

ARAVIND EYE CARE SYSTEM: GIVING THEM THE MOST PRECIOUS GIFT

It was year 1976. Padmashree Dr. G. Venkataswamy¹, popularly referred to as Dr. V., had just retired from the Government Medical College, Madurai² as the Head of the Department of Ophthalmology. Rather than settling for a quiet retired life, Dr. V. was determined to continue the work he was doing at the Government Medical College, especially organizing rural eye camps to check sight, prescribe needed corrective glasses, do cataract and other surgeries as needed and advise corrective and preventive measures: in short, providing quality eye care. This was to be provided to the poor and the rich alike. To Dr. V., this was more than a job to spend his time: he was a person seized with a passion to eradicate needless blindness. For an estimated 45 million people worldwide, and nine million in India, the precious gift of sight had been snatched away, most often quite needlessly. His vision was simple yet grand: eradicate needless blindness at least in Tamil Nadu, his home state, if not in the entire India.

With this mission, after his retirement, Dr. V formed a non-profit trust, namely, the Govel Trust³ with himself as the Chairman and his two brothers, two sisters and their spouses, and an ex officio member, namely, the Madurai Main Rotary President as trust members. In 1976, the Govel Trust began with running a modest 11 bed hospital, named as the Aravind Eye Hospital, in Dr. V.'s brother's house at Madurai, with a mission of serving the poor blind people. In this hospital, five beds were for patients who would pay to get treatment and six were reserved for those who would be offered free treatment.

By 2003, the humble 11 bed hospital had grown into The Aravind Eye Care System. The Aravind Eye Care System was not merely a chain of hospitals, but was an eye care system consisting of a centre for manufacturing synthetic lenses, sutures, and some eye pharmaceuticals; an institute for training; an institute for research; an international eye bank; a women and child care centre; a post graduate institute of ophthalmology awarding M.S. degrees and offering fellowship programmes; and a centre for community outreach programs (see Exhibit 1 for the “Aravind Eye Care System”). The Aravind Eye Hospital (AEH) at Madurai had grown to a 1500 bed hospital performing nearly 95,000 eye surgeries every year. In addition to Madurai, there were four more Aravind Eye Hospitals located at Tirunelveli, Coimbatore, Theni, and Pondicherry (see Map 1 for the location of these places). The five hospitals together performed a total of 190,000 surgeries every year, or nearly 45 percent of *all* eye surgeries done in the state of Tamil

¹ Awarded in 1972 by the Government of India. Padmashree is one of the top civilian honours conferred by the Government every year for outstanding work in different fields.

² Madurai is a famous temple city and is the third largest city in the State of Tamil Nadu, South India.

³ Named after Mr. Govindaswamy, Dr. V's father; Venkataswamy, Dr. V. himself and Mrs Lakshmi, Dr. V's mother.

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Nadu and five percent in India. In charge of this system were Dr. V., his sister, Dr. G. Natchiar, and her husband, Dr. P. Namperumalsamy (“Dr. Nam”).

The various members of the Govel Trust worked ceaselessly to improve their services and to reach closer to their goal of eradicating needless blindness. In March 2003, when one of the case writers met Dr. V., now 85, at the appointed time of 8.30 A.M. in the latter’s office, Dr. V., was busy planning the day. After the preliminaries, he opened the conversation as follows:

Despite all our efforts, so many people with problems with their vision have still no access to hospitals. Much of the blindness can be corrected through surgery. But they are afraid of operations. So we have to increase the awareness of the causes of blindness and the need for early treatment. Even in villages where we conduct eye camps, only seven percent of people having eye problems turn up. We have to do more to create demand.

Most of this blindness is needless and curable. We have to eradicate all needless blindness...

Dr. Nam was equally enthusiastic about this vision:

At present we do about 3.6 million eye surgeries in India. If this can be increased to 5 million, needless blindness can be eradicated. We do about 2600 surgeries per doctor per year in our Aravind Eye Hospitals. The all India average is about 400. It is possible for other hospitals to come to our level of productivity. We are willing to help them to do so.

