

# Outreach cataract surgery services- How good are their outcomes?

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## Declaration:

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# **Abstract**

## **Background**

Cataracts are the main cause of blindness worldwide. Cataract blindness is reversible with surgery, a procedure which is well recognized for its clinical and cost effectiveness. Several approaches are used to reduce the cataract burden. They include a “reach out” approach, a “reach in” approach and a combination of the two. The Aravind Eye Care System in India, performing over 250 0000 cataract surgeries annually, exclusively utilizes the “reach in” approach. In neighbouring Nepal, with its large rural population residing in mountainous areas, outreach services still play an essential role in addressing cataract blindness. In South Africa, there are several non-governmental cataract surgery services utilizing the “reach out” approach.

## **Objectives**

The primary objective of this study is to investigate the visual outcomes of a non-governmental organization providing outreach cataract surgery services (referred to as the “Outreach Service” from now on) in South Africa. This was done by directly comparing them to the visual outcomes obtained at a permanent hospital-based cataract surgery service. The secondary objective is to compare the visual outcomes in both these settings to the recommended day one postoperative visual acuities as set out by the WHO.

## **Methods**

A retrospective comparison was made of the day one postoperative visual acuities of patients who underwent cataract surgery during outreaches conducted by the Outreach Service and the day one postoperative visual acuity of patients who were operated on at Groote Schuur Hospital. The study period was from July 2014 to December 2014.

## **Results**

A total of 1067 cases from the Outreach Service and 584 cases from Groote Schuur Hospital were included in the study. The patients who underwent surgery at Groote Schuur Hospital

had significantly better day one visual acuities (Pearson chi square test,  $p < 0.0001$ ). The day one visual acuity in cases performed during outreaches also did not fulfil the minimum day one visual acuity as set out by the World Health Organization (WHO).

### **Conclusion**

Despite its limitations, our study does raise concerns about the quality of cataract surgery performed on these outreaches. Our recommendation is that non-governmental outreach cataract surgery services should audit their four to six-week visual outcomes. Should they still not meet the WHO's criteria, the necessary steps should be taken to identify and rectify the reasons for these poor outcomes. Ultimately, South Africa should strive towards establishing more permanent eye care centres.

## **Acknowledgements**

I would like to acknowledge the Outreach Service who supplied me with data collected during their cataract surgery outreaches.

I would also like to acknowledge my supervisor, Prof Colin Cook for all the input and support I received from him, as well as Dr H Aliyu for supplying me with data from her study.

# **CHAPTER 1: INTRODUCTION AND LITERATURE REVIEW**

## **1.1) Introduction**

Cataracts are the leading cause of blindness worldwide. <sup>[1]</sup> Cataract surgery is very effective in restoring sight in these patients. <sup>[2]</sup> South Africa is unable to achieve its recommended cataract surgical rate of 2000 cases 1 million population, leading to substantial surgical backlogs. <sup>[3]</sup>

Outreach cataract surgery services were popular in India two decades ago. They were also known as Peripheral Eye Camps. During these initiatives, large volumes of patients underwent cataract surgery in a short period of time. These operations were usually performed in peripheral, under resourced areas. Visiting surgeons would use local facilities to operate in, which included hospitals, school and churches. This is known as the “reach out” approach. In recent times there has been a drive towards identifying patients with cataracts in peripheral areas and transporting them to established eye care centres. It is also known as the Base Hospital or “reach in “approach. There are several potential advantages to this model and it has been widely implemented in countries like India and Nepal. <sup>[4,5]</sup>

There are several non-governmental organizations involved in outreach cataract surgery services in South Africa. They usually offer their services to under resourced communities. These areas often lack permanent eye care services, resulting in poor postoperative care and the unavailability of long-term postoperative data.

## 1.2) Literature review

Despite the shift towards a base hospital approach, there are not many robust studies supporting its superiority over outreach cataract surgery. There are several single studies looking at the outcomes of each setting individually<sup>[6,7,8]</sup>, but no meta-analyses regarding the outcomes of either base hospital surgery or outreach cataract surgery are available.

Maheshgauri et al compared the six to eight-week best corrected visual acuity (BCVA) of 500 patients who received cataract surgery in surgical eye camps with 500 patients operated on at a local base hospital. Complicated cataracts and patients with systemic illnesses were excluded from the study. They did not mention how the patients were selected. Of the base hospital patients, 97% achieved a good BCVA (>6/18) compared to 80% of the camp patients. The studies' second outcome, that of patient satisfaction after surgery, was considerably less in the camp group (58%) compared to those from the base hospital group (83%). The type of procedures and their respected proportions in the two groups were not mentioned, but the same surgeons utilizing standardised techniques were used in both settings. In their conclusion, they acknowledged that surgical eye camps still form an integral part in addressing the cataract burden in rural Maharashtra and the Indian sub-continent in general, but that steps should be taken to ensure that their outcomes are more in line with those obtained in base hospital setups. They recommend that repetitive camps should be held in the same locations by the same surgeons using standardised techniques.<sup>[9]</sup>

In a prospective cross-sectional study, Manandhar et al, investigated whether similar cataract surgical outcomes can be obtained in both eye camps and in base hospitals. The location of the study is in a mountainous rural area in Nepal. These "outreach camps", referred to as Primary Eye Care Centres (PECCs), are in fact permanent eye centres. Each PECC is staffed by an ophthalmic assistant and equipped with slit lamps and autorefractors among others. The ophthalmic assistants manage 85% to 95% of all the patients personally. These PECCs have the necessary facilities to perform cataract surgery, with a visiting ophthalmologist and theatre staff from the base hospital that conduct monthly cataract surgery outreaches. A total

of 1071 cataract procedures were performed over twelve months during 2015-2016. Manual small incision cataract surgery (MSICS) was used in all cases by the same experienced ophthalmologist. Complicated cases and those with pre-existing pathology were excluded from the study. At the two to three-week follow-up, 78% of PECC operated patients achieved a good BCVA, compared to 82% in the base hospital group. Only 1.7% of the PECC patients and 0.3% of the base hospital group, had a poor BCVA. This setup is unfortunately not representative your typical outreach cataract surgery setup. They are dedicated ophthalmic units, staffed by full-time ophthalmic assistants with regular cataract surgery outreaches performed by an ophthalmologist from the same base hospital. These PECCs might be good, cost-effective alternatives to large base hospitals in rural parts of South Africa.<sup>[10]</sup>

