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Eliminating cataract blindness – How do we apply lessons from Asia to sub-Saharan Africa?

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The VISION 2020 initiative aims to eliminate avoidable blindness by the year 2020. Cataract, the main cause of blindness and other visual impairment, is a main focus of this effort. In India, the Aravind Eye Care System provides an impressive model demonstrating how high quality eye care, including cataract surgery, can be delivered to large numbers and made affordable to all. Similarly, financially self-supporting systems have not been developed at this point in sub-Saharan Africa. This paper explores the factors that lead to success at Aravind, and compares and contrasts the conditions in India with those found in much of sub-Saharan Africa.

Keywords: VISION 2020; cataract; India; sub-Saharan Africa; sustainable health care

Cataract remains the single most common cause of blindness in the poorer countries of the world, where it is usually estimated to account for around half of the problem (Resnikoff *et al.* 2004). In fact, evidence from India shows that it is responsible for more than that: a staggering 82% of blindness in those over 50 years of age in India was demonstrated to be due to cataract in a recent, large population-based survey (Neena *et al.* 2008). This figure is staggering precisely because cataract need not cause blindness or visual impairment at all. For several decades, we have had the surgical techniques to change an eye with visual impairment from cataract to an eye with normal vision virtually overnight, and the resources needed for this are not huge. In fact, there are several examples from Asia of how cataract surgery can be delivered efficiently. One of the best known is the Aravind Eye Care System in Madurai, which has been described in a number of publications and media presentations, including a recent highlight in *The Economist* (2009). There, under the leadership of the late Dr Venkataswamy, a system for providing eye care on a large scale, in a sustainable fashion, where even the very poorest receive services, was developed over the past few decades and continues to function today at an impressive level.

The principles behind Aravind's success deserve a brief review. The factors that allow it to work are interrelated and are shown schematically in Figure 1. High productivity, standardisation, patient-centred care, community participation and a

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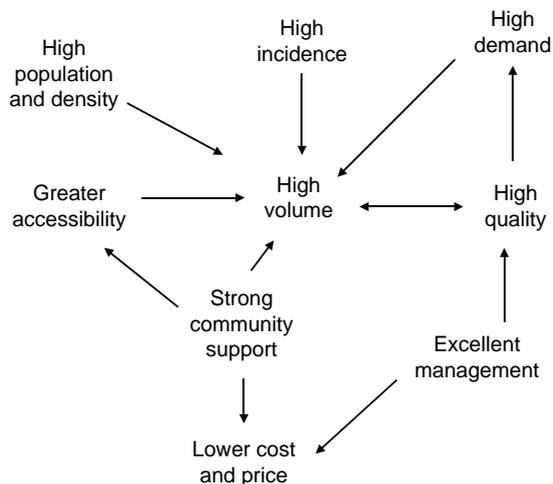


Figure 1. Relationship among factors that lead to success at Aravind.

rigorous quality assurance process are at the heart of the system. High productivity allows the unit cost of operating on one cataract to be brought very low, which is passed on to patients in the form of a low price. High quality resulting from standardisation and the quality assurance process helps to generate a demand for the service. An efficient and dedicated staff contributes to lower costs and ensures a high service quality that increases demand as word of success spreads from satisfied patients. All in all, it's a classic model of a high quality product produced inexpensively through excellent management practices, and then marketed successfully.

Not shown in the figure, but key to Aravind's financial success is the 'tiered' pricing system. The price is not imposed by the hospital based on patients' ability to pay, but rather the price is chosen by patients themselves based on their willingness to pay for amenities such as more luxurious rooms or special meal services. Everyone receives the same high quality surgery, and the hospital subsidises surgery for the poor from the fees paid by the more well-to-do. This system is so effective that around 70% of patients receive free or highly subsidised operations (Natchiar *et al.* 2009). This is possible since cataract, unlike some blinding conditions, affects the rich and poor alike, and thus Aravind is able to attract enough middle- and upper-class patients to subsidise the poorest.

Aravind provides a thought-provoking example of how high quality eye care can be delivered to rich and poor alike in a financially sustainable manner. Today, these hospitals provide over 200,000 cataract operations every year, which are roughly 60% of the entire National Health Service output in the UK (National Health Service 2008). The outcomes of the surgery are excellent (Ravindran *et al.* 2009). The hospital system is actively engaged in helping other hospitals to develop similar systems.

