

Task-shifting: Ophthalmologist to Non physician cataract surgeon: A review of the evidence

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Introduction and Background

The problem of blindness and visual impairment

Blindness is estimated to affect around 39 million people in the world and an additional 246 million are visually impaired.¹ Africa has one of the highest rates of blindness (0.73%) and critically, at least 80% of visual disability in Africa could be avoided by application of recognized preventive and curative measures. Approximately 50% of the disability is due to cataract. Recognizing this, in 1999 a coalition of non-governmental organizations (NGOs) and the WHO launched an initiative named "VISION 2020: The Right to Sight," which aimed to eliminate avoidable blindness by the year 2020. This was considered realistic because of the fact that the technical solutions to eliminate much visual disability already exist and are not unduly expensive nor complex. Cataract surgery, for example, is considered to be one of the most cost effective interventions, costing only approximately \$5/DALY averted (comparable to other well-recognized interventions such as immunization at \$8/DALY).^{2,3} However the shortage and poor distribution of human resources to provide cataract surgery were recognized from the beginning as posing a significant challenge.

Task shifting: a solution?

The shortages and misdistributions of health workers in developing countries are well known. One solution put forth has been to shift tasks from highly specialized--scarce and expensive--health workers to less specialized-- more readily available and less expensive-- workers. "Task shifting" is one term for the phenomenon, but it is also known as substitution. It is not new. "Clinical officers" in Africa have been trained and provided the backbone of medical care in many countries for years. These workers generally have a basic secondary education followed by 2 or 3 years of practical medical training, after which they take on tasks that would often be performed by doctors in industrialized countries. They are usually given more responsibilities and prestige than nurses, often working as heads of district hospitals and filling the roles of fully trained medical doctors. They may serve as general practitioners but specialized training has also been designed for them in a number of areas including anaesthesia, obstetrics, general surgery, orthopaedics, and others. A report from Mozambique showed excellent results from a study of some

of these “surgical technicians” in performing a wide variety of surgeries, both elective and emergency including relatively complicated procedures such as hysterectomies and bowel resections.^{4,5}

In the field of ophthalmology an important example of task shifting is the training of so called “cataract surgeons,” sometimes referred to specifically as “non physician cataract surgeons” (NPCS) to differentiate them from ophthalmologists (medical doctors with specialty training) who normally would perform cataract surgery or *physician* cataract surgeons who are generalist physicians with extra training in cataract surgery but not with full specialist certification. NPCS are generally selected clinical officers or ophthalmic nurses who then obtain, on average, an additional 1 to 2 years training.

Amongst ophthalmologists, ministries of health, and NGOs that are involved in providing eye care, there are different views, often polarized, on the advisability of training and employing NPCS. Arguments on both sides are often taken as self evident and supported by anecdotal evidence but there is little systematically gathered data.

The strongest arguments in favour of NPCS have always been (1) that the shortage of ophthalmologists makes cataract surgeons essential to reducing the prevalence of blindness due to cataract and (2) that cataract surgeons are more likely to live and work in rural areas than are ophthalmologists, in part because they have less education and (3) the cost of training and employing non-physicians is lower.

On the other hand, some argue that cataract surgery by non medical specialists is “second class” medicine and produces inferior outcomes. Furthermore, NPCS are minimally trained to diagnose and treat other important conditions that lead to blindness and may overstep their competence. Some ophthalmologists see the NPCS as a threat to their own professionalism.

In this review, we will examine documentation and evidence (where they exist) of how widespread the use of NPCS is across Africa, how well it works to ensure acceptable quality eye health for Africans at all levels and the factors that might influence its effectiveness, both in theory and in practice. This information is important for planning and decision making regarding human resources for eye health in Africa.

Methods

We conducted a review of the literature on non physician cataract surgeons. A search of Medline was conducted using Pubmed and the grey literature using Google with combinations of the following key words: cataract Africa (111 articles), non-physician surgeons (46), cataract surgeons (26), task shifting (141), ophthalmic nurses (43), nurses eye care Africa (31), rapid assessment of avoidable blindness (22), outcomes of cataract surgery(26), ophthalmic paramedicals (6). Library technicians at the College of Physicians and Surgeons of British Columbia ran a parallel search using Medline, Google Scholar and CINAHL (a nursing and allied health database). From these articles, abstracts of interest (53) were reviewed and most of these were obtained in full text where available. Additional articles were identified and obtained from reviewing bibliographies of relevant articles. In all, 98 articles and reports were reviewed in full text. The information obtained is summarized in the following review.