In a prospective observational comparative case study, Bhatta et al compared the visual outcomes of cataract surgery performed at base hospital versus surgical eye camps in rural Nepal. Surgery in these camps were conducted in typical eye camp settings, namely a school, a Red Cross facility and a district hospital where temporary theatres were set up. A single experienced ophthalmologist performed MSICS on all the cases. Complicated cataracts were excluded from the study. A total of 445 cases, 224 from camps and 221 from base hospital were selected for the study. 99.5% of camp patients versus 98.9% from base hospital had a good BCVA at four to six-week follow-up which is statistically insignificant. They had no poor BCVA outcomes in either group. The posterior capsular rupture rate was 0.45% in the camp group compared to 0.9% in the base hospital group. To our knowledge, this study is the best direct comparison between the outcomes of cataract surgery performed on outreach and those at base hospital. Its strengths, other than being a relatively recent study, includes the following. Single surgeon and procedure in all cases to exclude inter-surgeon and procedural variability, a good four to six-week follow-up rate, similar number of cases in both groups and no significant difference in age or gender in both groups.<sup>[11]</sup>

In a large cross-sectional analysis from India, Gogate et al compared the final visual acuity of 3130 patients who underwent cataract surgery at a base hospital to 1135 patients who were operated at peripheral eye camps. The final best corrected visual acuity in the base hospital

group was better than those performed during peripheral eye camps (82.7% > 6/18 versus 43.7% > 6/18). The patients operated at base hospital also had quicker and better visual rehabilitation. It is important to note that in this study, the base hospital patients had extracapsular cataract extractions (ECCEs) which were done under a microscope using viscoelastic devices. Most patients had posterior chamber intra-ocular lens (IOL) implants. Intracapsular cataract extractions (ICCEs) performed under incandescent lamps was the method utilized during the peripheral eye camps. The results are thus more a reflection on the type of procedure rather than the actual setting in which it took place.<sup>[12]</sup>

In an older study from 1999, Limburg et al, looked at the visual outcomes of 4168 patients who underwent cataract surgery in three states of India. Their data was not randomized and might not have represented the population examined. One of their findings was that poor visual outcomes measured at four to six-weeks after surgery was almost twice as prevalent in surgical eye camps (20.5%), compared to patients operated on in base hospitals (11.4%). Various procedures, including ICCE mostly without anterior chamber IOLs and ECCEs with or without posterior chamber IOLs were performed in uneven ratios in the two settings. All, except ECCEs with posterior chamber IOLs and ICCE with anterior chamber IOLs (cumulative 8.2% in camps and 15.6% in base hospitals) were corrected with spectacles. Even though these two procedures were performed in the vast minority of cases, not recording their BCVA can be seen as biased and could have influenced the results. This makes it difficult to use this study to truly compare the visual outcomes between camps and base hospital patients. The fact that the majority of camp patients (61%) had ICCEs with spectacle correction compared to only 26.7% of base hospitals, is a further confounding factor. Despite above discrepancy, base hospital-operated ICCEs with spectacle correction still had a lower rate of poor outcomes (2.9%) compared to those in camps (9.9%). It's also interesting to note that ICCE with spectacles in both settings had a significantly lower percentage of poor outcomes than any of the other procedures, including ECCEs with PC IOLs. They postulate that this might be attributed to the transition period in the late 90's from ICCE to ECCE with or without IOLs.<sup>[13]</sup>

Due to the remote locations where outreach cataract surgery often takes place, it is often not possible to obtain the four to eight-weeks postoperative BCVA. Aliyu et al demonstrated a strong association between the day one and the four to eight-week postoperative visual acuity. Corneal oedema (mostly secondary to intraoperative complications) leading to poor vision on day one was an exception to this correlation and the visual acuity in these patients often improved to a WHO category one or two with time. Unfortunately, the reasons for poor visual acuities after four to eight weeks were not investigated and might have included comorbidities such as refractive errors, diabetic retinopathy and glaucoma. <sup>[14]</sup>

Congdon et al showed a similar correlation between early and late postoperative visual acuity. They attempted to justify omitting a late postoperative follow-up visit in rural communities where there are often several obstacles to further follow-up reviews. <sup>[15]</sup>

### **1.3) Objectives**

The primary objective of this study is to investigate the visual outcomes of a non-governmental organization providing outreach cataract surgery services (referred to as the “Outreach Service” from now on) in South Africa. This will be done by directly comparing these to the visual outcomes obtained at a permanent hospital-based cataract surgery service. The secondary objective is to compare the visual outcomes from both these settings to the recommended day one postoperative visual acuities as set out by the WHO. The primary outcome measure is uncorrected visual acuity on the first postoperative day, as measured with a Snellen chart.

### **1.4) Justification for this study**

There are no published data available on the quality of cataract surgeries performed by outreach cataract surgery services in South Africa. Our results will guide future policies on outreach-based cataract surgery.