So, will the model work in sub-Saharan Africa? This is an important question. The difficulties of delivering equitable high quality health care in Africa are often the subject of rich discussion, and this should include eye care. The Kilimanjaro Centre for Community Ophthalmology (KCCO) is an institution dedicated to public health

ophthalmology in eastern Africa, including the study of human resource management, planning and health care delivery systems. KCCO does not just study systems, but also helps to implement programmes, tries new approaches and documents findings from the field. Lessons learned are disseminated through teaching and training courses run for eye care professionals from across the continent. In accordance with the strategy advocated by the VISION 2020 initiative in Africa, KCCO helps ministries of health and NGOs to plan and implement eye care programmes in eastern Africa within administrative 'districts' of one to two million people. Systematic study of these programmes has allowed KCCO to explore the feasibility of the Aravind model in Africa. Likewise, Lions Aravind Institute of Community Ophthalmology (LAICO) runs several training courses in programme and eye care management, which have been attended by participants from sub-Saharan Africa. LAICO also has an active process to help individual eye hospitals adopt best organisational practices for enhancing the delivery of eye care services. Twenty hospitals from Africa have undergone this intensive organisational development process.

There are several key factors in Aravind's success that we need to consider in trying to transfer the model to Africa; these are interrelated but broken apart here for discussion.

Key elements to success at Aravind

Good *management* has always been given a high priority at Aravind. The entire management structure at Aravind is geared towards efficiency. There is a continual, ongoing analysis of productivity focused on the use of human as well as material resources, and new ways to reduce wastage of both are constantly considered. Aravind has effectively 'shifted tasks', with the theory that no one should be doing a job that someone with a lesser qualification and a lower salary might do competently. They continually monitor outcomes to ensure that quality is maintained in this task shifting. Supportive supervision, and a sense on the part of all staff, from the 'lowest' to the 'highest' that they are contributing to an important effort, helps maintain morale. There is much that any organisation can learn about good management from Aravind, not just in sub-Saharan Africa, but in the richest of nations as well.

Unfortunately, health care management in general is still poorly developed in much of sub-Saharan Africa ([Dovlo 2005](#)). Poorly managed health systems are common, and many health workers have no experience with or examples of good management, either in the government or the private sector. Supervision in health systems is notoriously lacking, morale is frequently low, dependence on often erratic donors has not fostered the ability to develop planning skills, and accounting is often sub-standard or even absent for a number of reasons.

Another factor, key to the success of the Aravind system, is the *high quality* of the surgery. While if done well, modern cataract surgery restores vision to a 'perfect' level with minimal discomfort to the patient, poorly done surgery can blind an eye completely or leave it worse off visually than it was before surgery. Visual acuity after cataract surgery at Aravind is excellent; with-spectacles visual acuity better than 6/18 (considered 'normal' by World Health Organization (WHO) definitions) is achieved in over 90% of patients and visual acuity worse than 6/60 (considered 'severe visual impairment' by the WHO and 'blind' by most industrialised country

definitions) occurs in less than 1%. Uncorrected (without-spectacles) visual acuity is better than 6/18 in over 60% of patients (Thulasiraj, personal communication, 2008). Quality at Aravind is not limited to the technical aspects of the surgery; counsellors, whose job is to answer patients' questions and ensure that they are comfortable and taken care of, are specially trained on site. Anecdotal experience is that one bad outcome can dissuade many from undergoing cataract surgery, so Aravind goes to great lengths to guarantee good quality and a good experience for every patient.

The WHO recommends that 80% of eyes should have visual acuity better than 6/18 after surgery and that less than 5% should be worse than 6/60. There is limited data on outcomes after cataract surgery in sub-Saharan Africa, since most hospitals do not monitor or report the outcomes of cataract surgery at all. However, several recent population-based surveys, shown in Table 1, have demonstrated that normal vision (visual acuity of $\geq 6/18$ or better) was restored to between 23 and 59% of examined eyes that had been operated for cataract, while 23–58% had a final acuity of less than 6/60 (defined as blind in most industrialised countries). These population-based data from Africa reflect services provided in the past as well as the present, and may be worse than data collected at the hospital; nonetheless, these figures represent what members of the community are exposed to and bode ill for the services in these settings. Poor outcomes decrease demand and lower volume.

Aravind's success also relies on a true *team approach* to service delivery, rather than focusing predominantly on the role of the surgeon. As noted, the team includes not only clinical personnel (surgeons and nurses), but also dedicated counsellors who take the time to explain the details that patients want to know but are often afraid to ask of people in white coats. Counsellors ensure that patients understand their own role and responsibility in post-operative care and follow up. An outreach team

Table 1. Presenting (mostly uncorrected) visual acuity after cataract surgery: results of population-based surveys in Africa.