Said Dr. Natchiar:

All our systems are oriented towards enabling the doctors to be at their productive best. We support them through well-trained paramedical staff. Community outreach programmes are central to our mission, since most of the blind are poor and are in rural areas.

Continued Dr. Nam:

We perform 95 percent of our cataract surgeries with insertion of Intraocular Lenses (IOLs)⁴. The all India average of IOL surgeries is only 60 percent, and in some states like Bihar, it is only 30 percent. We have to bring up this percentage through training of doctors.

⁴ Intra Ocular lens (IOL) was a tiny artificial lens inserted into the eye after removal of the natural lens affected by cataract. Earlier, after the removal of the natural lens, a thick positive powered glass (known as aphakic glass) was required to be worn by the patient. IOL obviated this need.

Aravind Eye Care System: History

Inception

Dr. V. was born in 1918 in a small village near Madurai as the son of a reasonably well-to-do farmer. He grew up in rural surroundings and was educated in local schools and colleges. He completed his M.B.B.S. in 1944 from Madras University, joined Army Medical Corps in 1945, and was discharged in 1948 due to rheumatoid arthritis. This was a difficult time for him, for he was practically bed ridden, unable to stand up or even hold a pen. His fingers were crippled. Due to sheer perseverance and great will power, he was able not only to start writing but also to wield the surgeon's scalpel. He then joined the Government service as an eye surgeon. He eventually became the Head of the Department of Ophthalmology at the Government Madurai Medical College in 1956. During his service Dr. V. pioneered state-level programs in 1961 to address blindness by establishing mobile eye camps. Villagers living in distant villages were reached by the mobile eye camps where their eyes were tested, diagnosed, and treated. In 1965 Dr. V. visited the United States for the first time to attend a conference on the rehabilitation of the blind. It was at this conference in New York that Dr. V. struck a life-long friendship with Sir John Wilson, the founder of the Royal Commonwealth Society for the Blind (now known as Sight Savers International), an organization that was supporting eye camps in India. Dr. V and Sir John Wilson went to the then Prime Minister of India, Mrs. Indira Gandhi, to ask for support for a national organization to control blindness. Dr. V. in the meanwhile had also accompanied the then Chief Minister of Tamil Nadu, Mr. Karunanidhi for his eye treatment, and the latter supported the government sponsored eye camps all over Tamil Nadu spearheaded by Dr. V. Even before Dr. V. retired, he was overseeing the growing network of eye camps all over Tamil Nadu and had developed a network of friends and well wishers across India who empathized with his passion for providing good quality affordable eye care.

Dr. V. was profoundly influenced by Mahatma Gandhi and Sri Aurobindo Ghosh, the sage philosopher who founded the famous ashram at Pondicherry. A strong need to give to society (rather than take from it) was imbibed in Dr. V. The name Aravind in the Aravind Eye Hospital was chosen to honour Sri Aurobindo. Wrote Dr. V:

Many people often ask me: What made me take up a task of such magnitude at the age of 58? I guess I drew my inspiration from the legacy of our great forefathers... Besides, there were inspirational leaders like Mahatma Gandhi and Sri Aurobindo whose philosophy and way of life influenced many. Naturally I felt impelled to give something back to this great land of ours⁵.

⁵ Aravind Eye Care System (2001). "Promises to Keep." Aravind Eye Care System, Madurai: 2001.

Growth

Dr. V. started a modest hospital with his personal savings and with partial government support⁶ for cataract surgeries done on poor patients from eye camps. From the beginning, a policy was put in place – there would be paying as well as free patients. The paying patients would be charged only moderately and not more than comparable hospitals in the city. There were to be no “five star” customers to cross subsidize the poor patients. Dr. V was certain that high productivity and volumes were necessary if the hospital had to be viable and generate a surplus for providing funds for expansion.