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# **Chapter 2: Publication-ready manuscript**

## **Outreach cataract surgery services- How good are their outcomes?**

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### **Abstract**

#### **Background**

Cataracts are the main cause of blindness worldwide. Cataract blindness is reversible with surgery, a procedure which is well recognized for its clinical and cost effectiveness. Several approaches are used to reduce the cataract burden. They include a “reach out” approach, a “reach in” approach and a combination of the two. The Aravind Eye Care System in India, performing over 250 0000 cataract surgeries annually, exclusively utilizes the “reach-in” approach. In neighbouring Nepal, with its large rural population residing in mountainous areas, outreach services still play an essential role in addressing cataract blindness. In South Africa, there are several non-governmental cataract surgery services utilizing the “reach out” approach.

#### **Objectives**

The primary objective of this study is to investigate the visual outcomes of a non-governmental organization providing outreach cataract surgery services (referred to as the “Outreach Service” from now on) in South Africa. This was done by directly comparing them to the visual outcomes obtained at a permanent hospital-based cataract surgery service. The secondary objective is to compare the visual outcomes in both these settings to the recommended day one postoperative visual acuities as set out by the WHO.

## **Methods**

A retrospective comparison was made of the day one postoperative visual acuities of patients who underwent cataract surgery during outreaches conducted by the Outreach Service and the day one postoperative visual acuity of patients who were operated on at Groote Schuur Hospital. The study period was from July 2014 to December 2014.

## **Results**

A total of 1067 cases from the Outreach Service and 584 cases from Groote Schuur Hospital were included in the study. The patients who underwent surgery at Groote Schuur Hospital had significantly better day one visual acuities (Pearson chi square test,  $p < 0.0001$ ). The day one visual acuity in cases performed during outreaches also did not fulfil the minimum day one visual acuity as set out by the World Health Organization (WHO).

## **Conclusion**

Despite its limitations, our study does raise concerns about the quality of cataract surgery performed on these outreaches. Our recommendation is that non-governmental outreach cataract surgery services should audit their four to six-week visual outcomes. Should they still not meet the WHO's criteria, the necessary steps should be taken to identify and rectify the reasons for these poor outcomes. Ultimately, South Africa should strive towards establishing more permanent eye care centres.

## **2.2) Introduction:**

Cataracts are responsible for 51% of blindness worldwide. <sup>[1]</sup> Cataract blindness is reversible with surgery, a procedure which is well recognized for its clinical and cost effectiveness. <sup>[2]</sup>

Cataract blindness treatment programmes are often overwhelmed in middle- to low-income countries, especially in rural communities. One of the most effective strategies to address this problem is through community outreach initiatives. These are widely employed in countries such as India and Nepal where they are known as surgical eye camps, community camps or peripheral eye camps (referred to as “camps” from now on).

These camps may either have a “reach out” or a “reach in” approach. The “reach out” or Peripheral Eye Camp approach was the main trend in India during the 1970’s and 1980’s. Camps were conducted in the target community and cataract surgeries were performed on site, usually in rural hospitals, primary health care centres, schools or community halls. Intracapsular cataract extraction (ICCE) was the procedure of choice and after a postoperative stay of four to seven days, patients were discharged with +10 dioptre aphakic spectacles. <sup>[3,4,5]</sup>

Over the past two decades there has been a transition from the “reach out” to the “reach in” or base hospital approach. Screening camps take place in the community itself, where after suitable candidates are transported to the base hospital. Here they undergo the necessary preoperative investigations followed by their surgery, which is conducted under microscopes in well-equipped theatres. The emphasis in this type of setting is on the quality (rather than the quantity) of surgery. <sup>[5]</sup> There is also a shift away from ICCE with aphakic spectacles towards extracapsular cataract extraction (ECCE) with intraocular lens implantation. If there are no complications on day one postoperatively, the patients are transported back to their respective communities. <sup>[3,4]</sup> Today, the base hospital approach is the preferred method in India, with Peripheral Eye Camps reserved for remote, inaccessible communities. <sup>[5]</sup>

In South Africa there are several non-governmental organizations (NGO's) involved in outreach cataract surgery. They usually offer their services to under resourced communities. These areas often lack permanent eye care services, which means that there is no postoperative care or long-term postoperative data available for these patients. We looked at the visual outcomes of one of these NGO's, which will be referred to as the "Outreach Service" from now on.

The Outreach Service utilizes the "reach out" approach and staffs several mobile units. These units are responsible for conducting outreach cataract surgery initiatives (referred to as "cataract tours" from now on) throughout the country, mostly in rural, impoverished communities. These cataract tours typically lasts four days. Day one is set aside for screening, refraction and biometry. They aim to perform 40 cataract surgeries on day two and three and postoperative evaluations are done on day four. Each unit is staffed by three ophthalmic trained nurses and a volunteer surgeon. They are further equipped with a microscope and all the other necessary items to perform high volume cataract surgery, while theatre facilities are provided by local hospitals.

Each cataract tour's statistics are recorded by the ophthalmic nurses. They record the age, sex, pre-operative visual acuity as well as the day one post-operative visual acuity for each patient. There are furthermore columns for documenting the type of procedure, complications and the name of the surgeon. Most patients are discharged on day one without any future follow-up dates and no data are available on long term visual outcomes. Complicated post-operative cases are referred to the closest hospital with the necessary ophthalmology services to deal with these complications.

Venkatesh et al showed that good quality cataract surgery is possible in a high-volume setting. In order to achieve the latter, they advised standardised techniques, standardised protocols and good training of surgeons and paramedical staff. <sup>[6]</sup> Their study was conducted in a

permanent eye care facility using staff members that are familiar with its functioning and layout.

The nature of these cataract tours may be suboptimal, due to different surgeons with varying levels of experience employing diverse techniques in unfamiliar environments. The cataracts seen during tours are often of an advanced nature. This, in addition to a large number of surgeries performed in a limited time frame, might contribute to an increase in intra- and post-operative complications. When complications arise, they are often difficult to manage appropriately under these conditions.