Country	Percentage of eyes $\geq 6/18$	Percentage of eyes $< 6/60$
Cameroon (Limbe) ^a	23	58
Cameroon (Myuka) ^b	25	64
Kenya (Kericho, Bureti and Bomet) ^c	58	31
Kenya (Nakuru) ^d	50	31
Malawi ^e	23	53
Rwanda ^f	23	31
Tanzania (Kilimanjaro) ^g	59	23
Tanzania (Zanzibar) ^h	37	31

^aOye and Kuper (2007).

^bOye *et al.* (2006).

^cKimani *et al.* (2008).

^dMathenge *et al.* (2007a).

^eCourtright *et al.* (2004).

^fMathenge *et al.* (2007b).

^gHabiyakare (2008).

^hKalira (2008).

Note: $\geq 6/18$ is considered 'normal' vision by the World Health Organization, while eyes $< 6/60$ are classified as having 'severe visual impairment' by the World Health Organization and as 'blind' by most industrialised countries. Poor visual acuity after cataract surgery may be due to poor surgery or follow-up care or due to other serious eye disease, which was not recognised before surgery.

proactively plans and ensures a steady inflow of patients for cataract surgery. At Aravind, doctors are respected, but they also understand and respect the critical roles played by other members of the clinical team and by the non-clinical personnel who organise and manage the systems that allow them to function efficiently as surgeons. Aravind has convincingly demonstrated that having enough paramedical personnel to support the surgeon is critical to efficiency.

In contrast, all too often in Africa, eye surgeons are not supported with staff they need. A surgeon spends time doing jobs that could otherwise be done by paramedical personnel, or sitting in theatre waiting for assistants to move patients in and out, or in frustrating hours trying to track down supplies. In many settings, doctors are placed in charge of departments with no managerial or even basic administrative support. They have not been trained to understand the role of management, sometimes seeing it as a threat and resisting it if it is available. These problems decrease productivity dramatically and create frustration.

Another critical feature of the Aravind model is the *tiered service system* that allows them to offer free surgery to all who want it and to subsidise care completely through fees paid by wealthier patients who *choose* to pay for additional services, such as finer food, private rooms or amenities in the rooms. This works for two reasons: first, Aravind has managed to lower the actual cost of providing cataract surgery to an amount lower than many middle- and upper-class people are willing to pay; and second, there are enough middle- and upper-class patients who are willing to pay for amenities to support this system.

There is no apparent reason why this sort of tiered system couldn't work in urban centres in Africa, where there is some middle and upper class. It is not clear, however, to what extent it would work i.e., whether the numbers of middle and upper class able and willing to pay for amenities could subsidise all those wanting free services. In rural Africa, it is our experience that nearly 100% of patients will opt for free surgery if it is offered. The 'status' afforded by choosing higher class accommodations does not appear to be a factor. It is possible that Indian patients may be more willing to pay for cataract surgery because there is a long history of the private and voluntary sector providing a substantive portion of the health care. In the government hospitals, charging patients' fees for health services is still controversial both in India and in many countries of sub-Saharan Africa. Some donors and governments insist that cataract surgery should be offered for free to everyone, and there is a widespread belief that even a small charge creates an insurmountable barrier to many elderly cataract patients. In India, the government provides a subsidy of Rs. 750 (US\$16) per cataract surgery performed free of cost. Although insurance schemes that reimburse for cataract surgery are beginning to appear in Africa, only a limited population is covered and there is anecdotal evidence that payments cannot be counted on. These factors all contribute to making significant cost recovery very challenging in rural sub-Saharan Africa, which is where most of the population lives.

An additional feature, the constant focus on *high productivity* at Aravind, has led to an assembly line-like efficiency in clinics, on the ward and especially in the operating theatre. Interestingly, this is done with the utmost humanity, because kindness and care to patients are factored in as part of the service being delivered. The impact of this is a *high volume* of services delivered, which has several effects. Having a larger scale allows for the employment of personnel who sub-specialise in a specific set of tasks and excel in them, whether it is surgery or administration. It is

easier to use people efficiently when the patient volume is high. Many African surgeons and nurses have experienced the pleasure of working well together in a team and completing 20 or 30 cataract surgeries in a session during surgical outreach visits. The same team, however, back at the base hospital, may take all day to do five surgeries, if that's all there are: work expands to fill the time allotted. Not only does high volume demand efficiency, but also drives it. High volume also helps to maintain high quality. Surgery and other procedures are not rushed at Aravind, but are systematically performed in standard fashion; people develop expertise at tasks they do over and over. It is actually easier to maintain good surgical skills with high volume.