Findings

How Wide Spread is the Use of Non-Physician Cataract Surgeons?

A recent review and situation analysis undertaken for the International Council of Ophthalmology (ICO) by Lewallen and Courtright summarizes the current situation of NPCS in Sub-Saharan Africa.⁶ This review was requested because member ophthalmologists in the ICO were concerned about the training and use of the cadre. Of the 28 National Eye Coordinators who responded to a survey about cataract surgeons, half reported that they had NPCS employed in their countries. Most (73%) of the 256 NPCS were concentrated in Kenya, Tanzania and Ethiopia. In 7 of the countries with NPCS, there were small numbers (<5) reported to be working. NPCS are only officially recognized in 6 countries and there is a regulatory body governing them in only two. Among the 256 NPCS, 27% worked alone and the rest worked in facilities that also had ophthalmologists.

Of the 14 countries without NPCS, 3 allowed medical doctors with extra training to do cataract surgeries and the remaining 11 allowed only ophthalmologists. Four of the countries without cataract surgeons felt that there was a need to adopt this cadre to address the backlog of surgeries. Of the others who did not feel cataract surgeons were needed, most shared the belief that local ophthalmologists would oppose such a change.

A review in 2007 looking at cataract surgeries in eastern Africa reported that between 2000 and 2004, NPCS performed 77,120 surgeries.⁷

Dedicated training programs for NPCS exist in several countries including Kenya, Tanzania, Ethiopia, Malawi, and The Gambia.^{6,8}

Effectiveness of Non-Physician Cataract Surgeons

Effectiveness of cataract surgeons can be assessed on both an individual and a program level. The most commonly used individual indicators are surgical outcomes, particularly postoperative visual acuities, complication rates, patient satisfaction and volume of surgeries.

Quality of Surgery

There are relatively few published studies directly comparing outcomes of NPCS to those of ophthalmologists. In 1981, Whitfield carried out a prospective study of the surgical, immediate postoperative and late post-operative results of 100 consecutive cataract extractions performed by an ophthalmic clinical officer and 100 performed by ophthalmologists in Kenya under similar conditions using the same surgical technique. He concluded that, although some complication rates were slightly higher for the clinical officers, their surgical results were comparable to the ophthalmologists.⁹ Around the same time, another comparison was done between a clinical officer and two ophthalmologists and the complication rates of the clinical officer were found to be lower than the ophthalmologists (vitreous loss 3% vs. 2.9% and 5.0%; unplanned extracapsular 4% vs. 4.7% and 5.7%) although it was reported that at least one of the ophthalmologists had taken on more complicated cases.¹⁰ It should be noted that both of these studies were carried out 30 years ago, prior to the use of intraocular lenses (IOLs) and at a time when only blind eyes were operated. They are probably not relevant to current surgical practice or current patient expectations.

More recently, using modern techniques and IOLs, a prospective trial monitoring outcomes of cataract surgery was conducted by Yorston in a Kenyan eye centre where there were 4 ophthalmologists and 4 NPCS (who did 47.2% of the operations).¹¹ Although the study was not designed to test outcomes between the two groups, there was found to be no difference between ophthalmologists and NPCS. However, the authors noted that NPCS operated only on uncomplicated

cases in which a good outcome was expected. The study was carried out in a highly productive, well-supervised tertiary hospital in Kenya and may not reflect current routine service delivery in Kenya or other countries.

While it would be ideal to use data from population based surveys (such as the Rapid Assessments of Avoidable Blindness (RAAB)) to provide information on the quality of surgery carried out by NPCS compared to ophthalmologists, it is not usually possible to tease out this information in cases where the survey is conducted in a population that receives services from both NPCS and ophthalmologists. Similarly, it is difficult to assess and compare the contribution of NPCS to the cataract surgical coverage in survey areas.