Aliyu et al demonstrated a strong association between the day one and the four to eight-week postoperative visual acuity. Corneal oedema (mostly secondary to intraoperative complications) leading to poor vision on day one was an exception to this correlation and the visual acuity in these patients often improved to a WHO category one or two with time. Unfortunately, the reasons for poor visual acuities after four to eight weeks were not investigated and might have included comorbidities such as refractive errors, diabetic retinopathy and glaucoma. <sup>[7]</sup>

Congdon et al showed a similar correlation between early and late postoperative visual acuity. They attempted to justify omitting a late postoperative follow-up visit in rural communities where there are often several obstacles to further follow-up reviews. <sup>[8]</sup>

In this study, we compared the day one visual acuity of cataract surgeries performed by the Outreach Service to those performed at a permanent ophthalmology centre involved in cataract surgery.

### **2.3) Methods:**

All patients who received cataract surgery between July 2014 and December 2014 during the Outreach Service's cataract tours and at Groote Schuur Hospital were included in our study. The Outreach Service and the Department of Ophthalmology at Groote Schuur Hospital provided us with their data bases of all patients who underwent cataract surgery during this six-month period.

An identifiable variable and the day one post-operative visual acuity were collected. Visual acuity was documented as Snellen visual acuity and was categorized according to the WHO categories 1(good, 6/6-6/18), 2(ok, 6/24-6/60) and 3 and 4(poor, <counting fingers).

The data were analysed using STATA 12 (StataCorp, Texas, USA).

Ethical approval for the study was given by the Human Research Ethics Committee of the University of Cape Town (HREC reference 558/2018).

### **2.4) Results:**

A total of 1067 cases from the Outreach Service and 584 cases from Groote Schuur Hospital were included in the study. They were allocated into one of the day one postoperative WHO visual acuity categories.

Table one shows the number of cases in the WHO categories 1, 2 and 3+4, with the WHO recommendations for the proportions in each category on day one.

**Table one: Day one postoperative visual acuities.**

<b>Outreach Service day 1 postoperative visual acuities</b>			
WHO category	Number	%	WHO recommendation (%)
1 (6/6-6/18)	234	21.9	40
2 (6/24-6/60)	492	46.1	50
3+4 (<6/60)	341	32	10
Total	1067	100	100

<b>GSH day 1 postoperative visual acuities</b>			
WHO category	Number	%	WHO recommendation (%)
1 (6/6-6/18)	342	58.6	40
2 (6/24-6/60)	151	25.7	50
3+4 (<6/60)	91	15.6	10
Total	584	100	100

The difference in the visual acuities between the two groups was statistically significant. (Pearson chi square test,  $p < 0.0001$ )

## **2.5) Discussion:**

India is the country in the world with the most cataract related blind and visually impaired people. <sup>[1]</sup> Over the past five decades, they have made significant strides towards alleviating their high cataract burden. Their cataract surgical rate has increased from 700 per million in 1981, to 6000 per million in 2012. <sup>[9]</sup> Surgical eye camps, employing a “reach out” approach, played a pivotal part in achieving this. Over the past two decades however, there has been a paradigm shift away from these camps towards a base hospital - or a “reach in” approach. Questionable postoperative outcomes, poor follow-up and a lack of modern equipment and

surgical techniques have been raised as reasons for this, despite the absence of supporting evidence in the literature. <sup>[10]</sup>

During a “reach in” approach, a well-organized team, consisting of ophthalmologists, optometrists and a coordinator from within the community, performs screening camps in rural areas. Volunteers from the community can help the coordinator to recruit patients and to also help overcome some of the barriers to surgery that might exist in the community. Appropriate cases are then transported to the closest base hospital where they are admitted. There, the appropriate preoperative workup is performed after which they undergo their surgery. Patients are kept in hospital for early postoperative evaluation, and any problems that might occur can be dealt with at the base hospital. To maintain a sense of community orientation, follow-up visits and postoperative refraction are often conducted in the periphery during “reach out” tours. The Aravind Eye Care System in India, performing over 250 000 cataract surgeries annually, is a well-known example of this. <sup>[11]</sup>

Maheshgauri et al did show better visual outcomes at base hospital than on camps. Unfortunately, uniform procedures weren’t used, making it difficult to highlight the actual camp-setting as the reason for the poorer outcomes. Despite the poorer results from camp surgery, they still had a good 6-8-week BCVA in 80% of their cases which is close to the WHO recommendations. <sup>[12]</sup>

In their older comparative study, Gogate et al also showed more favourable results at base hospitals compared to camps. The study isn’t without significant confounding factors. Of note was the fact that ECCEs with IOLs were used at base hospital compared to largely ICCEs with aphakic spectacles at camps. The literature shows that ICCEs have inferior results to ECCEs with IOLs. <sup>[13]</sup> This study highlights the superiority of ECCEs with IOLs over ICCEs with aphakic spectacles, rather than the actual setting in which surgery took place. <sup>[4]</sup>

More recent studies from Nepal, where camps are still widely employed due to mountainous terrain, does show comparable results between the two. In their prospective, comparative observational study, Bhatta et al obtained similarly excellent results in both base hospital as well as camps. Through standardized techniques (MSICS) and same surgeon surgery in both settings, they showed that it's possible to provide a high-quality outreach cataract surgery service to inaccessible communities. <sup>[14]</sup> In a very similar prospective study, Manandhar et al, also showed the same good results in both camps and at base hospital. <sup>[15]</sup>

Our study shows that the day one visual acuities of surgeries performed by the Outreach Service are worse than those performed at Groote Schuur Hospital. They also don't meet the WHO recommended day one visual acuities. Even though we cannot assume that all these cases will end up with poor vision, evidence shows that there is an association between poor day one visual acuities (in the absence of corneal oedema) and poor long-term visual acuities. <sup>[7,8]</sup> Unfortunately, due to a lack of postoperative care, follow-up and refraction, it is not possible to obtain data on the final visual acuities of patients who underwent surgery during the Outreach Services' cataract tours.

