApp. The consent was given online, and anonymized data were analyzed. The questions asked are attached in Table 1. The responses were collected on a server and downloaded to a local computing environment. Mean (SD), median (inter-quartile range), and frequency (percentage) were used for descriptive statistics based on the variable using SPSS version 27.0.

### Sample size

The All India Ophthalmology Society has about 23,000 registered ophthalmologists. The Statista website estimated the number of ophthalmologists available in India in 2020 to be 25,000.<sup>[10]</sup> Giving the population estimates a generous 20% margin, we rounded off the number to 30,000 assuming that all ophthalmologists may not be registered with the All India Ophthalmology Society considering the geographic expanse of India. Then we assumed the highest possible variance to reflect a heterogeneous population because there were no previous data on the subject in the literature. Taking the population to be 30,000 with a confidence interval of 95% and a margin of error of 8%, our sample size was 149 in this exploratory study.

## Results

Of the 153 people who responded, 70.59% (n = 108) were males and 28.75% (n = 44) were females with one person choosing not to reveal gender. The mean age of respondents was 47.02 years (SD = 11.53 years) with the range from 27 to 71 years. The geographical distribution of the respondents is given by way of map in Fig. 1 and the bar graph in Fig. 2. Almost half of the respondents (49.7%, n = 76) were working in metropolitan cities with a population of more than 10 lakhs. 46.4% (n = 71) were working in towns and smaller cities. Only 4% (n = 6) of the respondents reported to be working in rural areas.

The experience of these ophthalmologists ranged from 46 years in ophthalmic practice to just clearing the post-graduation examination and starting with their career with a mean experience of 17.26 years (SD = 11.96 years). 52.9% of the respondents (n = 81) had completed a fellowship after their post-graduation. Most of the ophthalmologists were practicing as comprehensive ophthalmologists (n = 107, 69.93%) and anterior segment surgeons (n = 77, 50.32%) as shown in Fig. 3. This response permitted multiple boxes to be ticked depending on the working profile of the ophthalmologist. 86.27% of the responders (n = 132) were regularly using phaco-emulsification as a means of treating cataract, whereas 80.39% were using MSICS (n = 123) for treating cataracts. FLACS was available to 7.19% (n = 11) of the surgeons. The distribution of different types of cataract surgical procedure users is given in Table 1. Before the lockdown, only 11.11% (n = 17) of the responding surgeons were using only phaco-emulsification as the lone cataract treatment modality. A similar number of 9.8% (n = 15) of the responding surgeons were using MSICS as the lone cataract treatment modality before the lockdown



**Figure 1:** Location map of responding ophthalmologists

started. No surgeon was purely using FLACS for all patients. 76.47% (n = 117) of the ophthalmologists were using a mix of different techniques for cataract extraction. Before the lockdown started, 69.93% of the ophthalmologists (n = 107) were not using FLACS for their patients. 67.05% (SD = 35.03) patients were reported to be treated by phaco-emulsification as judged by the operating surgeons. For MSICS, the reported mean was 35.87% (SD = 35.92), whereas for FLACS, it was a mean of 1.26% (SD = 5.64). This data reflect a very large variance.

Standalone practices and family practices (42.48%, n = 65) along with private eye institutes (10.45%, n = 16) constitute half the trained human resource available in ophthalmic surgery. Quite interestingly, medical colleges (12.41%, n = 19) had a greater concentration of human resources and manpower compared to the government non-teaching hospitals (11.11%, n = 17) [Table 1]. Roughly 56.20% of the respondents (n = 86) are doing sub-specialty work. About 70% of the respondents (n = 107) preferred phaco-emulsification as the primary treatment surgery for cataract, whereas 25.49% were in favor of MSICS (n = 39). About 44% (n = 67) felt that the outcomes of phaco-emulsification were better than those of MSICS, whereas approximately 38% (n = 58) were of the opinion that the outcomes were comparable. 15% (n = 23) felt that MSICS gave better results than phaco-emulsification. The frown incision was the most popular (n = 82, 53.59%), followed by the straight incision (n = 30, 19.60%) and a straight incision with back cuts or the Blumenthal incision (n = 16, 10.45%), as shown in Table 2. Although about 39% of the respondents (n = 60) were not interested in any training of any kind, about 34% (n = 52) expressed a desire to learn and undergo training for FLACS.