Productivity of Cataract Surgeons

There was only one study identified assessing productivity of cataract surgeons and this came from eastern Africa.⁷ Although the total number of surgeries performed (77,000 between 2000-2004) is large, the average rate was 243 per surgeon per year. For comparison, most surgeons agree that operating 20 cataracts per week (10/day on 2 days) is not difficult and if this were done for 40 weeks one would expect 800 surgeries per year to be possible. In fact, in India, where very efficient, high-volume cataract services have been developed some surgeons routinely do as many as 80 surgeries per surgeon per *day*.¹²

In the eastern Africa study there was an association between higher productivity and having enough equipment, support staff, and community programs which provided transport for patients.⁷ These same factors would be expected to influence productivity of ophthalmologists as well as NPCS.

Productivity in cataract surgery is not all or even mostly a function of the surgeon. As evidenced by the study in eastern Africa, a number of program and community factors determine how many patients are available for surgery. It is very rare for a surgeon to turn away a cataract patient once he or she has come to a hospital or clinic for surgery due to lack of time to operate. Instead, lack of demand for the surgery in the community is a problem. There are many reasons for this cited but often it is lack of awareness of the availability of a surgical cure, fear, finances or

lack of an accompanying person. Many of these factors can be addressed by appropriate community outreach, education, case finding and assistance with transportation to the surgical venue. Experiences in the Gambia and in Malawi showed dramatic increases in cataract surgical rates following introduction of community outreach programs.^{13,14} One study reported that providing transportation to the eye centre was linked to increased surgeon productivity.⁷ The fact that large numbers of patients in some areas still choose the traditional medicine approach of “couching” over modern cataract surgery (couching surgical coverage reported as 14% compared to cataract surgical coverage of 4.4%) suggests that there is much educational effort still required.¹⁵

It is important to note that productivity figures for ophthalmologists in Africa are not available for comparison. The low productivity among the NPCCS surveyed may reflect general health service dysfunction, which would equally well affect ophthalmologists.

Patient Satisfaction

Despite the relatively low level of WHO defined “good” outcomes, population based surveys^{16,17} or semi population based surveys¹⁸ of patient satisfaction after cataract surgery have generally reported satisfaction levels of 69% to 85%, including one study from Kenya which specifically mentioned that 83.4% of patients were satisfied with the results of their surgeries, 92% of which had been completed by cataract surgeons.¹⁹

Evidence of effectiveness from programs using NPCCS

Review of findings documented in a number of countries can be illustrative of the role of NPCCS within specific programs. To measure success in programs providing cataract services, there are several useful population-level indicators.^{2,20} One is the Cataract Surgical Rate (CSR) which is defined as the number of cataract surgeries performed per million population per year. Another is the Cataract Surgical Coverage (CSC), the ratio of operated cataract among those who would otherwise be blind (or visually impaired) due to cataract to the total of operated and non-operated cataract-affected; CSC is a better reflection of how well the population’s needs are being met than CSR since it takes into consideration the prevalence of cataract blindness in the population. CSC, however, can only be measured by carrying out population-based studies, while CSR just requires collecting information

on service delivery for the population of a given area. Vision 2020 recommendations are for a CSR of 1000 for Africa although, as of 2005, only 9/46 countries reported rates greater than 500 compared with India (3650) and Australia (>6000).²⁰

Finally, although CSC and CSR concern numbers of surgeries done there is agreement and growing concern that this alone is no longer adequate. The service should be of high *quality*; the easiest way to measure this is to monitor the proportion of operated eyes with good, borderline, or poor visual acuity after cataract surgery. (These categories are defined by WHO) A number of factors influence visual acuity outcome; one is adequate volume.²⁰ Cataract surgeons need to operate frequently to maintain their skills. Long-term monitoring of outcomes is being recognized as an effective and important method to improve surgical outcomes.²¹⁻²⁴ Another variable affecting outcome is the use of IOLs, either with ECCE or SICS,^{2, 25,26} which fortunately is now becoming routine.²⁷ The location of surgery is still somewhat controversial. Studies from outreach eye camps in India resulted in such poor outcomes that they were subsequently banned.^{2,10} In outreach camps the operating conditions may be suboptimal, screening for co-morbid conditions more difficult, other services like biometry may be unavailable and follow-up may be difficult or impossible, leading to higher complication rates and poor outcomes.^{9,16,28,29} Other authors suggest however, that with the appropriately trained personnel, support, facilities and follow-up, outreach camps have a role to play in providing services closer to patients' homes, thus improving access.²⁰

It should be noted that none of the studies addressed the other eye conditions (e.g., glaucoma, diabetic retinopathy) which NPCS are likely to face in their practice; it is unclear what proportion of patients with these conditions are [a] referred to an ophthalmologist (and comply with the referral), [b] are treated appropriately, or [c] are treated inappropriately.