We were unable to comment on the reasons for the Outreach Service's poor day one visual outcomes. Further investigation will be necessary to determine if it's related to outreach-specific circumstances as opposed to reasons that may be encountered in any cataract surgery set-up. Even though the Outreach Service is well equipped with most of the necessities to perform modern cataract surgery, several other variables might play a role.

### **Challenging operating environment**

Microsurgery in an unfamiliar theatre set-up can be daunting. For the visiting surgeon, variables such as new equipment, surgical instruments and nursing staff might make such an environment uncondusive for high volume cataract surgery. Repetitive, same-surgeon outreaches in the same community, might negate this.

### **Staff fatiguability**

Outreach cataract surgery is characterized by high volumes of surgeries performed over a short period of time. The staff often consists of a single surgeon supported by one or two nursing staff members who travelled long distances to reach the target community. This, combined with long operating hours, can have a negative impact on the quality of surgery.

### **Lack of senior cover or access to referral centres**

Due to limited funds and long travelling times to reach rural communities, it is often difficult to recruit qualified ophthalmologists to conduct outreaches. Outreach cataract surgery services in South Africa often relies on medical officers and ophthalmology registrars, with varying levels of surgical experience, to perform outreaches. Without the necessary senior cover or access to referral centres should complications arise, junior surgeons should not expose themselves or their patients to these circumstances.

Limitations of this study includes the following. It's a retrospective review with the weaknesses associated with that. It's a crude comparison between the visual outcomes in these two settings and by no means an absolute indication of the final visual outcomes. There are several confounding factors that may play a role. Even though the procedures were not documented in a substantial proportion of the Outreach Service's cases, the majority of the ones that were documented were ECCEs. We are unsure how many of these were MSICS. On the contrary, most cases at Groote Schuur Hospital were PHACOs. Even though it has been shown that MSICS can have comparable results to PHACO in the right hands, PHACO is widely recognized as the gold standard. <sup>[16,17]</sup> We have no information on the surgical experience of surgeons utilized by the Outreach Service, whereas all of the cases at Groote Schuur Hospital were either performed by consultants or registrars. Pre-existing ocular disorders, that may lead to poor visual outcomes after surgery, were not documented and this may skew the results.

## **2.6) Conclusion:**

Outreach cataract surgery services still plays an important role in our South African society today. Due to an uneven distribution of medical resources, a legacy of our past, these outreach initiatives are often the only hope for many South Africans to be cured from blindness.

Despite its limitations, our study does however raise concerns about the quality of cataract surgery performed on these outreaches. Our study doesn't tell us why the day one outcomes on outreaches were poor and it's therefore difficult for us to make definite recommendations. We suggest that all patients operated on during outreaches, should have four to six-weeks postoperative follow-up visits. The visual outcomes on these visits should be audited. Should they still not meet the WHO's recommendations, steps should be taken to firstly find the reasons for this and secondly to rectifying these. Rather than focussing only on one aspect of care, all the components of the care pathway should be explored. Outreach specific factors, such as staff fatigue, portability of equipment and pressure to perform large volumes of surgery in a set time period, should be looked at in particular.

South Africa should ultimately strive towards a base hospital approach, where every community has access to a dedicated cataract surgery centre. But until then, every effort should be made to provide the highest quality cataract surgery possible under outreach conditions to the most vulnerable communities in South Africa.

## 2.7) References

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# Appendices

## 1.) Sight Saver Clinic data collection sheet

NO	DATE	NAME & SURNAME	AGE	SEX	PRE-OP VA		POST-OP V/A 1 <sup>ST</sup> DAY		POST-OP V/A 2 <sup>ND</sup> WEEK		CHRONIC ILLNESS	COMPLICATIONS	TYPE OF SURGERY	DIOPTER	EYE OPERATED	DOCTOR
					R	L	R	L	R	L						
1	23/01/15		66	F	LP	60	6						ECCE	20.5	R.	
2	23/01/15		59	F	60	60	60						PHACO	20.5	L.	
3	23/01/15		57	M	MP	60	9						PHACO	20.5	L.	
4	23/01/15		85	F	60	60	60						ECCE	23.5	L.	
5	23/01/15		44	M	LP	36	18				HPT		ECCE	19.0	R.	
6	23/01/15		78	M	HM	60	3/60				HPT		PHACO	21.5	R.	
7	23/01/15		74	F	18	60	18				HPT		ECCE	21.0	L.	
8	23/01/15		56	M	9	HM	3	36					ECCE	22.0	L.	
9	23/01/15		78	F	24	60	3/60				HPT		ECCE	24.0	L.	
10	23/01/15		84	F	HM	MP	3/60						PHACO	16.5	R.	
11	24/01/15		62	F	60	60	18						PHACO	13.5	R.	
12	24/01/15		75	F	9	HM	9						PHACO	16.5	L.	
13	24/01/15		70	F	60	18	18				D.m		PHACO	21.0	R.	
14	24/01/15		74	F	18	60	18						PHACO	23.5	L.	
15	24/01/15		77	F	18	18	12				D.m		PHACO	26.0	L.	
16	24/01/15		76	F	36	18	18						PHACO	22.0	R.	
17	24/01/15		54	M	60	60	12						PHACO	20.0	L.	
18	24/01/15		46	M	HM	HM	12						PHACO	24.0	R.	
19	24/01/15		82	F	36	60					D.m		PHACO	22.0	L.	
20	24/01/15		85	F	36	60	60						PHACO	23.5	L.	
21	24/01/15		65	M	60	36							PHACO	19.0	R.	
22	24/01/15		61	F	60	60	9						PHACO	22.5	R.	
23	24/01/15		55	M	60	60	18				D.m & HPT		PHACO	22.5	R.	
24	24/01/15		70	M	36	HM	9						PHACO	19.5	L.	
25	24/01/15		62	F	9	24	9				D.m		PHACO	14.5	L.	
26	24/01/15		73	F	60	36	12						PHACO	22.0	L.	
27	24/01/15		73	M	18	60	60						PHACO	21.0	L.	
28	24/01/15		71	F	60	60	60						PHACO	23.5	R.	
29	24/01/15		70	F	18	36	12						PHACO	24.0	L.	