Indeed, the hospital generated a surplus from the very beginning and using such surplus generated it was possible to open a 30 bed hospital within a year, in 1977. A 70-bed hospital meant exclusively for free patients was built in 1978. The existing paying hospital building was opened in 1981 with 250 beds and 80,000 sq. ft. of space over five floors. The initial focus was on cataract surgery, but other specialties such as retina, cornea, glaucoma, paediatric ophthalmology, neuro-ophthalmology, uvea, low vision and orbit were gradually added. No compromises were ever made on the equipment: they were of the best quality and many were imported. However, the rooms (including those of doctors), waiting halls, and examination rooms were utilitarian.

Dr. V's sister, Dr. G. Natchiar her husband, Dr. Nam (who were also members of the Govel Trust), Dr. Nam's sister and her husband, all ophthalmologists at that time working in the government hospital at Madurai, were persuaded by Dr. V. to join in the very early stages of setting up of the hospital. Over the years other family members (all doctors) joined to head the different specialties. Many (including Dr. V., Dr. Nam, and Dr. Natchiar) had received training in the United States and had the reputation of being highly competent surgeons.

In 1984, a new 350 bed free hospital was opened to cater exclusively to free patients in Madurai. The top floor of this building accommodated the nurses' quarters. A basic model adopted by Aravind from the very beginning was that no surgeries were done at the eye camp sites, as was the common practice at that time. All patients were checked at the camps and those patients needing surgery were brought to the main hospital. The eye camp patients were for all poor patients and their treatment was “free” in the sense that the patients did not have to pay for the surgery. But the cost of IOLs was still quite high, and from 1992, IOLs were sourced from the new manufacturing facility, Aurolab set up to produce IOLs at an affordable cost. Usage of these lenses brought down the cost of providing cataract surgery with an IOL implant to about Rs.500 (essentially to cover the cost of IOLs, special sutures and medications). Through intense counselling and health education, IOL was systematically promoted both in eye camps and to the walk-in free patients at the base hospital. Both camp and walk-in free patients were required to pay Rs.500 for IOL surgeries, but for deserving cases, this could be waived by the doctor in charge at the Out Patients Department. Later, in 1995 when the Government of India launched a cataract blindness control programme with World Bank funding and offered a

⁶ Partial in the sense that though the government paid an amount for each surgery performed on poor patients from eye camps, this fell quite short of the total cost of the operation.

subsidy for the camp patients, the camp patients were not charged this amount. In stages, the number of beds increased to the present 1468 beds (1200 free and 268 paying) in the hospitals in Madurai.

In addition, other hospitals in other towns in Tamil Nadu were also being opened. In 1985, a 100 bed hospital at Theni, a small town 80 kilometres west of Madurai was opened (the desire for this was that it was Dr. Nam's birth place), mainly to cater for additional eye camp patients. A hospital with 400 beds was opened at Tirunelveli, a town 160 kilometres south of Madurai, in 1988. A 874 bed hospital was opened in 1997 at Coimbatore, the second largest city of Tamil Nadu to cater for the needs of the population in that area, and a 750 bed hospital at Pondicherry (a Union Territory but within the geographical area of Tamil Nadu) in 2003 to cater for the people living in northern Tamil Nadu (besides, it was the town where the Aurobindo Ashram was located). As of 2003, the five Aravind Eye Hospitals between them had a total of 3649 beds, consisting of 2850 free and 799 paying beds (for details of the beds in each unit, see Exhibit 2).

Growing from Hospitals into an Eye Care System

Though the initial focus of the Govel Trust was on building hospitals and reaching out to the poor to do cataract surgeries, it was soon clear to Dr. V. that, to reach their goal of eradicating needless blindness, several other activities had to be put in place. Thus over the years, these activities were added and Aravind Eye Hospitals evolved into the Aravind Eye Care System. The Aravind Eye Care System had many divisions: Aurolab, the manufacturing facility set up primarily for manufacturing intraocular lenses; a training centre named Lions Aravind Institute of Community Ophthalmology (LAICO); a centre for ophthalmic research named Aravind Medical Research Foundation; a research centre for women and children named Aravind Centre for Women, Children and Community Health; and an international eye bank named The Rotary Aravind International Eye Bank. The details of these divisions are given later in the case. All the activities of these divisions were related to the core mission of eradicating needless blindness.