71.24% of the respondents (n = 109) were willing to train fellow ophthalmologists and youngsters in MSICS, whereas

**Table 1: Questions and their Responses**

Question	Results
Age	Mean = 47.02 Years SD = 11.33 Years
Gender	Male = 108,70.59% Female = 44,28.76% Not specified 1,0.65%
State I practice in	Figure 2
I cleared my MD/MS/DO/DNB in which year? Experience of Practice in Years	Mean=17.27 Years SD=11.96 Years
Have you done a fellowship?	Fellowship Yes = 81,52.94% Fellowship No = 68,44.44% Prefer Not to Tell = 4,2.61%
What best describes you	Figure 3
I use the following surgeries for my cataract patients (Multiple responses are possible per ophthalmologist)	FLACS = 11,7.19% Phaco-emulsification = 132,86.27% MSICS = 123,80.39% ECCE = 23,15.03% ICCE = 10,6.54% Non-Operating = 4,2.61%
Before lockdown in one typical year, what percentage of my cataract patients was treated with phaco-emulsification?	Mean = 67.16% SD = 35.05%
Before lockdown in one typical year, what percentage of my cataract patients was treated with Manual SICS?	Mean = 35.87% SD = 35.92%
Before lockdown in one typical year, what percentage of my cataract patients was treated with FLACS?	Mean = 1.26% SD = 5.64%
I work in	Medical College = 19, 12.42% Corporate Hospital = 15,9.80% Private Eye Institute = 16, 10.46% My own practice as a solo or family practice = 65,42.48% Government Non-Teaching Hospital = 17,11.11% Charitable Hospital/Setup = 13,8.50% Others not covered in the above = 2,1.31% Group Practice = 5,3.27% No response = 1,0.65%
Are you doing sub-specialty work?	Yes = 86, 56.21% No = 63,41.18% Not specified = 4,2.61%
My preferred surgery for cataract is	AllPhaco = 17, 11.11% AllMSICS = 15, 9.80% AllFLACS = 0, 0% Mix = 117, 76.47% Non-Operating = 4, 2.61%
Perception of outcomes of cataract surgery between MSICS and Phaco	Phaco better = 67, 43.79% Both equivalent = 58, 37.91% MSICS better = 23, 15.03% No response = 5,3.27%
My Preferred external incision in MSICS is	Table 2
Would you like training in the following types of cataract surgery?	Manual SICS = 7, 4.58% Phaco-emulsification = 20, 13.07% FLACS = 52, 33.99% ICCE = 0, 0% I do not operate cataracts = 0,0% No I do not want any further training = 60, 39.22% No Response = 14, 9.15%
Will you be willing to train other ophthalmologists in MSICS?	Yes = 109, 71.24% Not sure = 15,9.80% No = 13, 8.50% I do not practice MSICS = 13, 8.50% No response = 3, 1.96%
In a typical year before lockdown, how many cataract surgeries of all types did you perform every year?	Median = 500 Inter-Quartile Range (Q1, Q3) – (150, 1000): 850 Mean=739.76, SD=918.81, Skewness=2.69, kurtosis=8.63 and outlier analysis necessitated median

**Table 2: Manual Small-Incision Cataract Surgery External Configuration of Incision**

Straight Line	30	19.61%
Frown	80	52.29%
Chevron	4	2.61%
Do not do MSICS	0	0%
Straight line with backward cuts	16	10.46%
Smile	3	1.96%
Customized according to astigmatism	1	0.65%
Depending upon nucleus size and stage of cataract	1	0.65%
Not responded	18	11.76%

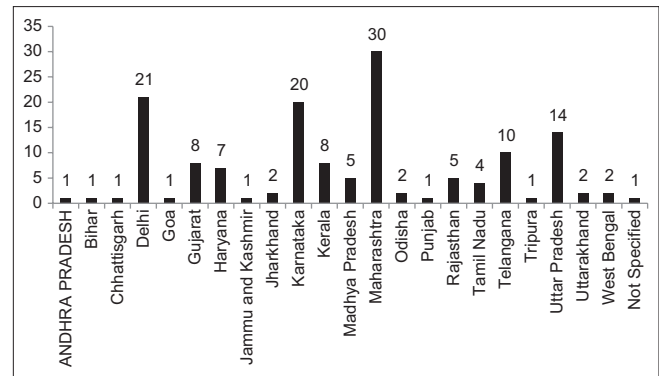
8.49% (n = 13) were not interested in imparting the training. Another 8.49% (n = 13) did not want to join in because they were not practicing MSICS [Table 1]. About 2% of the respondents (n = 3) were not surgically active in cataract. The number of cataract surgeries reported in a typical year by the ophthalmologists before lockdown ranged from 0 to 5000 with a mean of 739.77 (SD = 918.81, skewness = 2.69, kurtosis = 8.63). A histogram of the distribution of the surgeries is given in Fig. 4. The median number of cataract surgeries performed by this group was 500, with an inter-quartile range (Q1, Q3) from 150 to 1000.