## 2.) Groote Schuur Hospital data collection sheets

study number	age	gender	VA 1(logMAR)	VA 1(WHO)	VA 2(log MAR)	VA 2(WHO)
1	68	2	0	1		
2	67	2				
3	65	1	0,48	1	0	1
4	38	2	2	4		
5	83	2	0,6	2	0,8	2
6	73	2	0,2	1	0,2	1
7	67	2	0,6	2		
8	74	2	0,48	1	0,48	1
9	74	2	0,48	1	0,2	1
10	63	2	2	4	0,48	1
11	73	2	0,2	1	0,2	1
12	68	1	0,3	1	0,2	1
13	34	2	0,8	2		
14	54	1	0	1	0	1
15	43	2	0,48	1		
16	75	2	0,48	1	0	1
17	75	2	0,2	1	0,2	1
18	59	1	0,48	1	0,48	1
19	67	2	0,2	1		
20	62	2	0,2	1	0,2	1
21	40	1	0	1	0	1
22	63	2	0	1	0	1
23	15	2	0,2	1	0,2	1
24	38	2	0,3	1	0	1
25	79	2	0,6	2	0,48	1

### 3.) Department of Surgery Research Committee approval



UNIVERSITY OF CAPE TOWN

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#### Department of Surgery

##### Departmental Research Committee

**Dr Timothy Pennel**

D24 Office, Groote Schuur Hospital,  
Observatory 7925, South Africa  
Tel (021) 406 6168/6232/6227 Fax (021) 448 6461  
Email: [tim.pennel@uct.ac.za](mailto:tim.pennel@uct.ac.za)

26<sup>th</sup> September 2016

Dr N Nieder-Heitmann

Department of Surgery  
Groote Schuur Hospital  
University of Cape Town

Dear Dr Nieder-Heitmann

RE: PROJECT 2016/078

PROJECT TITLE: Outreach cataract surgery services-How good are their outcomes?

The above proposal has been reviewed by the Department of Surgery Research Committee. I am pleased to inform you that the committee approved the scientific merit of the study, and endorse the protocol for submission to the relevant ethics committee.

Please use the above project number in all future correspondence.

Yours sincerely

DR TIMOTHY PENNEL

CHAIRMAN: RESEARCH COMMITTEE

"OUR MISSION is to be an outstanding teaching and research university,  
educating for life and addressing the challenges facing our society."

## 4.) Ethics approval letter



UNIVERSITY OF CAPE TOWN  
Faculty of Health Sciences  
Human Research Ethics Committee



Room E53-46 Old Main Building  
Grootes Schuur Hospital  
Observatory 7925  
Telephone [021] 406 6492  
Email: [sumayah.arietdien@uct.ac.za](mailto:sumayah.arietdien@uct.ac.za)  
Website: [www.health.uct.ac.za/fhs/research/humanethics/forms](http://www.health.uct.ac.za/fhs/research/humanethics/forms)

17 September 2018

**HREC REF: 588/2018**

**Dr C Cook**  
Department Surgery  
Division of Ophthalmology  
Ward D 4, NGSH

Dear Dr Cook

**PROJECT TITLE: CATARACT SURGERY OUTREACH SERVICES - HOW GOOD ARE THEIR OUTCOMES? (MMed Candidate - Dr N. Nieder-Heitmann)**

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee (HREC) for review.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

**Approval is granted for one year until the 30 September 2019.**

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.

(Forms can be found on our website: [www.health.uct.ac.za/fhs/research/humanethics/forms](http://www.health.uct.ac.za/fhs/research/humanethics/forms))

***We acknowledge that the student: Dr N Nieder-Heitmann will also be involved in this study.***

**Please quote the HREC REF in all your correspondence.**

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate institutional approval, where necessary, before the research may occur.

Yours sincerely

**PROFESSOR M BLOCKMAN**  
**CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE**

Federal Wide Assurance Number: FWA00001637.  
Institutional Review Board (IRB) number: IRB00001938

## 5.) Permission e-mail from SANCB

Dear Anisha

Thank you for our previous conversation. I'm a consultant in ophthalmology doing part-time private practice while completing a postgraduate retinal fellowship at Grootte Schuur Hospital. I've previously been personally involved in Bureau tours in both the Northern Cape as well as in the Free State. I'm currently involved in George Provincial Hospital's surgical outreaches in Mosselbay. I do regular audits on my surgical outcomes and whenever they do not meet certain set criteria, I try to identify reasons for it and implement the necessary changes to improve them.

We've analysed the day 1 postoperative visual acuity achieved on Bureau tours from July to December 2014. Angelina Khupe kindly supplied me with the data. I compared these to the day 1 VA from Grootte Schuur Hospital over the same period as well as to the recommended day 1 VA as set out by the WHO. Unfortunately, the visual outcomes from Bureau tours during this period doesn't meet the WHO day 1 VA recommendations. They were also worse than those from GSH.

This is a very crude comparison and by no means convincing evidence of final outcomes. What it does highlight is the need for auditing of surgical outcomes (day 1 and 4-6 weeks), identifying reasons should these not meet the WHO standards and implementing the necessary changes to meet these. This will in turn lead to a better overall service provided by all agencies involved in outreach cataract surgery services in South Africa.

I have not named the Bureau in any of the write-ups and the Bureau has merely been referred to as an NGO. I do think that its important to get a discussion going among eye care professionals on ways to provide the best quality eye care to our patients. I would also be more than willing to help with future audits.