Blindness in India

Blindness could be classified into different categories (see Exhibit 3 for the categories and how they are defined). In India, it was estimated that about 12 million people were bilaterally blind and another 8 million were blind in one eye. About 36 million had low vision (which needed to be monitored and attended to in due course).

The variation in the prevalence of blindness among the states was considerable. Blindness in the 50 years or older age group (the group which accounted for 90% of all blindness and about 16% of the population), for example, varied from 4.3 percent in Kerala to 13.7 percent in Karnataka.

Cataract was the commonest cause of blindness, accounting for 62.6 percent, followed by uncorrected refractive errors (19.7 percent). The other important causes for bilateral blindness were glaucoma (5.8 percent) and posterior segment pathology (4.7 percent).

Exhibit 4 gives the cross section of the human eye. Cataract is a condition in which the eye lens becomes opaque. The degeneration is progressive and takes place over five to ten years. Earlier, the surgical procedure was to remove the lens when it had become more or less fully opaque (the so called, maturity) and a thick, positive power spectacle lens (known as aphakic glass) was prescribed to substitute for the natural lens. About 40 percent of cataract surgeries carried out in India in 2003 were still of this traditional type. The modern technique, however, was to insert the intra-ocular lens (IOL) inside the eye in place of the lens that was removed. The IOL surgeries enabled less hospitalisation, quicker post-operative recovery, and quicker restoration of sight (in a week to ten days). In a further improvement, IOL lenses were also available in foldable material. These lenses were “folded” and inserted through a small opening into the eye and it “opened out” inside the eye. These lenses required a smaller incision and hence recovery period was even shorter than that required for non-foldable lenses. Multi-focal lenses to take care of both distant and near vision were also available.

Another major improvement in surgery was through a technique called phaco emulsification, in which the opaque natural eye lens was pulverized using ultrasonic beams and then extracted through suction. IOL was then inserted as usual. This technique enabled the patient to return home two to three hours after the surgery.

IOL insertion required advanced training of surgeons in microsurgery and was always done under a microscope (in contrast, the traditional method did not require a microscope). In trained hands, the time taken to conduct IOL and non IOL surgeries were not very different as was seen by the case writers: about 12-15 minutes for the operation itself (excluding preparation, post operative bandaging etc.) Phaco surgery required both specialized doctors and specialized and expensive equipment (the cost of a good phaco equipment started at Rs.600,000).

Glaucoma was the third common cause of blindness⁷ problem. In the eye, there is a constant circulation of a fluid (aqueous humor) in the anterior chamber and is drained out. If the fluid exit is blocked, pressure builds up in the eye, and if it becomes high, it can damage the retina and the optic nerve. Unlike cataract, glaucoma was a silent killer of vision. The patient would get no symptoms or warnings. Diabetics were very prone to glaucoma. While cataract was usually age related, glaucoma could attack at any age. Due to its insidious nature, regular check up was the only preventive measure possible.

An estimated 3.7 million cataract surgeries were done per year in India by about 9000 ophthalmologists. In Tamil Nadu (population as per Census 2001: 62,110,839), 370,031 cataract surgeries were done in 2001-2002. Government hospitals did about 7.17 percent of these; 10.16 percent were done in eye camps, 7.86 percent in private clinics and the

⁷ More specifically primary open angle glaucoma. There are other types of glaucomas also, the incidence of which are rare.

rest (74.82 percent) by non-profit organizations (Aravind Hospitals came under the last category)⁸.

Besides Aravind Hospitals, the other major eye hospitals in Tamil Nadu, and the number of surgeries done by them per year, as per the information given by Aravind Eye Care System, were:

Sankara Nethralaya, Chennai:	25,000
Joseph Eye Hospital, Tiruchirapalli:	27,000
Sankara Eye Society, Coimbatore:	30,000
K.G. Eye Hospital, Coimbatore:	6,000

Tamil Nadu was the leader among Indian States in IOL surgeries, with 91 percent of surgeries done with IOL implantation. The all India average was 65.4 percent. Other states leading in IOL surgeries were Andhra Pradesh (79.7%), Orissa (79.3%) and Maharashtra (71.5%)⁹.