## Discussion

This represents the cross-section of surgically active ophthalmologists across the country. The age profile matches the US cohort of ophthalmologists reported by Fathy *et al.*<sup>[11]</sup> in 2018 where the median age of the cohort was 47 years and the gender distribution had 73.6 males, which was similar to our cohort. This would suggest that despite the difference in the countries, the demographic profile of the ophthalmologists is comparable. The practice of ophthalmology in democratic free societies seems to be deciding the demographic profile of the practitioners of the scientific pursuit rather than the other societal factors. However, then many more studies would be required to support the generalizability of these findings beyond the present cohort.

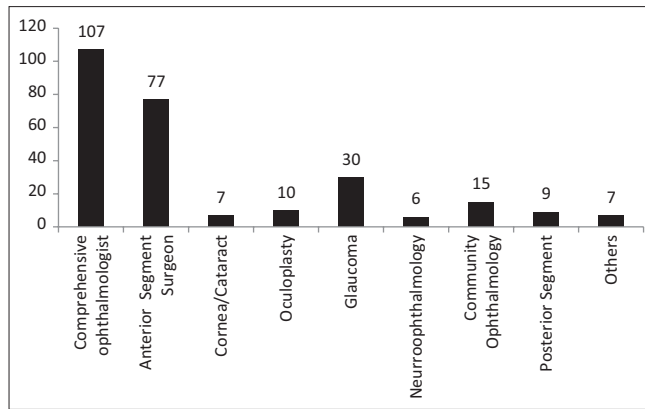
The geographic spread of the responses covers most of the states of the country. However, many of these high-polluted states had a larger number of ophthalmologists. For example, Delhi accounts for about 1800–2000 active ophthalmologists in its local members, which explains its numbers.<sup>[12]</sup> The states such as Maharashtra, Uttar Pradesh, Rajasthan, and Karnataka are large and populous states. The respondents had an equal opportunity to have responded, and the responses were generated randomly as a result of the online 24X7 access.

The private sector contributed to the majority of the available skilled manpower in this survey with private eye institutes (10.45%, n = 16), standalone practices, and family practices (42.48%, n = 65), accounting for more than half the trained human resource available in ophthalmic surgery. The private sector in India has a dominant presence, and studies in the past have reported that it accounts for 82% of out-patient visits, 58% of in-patient expenditure, and 40% of births in institutions.<sup>[13]</sup> However, this sector has not received any special incentives from the public funds in the form of tax breaks, subsidies, or investments. This is funded through out-of-pocket

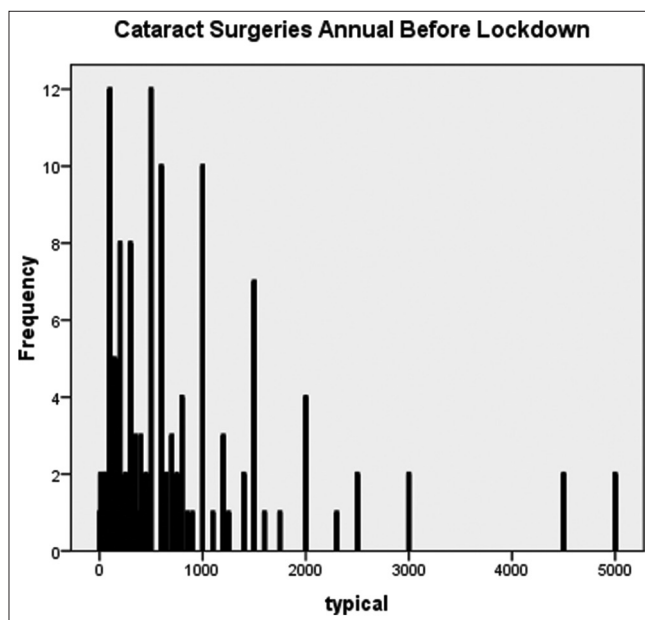
**Figure 2: Statewise weights of responses**