With your permission I would like to write up these findings as part of my MMED in Ophthalmology. My current supervisor is Prof Nagib du Toit who took over as HOD from Prof Colin Cook who retired at the end of last year.

I'm looking forward to hear from you.

Kind regards

Norman Nieder- Heitmann

Good morning Norman,

Thank you for your patience.

We discussed this matter at our OpsComm meeting and in essence we are satisfied with your email and its contents.

Best wishes,

Anisha Ramlal  
National Executive Director  
South African National Council for the Blind

## 6.) South African Medical Journal (SAMJ) instructions to authors

### General article format/layout

Accepted manuscripts that are not in the correct format specified in these guidelines will be returned to the author(s) for correction, which will delay publication.

General:

- Manuscripts must be written in UK English.
- The manuscript must be in Microsoft Word format. Text must be single-spaced, in 12-point Times New Roman font, and contain no unnecessary formatting (such as text in boxes).
- Please make your article concise, even if it is below the word limit.
- Qualifications, **full** affiliation (department, school/faculty, institution, city, country) and contact details of ALL authors must be provided in the manuscript and in the online submission process.
- Abbreviations should be spelt out when first used and thereafter used consistently, e.g. 'intravenous (IV)' or 'Department of Health (DoH)'.
- Include sections on Acknowledgements, Conflict of Interest, Author Contributions and Funding sources. If none is applicable, please state 'none'.
- Scientific measurements must be expressed in SI units except: blood pressure (mmHg) and haemoglobin (g/dL).
- Litres is denoted with an uppercase L e.g. 'mL' for millilitres).
- Units should be preceded by a space (except for % and °C), e.g. '40 kg' and '20 cm' but '50%' and '19°C'.
- Please be sure to insert proper symbols e.g.  $\mu$  not u for micro,  $\alpha$  not a for alpha,  $\beta$  not B for beta, etc.
- Numbers should be written as grouped per thousand-units, i.e. 4 000, 22 160.
- Quotes should be placed in single quotation marks: i.e. The respondent stated: '...'
- Round brackets (parentheses) should be used, as opposed to square brackets, which are reserved for denoting concentrations or insertions in direct quotes.
- If you wish material to be in a box, simply indicate this in the text. You may use the table format –this is the *only* exception. Please DO NOT use fill, format lines and so on.

*SAMJ* is a generalist medical journal, therefore for articles covering genetics, it is the responsibility of authors to apply the following:

- Please ensure that all genes are in italics, and proteins/enzymes/hormones are not.
- Ensure that all genes are presented in the correct case e.g. TP53 not Tp53.

**\*\*NB:** Copyeditors cannot be expected to pick up and correct errors wrt the above, although they will raise queries where concerned.

- Define all genes, proteins and related shorthand terms at first mention, e.g. '188del11' can be glossed as 'an 11 bp deletion at nucleotide 188.'

- Use the latest approved gene or protein symbol as appropriate:

- Human Gene Mapping Workshop (HGMW): genetic notations and symbols
- HUGO Gene Nomenclature Committee: approved gene symbols and nomenclature
- OMIM: Online Mendelian Inheritance in Man (MIM) nomenclature and instructions
- Bennet et al. Standardized human pedigree nomenclature: Update and assessment of the recommendations of the National Society of Genetic Counselors. *J Genet Counsel* 2008;17:424-433: standard human pedigree nomenclature.

## Research

*Guideline word limit: 4 000 words*

Research articles describe the background, methods, results and conclusions of an original research study. The article should contain the following sections: introduction, methods, results, discussion and conclusion, and should include a structured abstract (see below). The introduction should be concise – no more than three paragraphs – on the background to the research question and must include references to other relevant published studies that clearly lay out the rationale for conducting the study. Some common reasons for conducting a study are: to fill a gap in the literature, a logical extension of previous work, or to answer an important clinical question. If other papers related to the same study have been published previously, please make sure to refer to them specifically. Describe the study methods in as much detail as possible so that others would be able to replicate the study should they need to. Results should describe the study sample as well as the findings from the study itself, but all interpretation of findings must be kept in the discussion section, which should consider primary outcomes first before any secondary or tertiary findings or post-hoc analyses. The conclusion should briefly summarise the main message of the paper and provide recommendations for further study.

Select figures and tables for your paper carefully and sparingly. Use only those figures that provided added value to the paper, over and above what is written in the text.

Do not replicate data in tables and in text .

### *Structured abstract*

- This should be 250-400 words, with the following recommended headings:
  - **Background:** why the study is being done and how it relates to other published work.
  - **Objectives:** what the study intends to find out
  - **Methods:** must include study design, number of participants, description of the intervention, primary and secondary outcomes, any specific analyses that were done on the data.
  - **Results:** first sentence must be brief population and sample description; outline the results according to the methods described. Primary outcomes must be described first, even if they are not the most significant findings of the study.
  - **Conclusion:** must be supported by the data, include recommendations for further study/actions.

- Please ensure that the structured abstract is complete, accurate and clear and has been approved by all authors.
- Do not include any references in the abstracts.

### *Main article*

All articles are to include the following main sections: Introduction/Background, Methods, Results, Discussion, Conclusions.

The following are additional heading or section options that may appear within these:

- Objectives (within Introduction/Background): a clear statement of the main aim of the study and the major hypothesis tested or research question posed
- Design (within Methods): including factors such as prospective, randomisation, blinding, placebo control, case control, crossover, criterion standards for diagnostic tests, etc.
- Setting (within Methods): level of care, e.g. primary, secondary, number of participating centres.
- Participants (instead of patients or subjects; within Methods): numbers entering and completing the study, sex, age and any other biological, behavioural, social or cultural factors (e.g. smoking status, socioeconomic group, educational attainment, co-existing disease indicators, etc) that may have an impact on the study results. Clearly define how participants were enrolled and describe selection and exclusion criteria.
- Interventions (within Methods): what, how, when and for how long. Typically for randomised controlled trials, crossover trials, and before and after studies.
- Main outcome measures (within Methods): those as planned in the protocol, and those ultimately measured. Explain differences, if any.