Evidence from individual countries

Kenya

NPCS in Kenya have been practicing since the 1960's, initially informally trained by individual ophthalmologists and then through an official ophthalmic clinical officer cataract surgeon training course since 1984. In the early years they attributed their

success to careful supervision by a “concerned ophthalmologist” and frequent surgeries on a regular basis.⁹ A report on the Kenya Ophthalmic Program in 1999 reports that they had 50 ophthalmologists (only 20 outside the capital) and 100 ophthalmic clinical officers (some of whom are trained to do surgery) who are described as the key service workers in the public service and in rural areas.³⁰ Nationally, the numbers of cataract surgeries performed rose from 5000 in 1996 to over 12,000 in 1999.³¹ (This is a jump in CSR from approximately 174 to 400 for the whole country.)

In the district of Kwale, the Kwale District Eye Program employed a cataract surgeon to work with the existing ophthalmologist as well as a new ophthalmic nurse and more paid community eye workers in a newly renovated space to accommodate more surgery at the hospital. An assessment of the impact of this program showed the cataract surgical rate for the District rose from 644 to 1583 between 2002 and 2005.³²

A RAAB conducted in the Nakuru district where surgeries are performed by 2 ophthalmic clinical officers and one ophthalmologist reported a CSC for bilateral blindness (VA <3/60) of 78%, one of the highest reported from all RAABs in Sub Saharan Africa. Outcomes of surgery, however, were poor in 22% of the eyes and 61.1% of this was related to surgery; it is not possible to determine who did the surgeries.²⁶

Thus, these 2 programmes in Kwale and Nakuru, considered among the best eye care programmes in the country, have successfully incorporated NPCS and demonstrated that they can increase the numbers of cataract surgery provided. The annual CSRs for Kwale and Nakuru range from 1,000 to 1,500 while the national average is 562. The outcomes in Nakuru were disappointing, but no worse than those reported in most district surveys in SSA, many of which do not use NPCS.

The Gambia

The Gambian National Eye Care Program (NECP) was initiated in 1986 and it is reported that many of the Vision 2020 principles are based on this program. Following a national survey assessing the prevalence of blindness, The Gambia introduced several changes including the training and introduction of 5 cataract surgeons and more community eye care personnel. The cataract surgeons performed 24% of the 9006 surgeries performed during this period. The prevalence

of blindness decreased by 40% (from 0.70% to 0.42%) and the CSR increased from 300 to 1600 over 7 years. An analysis after 10 years examined these changes and concluded that the patterns of improvement closely followed the geographical pattern of the program roll-out.^{20,13,33}

Based on the NECP success in the region, the Health for Peace Initiative (HPI) in West Africa adopted eye care as one of its components. Between 2001 and 2005, teams of Gambian eye care professionals, predominantly cataract surgeons, provided outreach surgical camps in neighbouring countries (Guinea, Guinea-Bissau and Senegal). They performed 3865 cataract operations during 26 camps in the four countries. In addition to the individual surgeries performed, “the experience of participating in the camps has profoundly increased awareness amongst ophthalmologists in the region of a number of issues: the high degree of unmet need; the acceptance of the cadre of cataract surgeon; and the need to set up regional cataract services.” Following this outreach, the Gambian national eye care training centre was expanded to become a regional centre. Senegal previously did not allow cataract surgeons but following the HPI, they have been integrated into the eye care teams at the regional level, with the goal of providing increased and more equitably delivered cataract surgery services.³⁴

Tanzania

Tanzania has had cataract surgeons for many years and continues to train a significant number at Kilimanjaro Christian Medical Centre (KCMC).