spends of the people and private insurance. There has been no organized effort by this sector for getting recognition and returns for the massive investment that has gone into private medical services. At the policy level, we need to understand that investment in health and education improves the productivity of a nation. Such out-of-pocket spends reduce the spending power of the masses and have a negative impact on economy as a whole. A complete package for holistic development of the sector is therefore required. This was performed for the pharmaceutical industry after independence, and the result is that today, the Indian pharmaceutical industry is the world's third largest by volume and the 13<sup>th</sup> largest in value terms with a total annual turnover of Rs. 2,89,998 crore.<sup>[14]</sup>

Urban elderlies in India reported illnesses at a higher rate (34.04%) than their rural counterparts (24.63%). The majority (80%) of the elderly with unmet healthcare needs were in the rural areas.<sup>[15]</sup> Only 4% (n = 6) of the respondents reported to be working in rural areas. A part of this can be explained by the fact that cataract surgery is day care and ambulatory surgery. In the normal course, it would be expected that the government facilities would have a greater penetration in these underserved areas, but the medical colleges (12.41%, n = 19) reported a greater concentration of surgically active manpower compared to the government non-teaching hospitals (11.11%, n = 17). Although we have no information about these facilities, it would be likely that the former are always going to be in towns and cities. It is foolish to expect that the private sector would fill in the rural void that is created by non-creation of surgical facilities in the rural hinterland using public funds. Policy mandarins advising the government from medical colleges and ministries over the past 75 years have erred. Things cannot improve unless we give a voice to those working in the rural hinterland. The authors recommend that anybody advising on such issues should have worked in those conditions for at least a period of 1 or 3 years in the rural setups at any level. A complete cadre needs to be created, and rotation of postings in a transparent and equitable manner at all the levels of healthcare administration is desirable. The central government had a rotation policy in Andaman and Nicobar Islands which still continues in the administrative cadre of the Government of India. It is similar to the story of dirty worker toilets but clean executive toilets in a car manufacturing unit. The owner was told that it would take at least a month for the toilets of the workers to be usable. The owner simply exchanged the boards on the two toilets. Within 4 days, the facilities in both the toilets became equivalent. The owner still continued with the practice of exchanging boards every 15 days



**Figure 3:** Description of the type of practice of the respondent (more than one response possible)



**Figure 4:** Distribution of the volume of surgery among respondents

in his car manufacturing unit. Facilities and instruments for the rural as well as urban areas should be similar if not the same. This will be possible only if we follow what the army does by ensuring that every officer does both field and family station postings.

More than half of the licensed and trained surgeons chose to go and do a training or fellowship after completion of post-graduation, thereby indicating that the training system has failed to equip them with the necessary skills to practice the trade. A radical revamp is absolutely necessary because re-packaging medical education as competency-based training will not yield any results. These fellowships and training programs were not regulated by any government, and only those with a passion to impart skills to fellow healers were running them. A few months in these fellowships are producing confidence in the licensed ophthalmologists who theoretically do not need these fellowships to practice the trade. The ramifications of this finding are that the government needs to interact with the industry to create trained manpower which can be gainfully employed in the healthcare delivery in ophthalmology to improve outcomes.<sup>[16]</sup> This was seen in

East Timor from 2001 to 2009 when high-quality surgery was rendered when Royal Australian and New Zealand College of Ophthalmologists trained local trainees in specific surgery and subsequently they further trained others.<sup>[17]</sup> It is entirely likely that this failure of training delays the settlement of the young doctors into practice. This could be one of the reasons why we are unable to create opportunities in the rural hinterland. A degree of stigma may also be attached to service in the rural hinterland, which can only be overcome by a rotation policy.