### *Results*

- Start with description of the population and sample. Include key characteristics of comparison groups.
- Main results with (for quantitative studies) 95% confidence intervals and, where appropriate, the exact level of statistical significance and the number need to treat/harm. Whenever possible, state absolute rather than relative risks.
- Do not replicate data in tables and in text.
- If presenting mean and standard deviations, specify this clearly. Our house style is to present this as follows:
- E.g.: The mean (SD) birth weight was 2 500 (1 210) g. Do not use the  $\pm$  symbol for mean (SD).
- Leave interpretation to the Discussion section. The Results section should just report the findings as per the Methods section.

### *Discussion*

Please ensure that the discussion is concise and follows this overall structure – sub-headings are not needed:

- Statement of principal findings
- Strengths and weaknesses of the study
- Contribution to the body of knowledge
- Strengths and weaknesses in relation to other studies
- The meaning of the study – e.g. what this study means to clinicians and policymakers
- Unanswered questions and recommendations for future research

### *Conclusions*

This may be the only section readers look at, therefore write it carefully. Include primary conclusions and their implications, suggesting areas for further research if appropriate. Do not go beyond the data in the article.

### **Illustrations/photos/scans**

- If illustrations submitted have been published elsewhere, the author(s) should provide consent to republication obtained from the copyright holder.
- Figures must be numbered in Arabic numerals and referred to in the text e.g. '(Fig. 1)'.
- Each figure must have a caption/legend: Fig. 1. Description (any abbreviations in full).
- All images must be of high enough resolution/quality for print.
- All illustrations (graphs, diagrams, charts, etc.) must be in PDF or jpeg form.
- Ensure all graph axes are labelled appropriately, with a heading/description and units (as necessary) indicated. Do not include decimal places if not necessary e.g. 0; 1.0; 2.0; 3.0; 4.0 etc.
- Scans/photos showing a specific feature e.g. *Intermediate magnification micrograph of a low malignant potential (LMP) mucinous ovarian tumour. (H&E stain)*. –include an arrow to show the tumour.
- Each image must be attached individually as a 'supplementary file' upon submission (not solely embedded in the accompanying manuscript) and named Fig. 1, Fig. 2, etc.

### **Tables**

- Tables should be constructed carefully and simply for intelligible data representation. Unnecessarily complicated tables are strongly discouraged.
- Large tables will generally not be accepted for publication in their entirety. Please consider shortening and using the text to highlight specific important sections, or offer a large table as an addendum to the publication, but available in full on request from the author
- Embed/include each table in the manuscript Word file - do not provide separately as supplementary files.
- Number each table in Arabic numerals (Table 1, Table 2, etc.) and refer to consecutively in the text.
- Tables must be cell-based (i.e. not constructed with text boxes or tabs) and editable.
- Ensure each table has a concise title and column headings and include units where necessary.

- Footnotes must be indicated with consecutive use of the following symbols: \* † ‡ § ¶ || then \*\* †† ‡‡ etc.

**Do not:** Use [Enter] within a row to make ‘new rows’:

*Rather:*

Each row of data must have its own proper row:

**Do not:** use separate columns for *n* and %:

*Rather:*

Combine into one column, *n* (%):

**Do not:** have overlapping categories, e.g.:

*Rather:*

Use <> symbols or numbers that don’t overlap:

## References

**NB:** *Only complete, correctly formatted reference lists in Vancouver style will be accepted. Reference lists must be generated manually and not with the use of reference manager software. Endnotes must **not** be used.*

- Authors must verify references from original sources.
- Citations should be inserted in the text as superscript numbers between square brackets, e.g. These regulations are endorsed by the World Health Organization,<sup>[2]</sup> and others.<sup>[3,4-6]</sup>
- All references should be listed at the end of the article in numerical order of appearance in the Vancouver style (not alphabetical order).
- Approved abbreviations of journal titles must be used; see the List of Journals in Index Medicus.
- Names and initials of all authors should be given; if there are more than six authors, the first three names should be given followed by et al.
- Volume and issue numbers should be given.
- First and last page, in full, should be given e.g.: 1215-1217 **not** 1215-17.
- Wherever possible, references must be accompanied by a digital object identifier (DOI) link. Authors are encouraged to use the DOI lookup service offered by CrossRef:
  - On the Crossref homepage, paste the article title into the ‘Metadata search’ box.
  - Look for the correct, matching article in the list of results.
  - Click Actions > Cite
  - Alongside 'url =' copy the URL between { }.
  - Provide as follows, e.g.: <https://doi.org/10.7196/07294.937.98x>

### Some examples:

- *Journal references:* Price NC, Jacobs NN, Roberts DA, et al. Importance of asking about glaucoma. *Stat Med* 1998;289(1):350-355. <http://dx.doi.org/10.1000/hgjr.182>
- *Book references:* Jeffcoate N. *Principles of Gynaecology*. 4th ed. London: Butterworth, 1975:96-101.
- *Chapter/section in a book:* Weinstein L, Swartz MN. Pathogenic Properties of Invading Microorganisms. In: Sodeman WA, Sodeman WA, eds. *Pathologic Physiology: Mechanisms of Disease*. Philadelphia: WB Saunders, 1974:457-472.
- *Internet references:* World Health Organization. *The World Health Report 2002 - Reducing Risks, Promoting Healthy Life*. Geneva: WHO, 2002. <http://www.who.int/whr/2002> (accessed 16 January 2010).
- Legal references
  - Government Gazettes:  
National Department of Health, South Africa. National Policy for Health Act, 1990 (Act No. 116 of 1990). Free primary health care services. *Government Gazette No. 17507:1514*. 1996.