A study by Eliah et al in 2008 looking at two sites in Tanzania where a NPCS was the only surgery provider, reported increases in CSR from 237 to 601 in one site and 194 to 595 in the other (from 2002 to 2007) after implementation of Vision 2020 plans. Close administrative supervision was carried out to achieve this success, with site visits every 3-4 months, careful monitoring of reports and frequent phone calls and emails.³⁵

The Comprehensive Community Based Rehabilitation in Tanzania (CCBRT) in Dar-es-Salaam collects cataract patients from several regions and operates on 3500-4000 eyes per year. (This cannot be translated into a CSR since patients come from many places.) Around half of the cataract surgery there is provided by NPCS, under supervision of ophthalmologists and the hospital enjoys a reputation for high quality service, although no published figures on outcomes were available.

Malawi

Malawi permits NPCS although there are few of them practicing. A RAAB study in the southern region demonstrated a CSC (for people at the <3/60 level) of only 44.6% with only 38% good outcomes and 32% poor outcomes.¹⁶ Surgery has been provided by both ophthalmologists and NPCS in this area and it is not possible to know which cadre was responsible for individual cases. In contrast, a highly successful program, well funded and fuelled by community outreach work, in the central region of the country, where the only provider was an ophthalmologist reported a CSC of 83.3% (participation rate in the survey was low so this might have biased results); no outcomes were reported.¹⁴ This programme has recently hired a cataract surgeon (trained in Tanzania) to help lessen the burden on the ophthalmologists.

Ghana

Although cataract surgeons are not yet recognized in Ghana, one project sponsored by Christoffel Blindenmission in the eastern region of Ghana and extending into neighbouring Togo and Burkina Faso has achieved a respectable CSR of 1773 using a cataract surgeon in addition to two ophthalmologists, ophthalmic nurses and a team of primary eye care workers.³⁶

Evidence from training institutions

The situation analysis for the ICO⁶ included a report on interviews with institutions that train NPCS. Such training should be closely linked to the national eye program in the country where the surgeon comes from and should ensure that trained individuals will have a place to work after graduation where they will be adequately supported and supervised.³⁷ Unfortunately this has often not happened. Estimates from eastern Africa suggest that there is a 30-50% attrition rate after training. The ICO situational analysis noted that, "Some trainees have never done any cataract surgery after graduation because they had no equipment or lacked other support, some have waited 1-2 years for equipment and then felt they needed re training, and some have left the field of eye care entirely. Frustration among trainers was especially great because many of the trainees' fees were supported by MoH that did not provide any support after training."⁶ In that study only 2 of 14 trainees

interviewed were confident they would have adequate equipment and consumables in their new posts.

Concerns have been expressed by trainers that many trainees do not want to stay and practice rurally after completing training. Surgeons seem to want to live in urban centres much as their ophthalmologist counterparts do and one trainer complained that students underwent training at their own expense simply to escape from the rural setting.⁶

Current Acceptance of NPCS by the Eye Care Community

As noted in the beginning of this review there are different views, often polarized, on the advisability of training and employing NPCS amongst ophthalmologists, ministries of health, and NGOs that are involved in providing eye care.

One ophthalmologist involved with the Ghana project described above states, “Cataract surgeons are still neither recognised nor accepted in Ghana, despite overwhelming evidence of their importance in many African countries. My personal experience with cataract surgeons in the Gambia and elsewhere is that they are perfectly up to the task; revisiting this issue is more important now than ever, if we are to realise our stated goal of eliminating all causes of avoidable blindness by the year 2020.”³⁶ On the other hand, a survey of ophthalmologic trainees in Nigeria (where the cadre is not allowed) found that 89% opposed the adoption of cataract surgeons fearing they would “extend their services beyond the job specification, resulting in abuse of ophthalmic practice and quackery” and believing that medical doctors with additional training would be more suitable substitutes.³⁸ Some ophthalmologists have queried why there is any reason to support the development of a new cadre when the existing ophthalmologists working rurally are not being adequately supported.⁶

Following the situation analysis referred to here, the International Council of Ophthalmologists published an official 2010 policy statement stating:³⁹ “There will still be countries in which the number of available physicians is so low that ophthalmologists will be unable, even under the most efficient circumstances, to meet local cataract surgical needs. An alternative, hopefully “temporary,” solution is needed in the meantime. The only expedient, indigenously sustainable solution would appear to be the careful training of non-ophthalmologist “cataract surgery

providers”, willing and able to work in underserved, remote areas under the monitoring and oversight of “supervising ophthalmologists.” In their final recommendations they state: “In situations where it is necessary and appropriate to utilize non-ophthalmologist “cataract surgery providers”, ophthalmology has an obligation to establish carefully designed programs that train non-ophthalmologists to perform high-quality cataract surgery and to monitor and supervise their work.” This statement does not differentiate between non physician cataract surgeons and physicians without an ophthalmology specialist training.