The fact that cataract is the bread and butter of ophthalmology is known across the world, and it is not any different in India as five out of six work in the anterior segment. The global cataract surgery device market size was valued at \$8.3 billion in 2020 before the coronavirus disease pandemic. It is projected to touch \$12.2 billion by 2030 with a compounded annual growth rate of 3.9% from 2022 to 2030.<sup>[18]</sup> However, three out of five are also doing some specialty work, thereby showing that there is no dearth of sub-specialty services in the country. The study is unable to assess whether there is a skew in available at sub-specialty service. That is a limitation of the study which needs to be addressed by further research. The number of pure phaco-emulsification surgeons (11.11%,  $n = 17$ ) or pure MSICS surgeons (9.8%,  $n = 15$ ) is very limited. Most of the practicing ophthalmologists (76.47%,  $n = 117$ ) are conversant in both techniques and use a mix of techniques in their operation theaters. The reason for this phenomenon can only be speculated as this study did not have means of judging those. Future research in this area would be illuminating and rewarding.

Singer's "frown incision", curved opposite to the natural limbal curve, was the most popular ( $n = 82$ , 53.59%). It has classically been described as conforming to the astigmatic funnel of Koch and controlling the surgically induced astigmatism.<sup>[19]</sup> Chevron is reported to have even lesser SIA but was not quite as popular. The reasons for the popularity may therefore be other than SIA alone.<sup>[20]</sup> However, more research will be required for this to be answered.

Contrary to live surgery demonstrations, 69.93% of the ophthalmologists ( $n = 107$ ) had not used FLACS for their patients. Access to FLACS was available to 7.19% ( $n = 11$ ) of the polled ophthalmologists were found to be using FLACS at this present moment. No surgeon was purely using FLACS for all patients. Before the lockdown started, the relative use of the techniques can broadly be put as two-thirds of all patients (67.05%,  $SD = 35.03$ ) received phaco-emulsification, whereas one-third received MSICS. Femto-assisted cataract surgery was used in only a small fraction of patients (1.26%,  $SD = 5.64\%$ ). However, the reported data have a large variance in this heterogeneous country. It could also be because of some recall bias. Bigger studies with a larger sample size may be required. No information is available on this subject, and this can be a good starting point for further studies. Studies by Gogate *et al.* and Ruit *et al.*<sup>[4,6]</sup> have demonstrated that the visual outcomes of phaco-emulsification and MSICS are comparable, whereas George *et al.*<sup>[8]</sup> have demonstrated that the endothelial cell loss is also comparable. On surgically induced astigmatism, Ruit *et al.*<sup>[6]</sup> reported no statistically significant differences in mean astigmatism of 0.7 D for phaco-emulsification and 0.88 D for MSICS at 6 months post-operatively, whereas Gogate *et al.*<sup>[21]</sup> reported no significant differences in mean astigmatism of 1.1 D for phaco-emulsification and 1.2 D for

MSICS at 6 weeks follow-up.<sup>[5,7-9]</sup> Although it has been proved beyond doubt that there is no difference in the outcomes of phaco-emulsification and MSICS, only about 39% (n = 58) of the polled ophthalmologists were aware of this. A larger proportion of approximately 45% (n = 67) felt that phaco-emulsification gave better outcomes. The remaining were convinced that in their hands, MSICS performed better. This suggests the power of subtle messaging through conferences and media by the large trans-national mega corporations modifying perception even in a highly scientific community. Greater emphasis has to be given to scientific discourse so that the level of evidence associated with a finding is suitably presented to the practitioner.

Almost 40% of the individuals wish to learn and train themselves in FLACS. Almost three-fourths are willing to train others in MSICS, which demonstrates the availability and presence of eager and willing medical teachers in the community with experience and skills. This talent pool can be used to make India the training ground for the rest to the world not only in this surgical technique but also in other fields of medicine. It has long been argued that good doctors are not produced by buildings but by patients on the ground and in the out-patient. There is no dearth of patients or of skilled manpower in India. This should be leveraged to make use of the demographic dividend. This dividend will become a demographic disaster if we do not act now to harness the human resource potential.

## Conclusion

The high volume of surgeries performed by the respondents shows that India has the capability to train as well as provide services not only to our own country but probably to be in a position to export the services at globally competitive rates. India has done it in the past in information technology, and there is no reason why it should not be able to replicate it in ophthalmic services and ophthalmic education for the rest of the world.

## Declaration of Consent

The Indian Council of Medical Research guidelines enunciated in the "National Ethical Guidelines For Biomedical and Health Research Involving Human Participants" were followed.<sup>[22]</sup>

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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