Of course, the high population density in India contributes to the possibility of gathering large numbers of patients together at low cost. Aravind has championed the concept of outreach, going into the community to find patients who would not otherwise have access to services. Teams make regular trips to fixed 'outreach screening camps' in rural areas to bring busloads of patients back to the base hospital for surgery. In eastern Africa, 'high volume' programmes serving rural areas use similar screening outreach visits and provide transport for the patients, just as Aravind does, but the difference in cost is huge. While it costs about US\$4.50 to bring in one patient for surgery at Aravind (Thulasiraj, unpublished data), in the much less densely populated areas of eastern Africa, the same effort is estimated to cost US\$40–60, and that amount was calculated before recent rises in fuel prices (Lewallen *et al.* 2006). Poor roads, great distances and sparse population make it expensive to collect large numbers of elderly patients for surgery in many parts of sub-Saharan Africa.

High volume is also harder to achieve in sub-Saharan Africa because, in at least some of the countries, surveys show that the burden of cataract is considerably lower than it is in India. It is beyond the scope of this paper to discuss this at length, but the evidence is mounting (Neena *et al.* 2008, Oye *et al.* 2006, Mathenge *et al.* 2007a,b, Oye and Kuper 2007, Habiyakare *et al.* in press). Not only do Indians appear to get cataract at a younger age than Africans, but also the population in India is 'greying' more rapidly than in most sub-Saharan countries. The over 50 years age group in India accounts for over 16% of the population, a proportion more than twice that found in most of the sub-Saharan countries. There are probably unrecognised ethnic and genetic variations across Africa and we need to take care not to paint with too wide a brush, but it does appear that the prevalence of cataract in most of Africa is much lower than in India, which certainly contributes to the challenge of generating large volumes.

An important contributor to the success at Aravind is their *partnership with community organisations*, local industries, and educational and religious institutions, who actually organise the outreach activities: i.e., finding the right place to hold the screening; mobilising volunteers; and publicising the screening camp. The communities themselves provide financial and other resources for this. Aravind guides them in the process, carries out the actual eye examinations and takes over from there. This helps to ensure a higher patient turnout and spreads out the responsibilities, efforts and costs. In sub-Saharan Africa, communities rarely seem to function this way. Sometimes local non-governmental organisations or religious institutions offer limited support for outreach programmes for eye services, but generally 'volunteers'

expect to be paid. Hospital eye workers also, whether private or governmental, must be paid extra allowances to go on outreach, above any actual costs.

Most difficult to measure and monitor, but indisputably an essential factor in Aravind's success, is the *good leadership* that permeates the institution. The KCCO experience in trying to implement eye care programmes has consistently been that without good leadership no programme will work or will work for long. Good leadership, although hard to measure, is critical to success. It is the leaders who must choose to use profits made from the high-paying patients to improve the system and provide service for the poor. Leadership chooses to forgo greater personal gain in order to ensure that the poor are served. The leaders at Aravind understand the universal human tendency to take pride and find satisfaction in doing a job well and they take advantage of this. Good leadership underpins the work ethic. The spirit of service to patients that permeates Aravind comes down from the very top and influences morale throughout the organisation. In sub-Saharan Africa, particularly in the governmental sector, leadership positions are too often filled without consideration of demonstrated capability. Furthermore, changes in leadership often occur abruptly, key positions are often left open for a long time or filled by disempowered 'acting heads'. In eastern Africa in particular, where ophthalmologists are scarce, the expectation that paramedical surgeons (cataract surgeons) can be put in charge of programmes may result in deficiencies in leadership; frequently this cadre does not have the educational background or the stature to advocate for the needs of the eye department or for vision care in general.

What does all this mean for Africa?

Of the various factors discussed above, some can be changed and some can't. Population density and age structure change slowly. The prevalence of cataract is also unlikely to change although the population's demand for surgery will change as socio-economic conditions improve, a process that may, however, be slower than we'd like. Quality, management issues, efficiency, leadership, attitudes and perspectives, however, should be amenable to interventions and improvement. Indeed this is where KCCO, with much initial support from Aravind, has chosen to put an emphasis as it works with hospitals.

What can the 'Aravind model' teach those who plan eye care services? Specifically, is it relevant in sub-Saharan Africa?

High quality eye care is possible in poor settings. High quality cataract surgery should not be viewed as a luxury, available only to those in rich countries while Africans undergo operations by minimally trained surgeons. Based on the limited data now available on outcomes of cataract surgery in Africa, assessment of quality in all programmes needs to be a top priority. The WHO has recommended targets for acceptable outcomes and it does not appear that these are being met, even at good facilities. Operational research is needed to determine what the real obstacles are to better outcomes and how these can be effectively addressed. In spite of the much vaunted 'ease' with which cataract can be cured, it is an operation that requires a good deal of surgical training and judgement; it can go wrong quickly, with disastrous consequences for the patient. India learned the hard way that rural 'camps' can do more harm than good, and has since banned 'surgical eye camps'.