For reaching out to the rural areas, eye camps were a popular way. These camps were organized in different villages with prior publicity in the form of posters, announcements from vehicles and pamphlets. Charitable trusts or individuals sponsored the eye camp and did prior publicity of the eye camps. The cost of surgery and treatment was supported by the government and by institutions such as the World Bank. The eye camp check-ups and subsequent treatment were free for the patients. On the day of an eye camp, patients were examined and those requiring surgery were advised. In some camps, surgeries were done *in situ* in make shift tents. AEH felt this was neither hygienic nor productive and, as mentioned earlier, it did the surgeries only in its base hospitals. Follow up checks and prescriptions of glasses were done in subsequent follow up camps or during patients' visits to hospitals.

Aravind Eye Hospitals: Work Flow

Out Patient Departments

The workflow in the outpatient (OP) departments of the different units of Aravind Eye Hospitals, whether at the paying or free sections was essentially the same. Patients would start gathering much earlier than the starting hour of 7 A.M. and wait in the designated waiting areas. At 7 A.M., sharp, the first patient would register in the reception. The computerized registration took about a minute per patient after which the patient would move on to the case sheet counter located adjacent to the waiting hall. The counters generated, through computers, the case sheet and the patients were escorted to the doctors by the staff. Three computers were used for new cases, and one for old cases, and they could handle 200 cases per hour. Trained paramedical staff did the preliminary checks on

⁸ "Achievements under Cataract Blindness Control Project: 1994-2002", NPCB-India, *Quarterly Newsletter of National Programme for Control of Blindness & "Vision 2020: The Right to Sight Initiative"*, 1(2), July-September 2002.

⁹ *Ibid.*

the patients and trained refractionists rather than doctors did basic refraction tests. The patients then met the Resident doctors at the examination stations (usually four to five) who would record their diagnoses and recommendations. The final disposal of the cases was always done by a medical officer, a permanent doctor of the hospital. The whole process could take about two hours for a patient, but of course this would vary depending on the tests needed. The paying OP examined 1000 patients per day, six days a week.

Many patients were advised glasses after the refraction tests. After the glasses were prescribed, they could (but were not obliged to) go to one of the spectacle shops located in the hospital. These shops were run as a separate profit centre. These shops sold spectacles at less than what they would cost in an outside optical shop. There were separate shops in the free and paying hospitals but the prices of similar spectacles were the same in all the shops. The grinding of the glasses and their fitting were done in house while the patients waited, rather than asking them to come after one or two days, as was the practice with most of the optical shops in India. The system at Aravind thus saved time for the patients. This enabled the patients to go out of the hospital with glasses, in a time slot of three to four hours.

For those needing surgery, the patients were admitted immediately (subject to room availability) or the patients could choose a later date. In the case of paying patients, they could also choose the type of surgery (with the type of lenses preferred, namely, rigid, foldable etc., and whether they preferred phaco surgery) and the type of rooms. They could also indicate whether they wanted a particular doctor to carry out the surgery¹⁰. All these requests were processed on the computer, and an admission/reservation slip would be generated and given¹¹. The entire process of helping the patients to make their choices was carried out by a set of counsellors (who were paramedical staff) who explained the alternatives, the type of surgeries that would be carried out, the after care needed, the likely time to get full vision and the costs. The rate card showing the rates for different types of surgeries and different categories of rooms was shown to the patients to help in their choice. Pictures of the alternative rooms were also shown along with the facilities available. Dr. Aravind Srinivasan, who accompanied one of the case writers on a tour of the hospital said:

In many hospitals, many of these functions (especially refraction testing) are carried out by doctors. We seek to maximize the doctors' contribution by helping them to devote their time mainly to medical advising. Tests that can be done by paramedical staff are done by paramedical staff only. Our counsellors are highly trained to help the patients to take informed decisions, so that doctors are not required to spend their time on such matters.

What impressed the case writers was the smooth manner in which patients moved from place to place. They were always given clear directions where to go next; no one had to

¹⁰ Free patients could not choose their doctors. We were told that the actual exercising of this facility even by paying patients was not very common.