Conclusions

It is clear from the evidence that the advisability of training and employing NPCS is complex. The question of whether they should exist at all is the most controversial and this review cannot answer that question. This must be decided within each country. Currently about half are in favour and half not in favour. The ever increasing numbers of ophthalmologists has caused some to question again the rationale for training NPCS, but there is general agreement that the number of ophthalmologists is still too low in SSA and the distribution is a problem.

Small studies with well trained NPCS in well supervised centers that show no difference in surgical outcomes between NPC and ophthalmologists are interesting, but hardly definitive. The debate urgently requires data on patient outcomes after cataract surgery – both that performed by NPCS and by ophthalmologists. It is clear that there are both good and bad surgeons in both cadres. During the training of any surgeon, self-audit and the need for ongoing monitoring of surgical outcomes is critical³⁷ and this has not taken hold yet.

Given the continued polarization, the more fruitful question may be to ask how NPCS can best be trained and deployed to help increase access to high quality cataract surgery for Africans in countries where they do practice. Here there is much to be learned from the evidence.

In the eastern African training programmes, there has been too much emphasis on numbers of NPCS trained with little or no consideration of their post training opportunities and support. Both NGOs and MoH bear the responsibility for this as

both support the training programs and send trainees to them. Examples of the successful use of NPCS in programmes exist as described above, but it appears that few trainees end up in these ideal situations.

The documented examples of successful programs using NPCS probably suffer from publication bias, but are still instructive. All are characterized by having strong program support, often by an ophthalmologist, and strong community based programmes to ensure adequate numbers of patients. Many are NGO/mission run services. The only two successful programs describing NPCS working without an ophthalmologist in the facility (both MoH) were in rural Tanzania,³⁵ and in these two cases there was strong oversight and monitoring of activities by a supporting NGO. In general, there appears to be considerable benefit to cataract surgeons in working with an ophthalmologist for ongoing learning and supervision and the option of easy referral of difficult cases.²⁸ As noted in the ICO survey, only 27 % of NPCS were actually practicing independently, without an ophthalmologist in their hospital.⁶ For an ophthalmologist to supervise a NPCS effectively in a remote area will require a good deal of his time and it will be costly, especially in the MoH, where per diems and travel allowances are a large component of supervision. This reality, however, is in conflict with the rationale that NPCS are required because they will work in rural areas where ophthalmologists will not go. Several authors have identified the urban/rural disparity in their studies^{15,16,40,41,42} and this applies to cataract surgery provision. Governments may need to consider how they can make rural practice attractive to ophthalmologists if they expect the rural population to be served. Is it more effective to offer extra allowances to ophthalmologists to serve in rural areas or to use NPCS with good supervision? This requires careful planning and assessment of the real costs.

Clearly it is not enough to just train more NPCS (or ophthalmologists) in order to address the need for cataract surgery. Whichever cadre or combination is relied upon to provide surgery, it is obvious that an effective provision of cataract surgery requires far more than a surgeon; efficient delivery of a high quality service depends as much on adequate management and medical support personnel, supervision and resources as it does on the surgeon. In planning to deliver cataract surgery equitably, community outreach, education and transportation must be taken into account to increase access to and demand for surgery from patients.

The supposed advantages of NPCS have been realized in a few but not the

majority of situations. Each country must decide, if they choose to proceed with or continue employing NPCCS, whether they have adequate interest, political will and resources to use the cadre as something more than a “quick cheap fix” to the human resource shortage in ophthalmology. Cataract surgeons, like ophthalmologists or any other professionals, can only perform to their capacity if given adequate support within a well-functioning program.

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