Before we rush into shifting more cataract surgery to non-physician clinical officers or medical assistants and try to make it available at every small district hospital, we need to demonstrate that it can be done with good results. Quality should not be sacrificed for any consideration. It is unacceptable to operate on an eye with cataract and leave it with worsened vision. Better to perform no surgery than to provide an elective surgery with a poor outcome.

Good health management systems are essential if we are to make maximum use of limited resources. This is especially critical in the area of human resource management. Limited manpower can be offset by the efficient use of what is available. Failure to develop and utilise a management cadre because of a 'lack of money' is a false economy. The task of managers in health care systems is to establish and maintain settings where doctors and nurses can do what they are trained to do: to take care of patients. Expecting a doctor to do the work of a manager or administrator is counterproductive and wastes precious resources. Training more and more doctors without commensurately training the support staff they need in order to be efficient is a mistake. Surely we can learn from the emphasis on good management that underpins the Aravind model. Good doctors and nurses cannot do good work in bad systems. Good management systems are essential to ensure accountability and provide the supervision essential to keeping workers motivated and working efficiently. Doctors must be taught how to work with professional managers, rather than compete with them for what they perceive as 'power'.

Community outreach activities from hospitals, such as actively seeking poor patients in need of services, are essential if we are to reach most of those who need care. This means forming partnerships with communities and actively helping patients to gain access to care. Outreach strategies or referral systems that merely identify elderly patients needing surgery, advise them to go to the hospital for treatment and then expect them to find their own way are not effective. Effective outreach with transportation to a base hospital is not cheap in Africa, but the alternative of a cumbersome referral chain (which might cost just as much if it were properly staffed and supervised) has not been shown to provide better access. Unless we establish outreach services, we may be building fine facilities staffed with good doctors that will not be used maximally. We, therefore, need to explore more possibilities for enhancing the role of community organisations in both patient mobilisation and in reducing the costs of transportation and other logistics.

Africa should be training manpower for the future, not just for what appears expedient today. Does Africa want to have a system in which patients with 6/36 cataracts are turned away because minimally trained cataract surgeons only operate on 'blind' or 'severely visually impaired' eyes? It is to be hoped that with socio-economic development, the visual needs of older Africans will increase and the demand for surgery at a lower visual acuity threshold will increase. Reading, using computers and cell phones, and watching TV are all activities that require good vision. Shall we plan for a system that will deny these activities to all except for the fortunate few who can access private doctors in urban centres? Do we want a system with 'gatekeepers' or minimally trained surgeons who tell people with vision reduced to 6/36 from cataract (which requires good ophthalmoscopy skills to diagnose accurately) to go away and come back the next year? Task shifting has worked admirably at Aravind, but that is because the model provides supportive supervision and monitors the quality of the outcomes. Unless these supervisory and monitoring

systems are in place, there is a real possibility that task shifting could decrease the quality of care available to rural Africans. Africa today needs to be training manpower and developing health care systems that will work for a future envisioned 10 or 20 years from now.

A focus on quality, good management, effective supervisory and monitoring systems, and outreach with active community involvement will pave the way for 'revolutionising' eye care in Africa. While financially self-supporting eye care systems, such as Aravind, may not be feasible given Africa's current socio-economic conditions, there are still many valuable lessons to be learned.

Summary

There are factors in the success of the Aravind model from which the whole world and not just African health systems can learn. While the underlying principles of the Aravind model – high productivity, standardisation, patient-centred care and a rigorous quality assurance process – are very relevant in the African context, there are also some factors that are very different from those in India that will probably always limit the applicability of the Aravind model. Thus, there is a need to develop an 'African Model', which can achieve high productivity in populations with low density and lower cataract occurrence, developing a cost-effective delivery system in the face of poor roads and public transportation infrastructure. Insistence by some donors and advocates that eye care programmes in Africa should become 'self-sustaining', since it has been done at Aravind, should engage in an honest consideration of the current realities of the region and focus their support on addressing them. The initial thrust will need to be on creating an enabling environment for service delivery and addressing the challenges related to leadership, quality, management, supervision, outreach and the development of human resources. The degree of cost recovery, with sufficient services for the poor that is exhibited at Aravind, is not likely to be replicated to the same extent in Africa, owing to its economic and cost realities. Hence, in some parts of Africa attempts to provide low cost or free surgery will require considerable financial support from outside sources, whether it is from government subsidies or private charities. While we may not be able to import wholesale the Aravind model to Africa, it would be foolish not to learn from it what we can.

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