¹¹ For free patients, phaco surgeries were not available. Of course, all except those contra-indicated, were given IOLs, but free patients were given only rigid lenses.

enquire where to go or where a facility was located. This led to a lack of crowding in the waiting hall, quite unusual in a hospital of this size. There were paramedical personnel stationed at critical places for directing people to avoid confusion and crowding.

The doctors doing surgery did so only in the morning; and attended the out patient department (O.P.) in the afternoon. The doctors were rotated between free and paying hospitals, so that both the categories of patients received similar quality of medical attention.

Surgical Wards

The workflow in the surgical wards at Madurai was equally smooth and efficient. At 6.45 A.M., one of the case writers was picked up by Dr. Aravind Srinivasan to enable the case writer to observe the procedure for cataract surgery.

At 7 A.M., the doctor and the case writer were in the surgical gowns and masks. The names of patients to be operated on during the day in each theatre were put up. This scheduling was done using a software, which incorporated all the preferences expressed by patients at the time of their registration, including preferences for particular doctors. The nursing staff had already come at 6.30 A.M., and the patients for the day had been moved to a ward adjacent to the operating theatres. The patients to be operated on soon had been given the local anaesthetic injections and their eyes washed and disinfected. At 7.15 A.M., when Dr. Aravind and the case writer entered the theatre, already two patients were on two adjacent operating tables. In general, in many hospitals, two operating tables were not kept in an operation theatre because of the risk of infections. However, AEH had been following the system of having more than one table in an operation theatre from its inception and had not had any problems since all eye patients were otherwise healthy and the chance of cross infection was considered to be very small. This was vindicated by the low rates of post operative complications (see Exhibit 7) experienced.

The operation theatre had four operating tables, laid out side by side. Two doctors would operate, each on two adjacent tables. Dr. Aravind's first patient was on table #1, ready for the operation, with the microscope already focused, instruments ready and the nurses fully ready. Dr. Aravind commenced his operation, which could be seen by the case writer on a CC television through a camera attached to the microscope, and the doctor kept giving a description of what he was doing, for the benefit of the case writer. It was a phaco operation, and the entire procedure took about 12 minutes. The team consisted of one doctor and four nurses.

By the time the first operation was over, the second patient was ready with the microscope focused on the eye to be operated on. Dr. Aravind moved straight to table # 2, as soon as he finished the first operation. The first patient was bandaged by the nurses and moved out. The third patient, who had in the meanwhile been moved in (they usually walked in on their own) was sitting on a bench in the theatre. As soon as the first patient moved out, the third patient was put on table # 1 and readied for the operation.

The case writer observed that as soon as the second patient was finished, the doctor moved back to table # 1, with virtually no loss of time. He was constantly moving between table # 1 and 2, with hardly any break. In the same way, another doctor operated on tables # 3 and 4. Later on, in response to a query by the case writer, Dr. Aravind said:

I work like this the entire morning from 7 A.M. till 1 P.M. or 1.30 P.M., or even later, if there is a large number to be attended. Most doctors take a break for breakfast and a brief tea break may be for five to ten minutes. Usually I do about 25 surgeries in a half-day session. Most do this number.

No cataract surgeries were done in the afternoon. The theatres were scrubbed and cleaned and instruments sterilized. The patients who had already been operated on were moved back to their wards.

The procedures in other hospitals that the case writers visited in Theni and Coimbatore were the same. The Coimbatore hospital was a newer and an integrated well designed hospital with all the specialties and also the facilities for training for the Dip NB (equivalent to MS) program. It also conducted short-term specialized programmes for doctors from other developing countries. The basic workflow for the outpatients and the surgeries was the same as it was in Madurai. The Theni hospital was smaller and did not do paediatric and retinal surgeries.

Exhibit 5 gives the details of the number of surgeries done and the out patients attended to from 1997 by all the hospitals under the Aravind Eye Care System. Even in a small hospital like Theni, the three doctors stationed there performed 6000 operations every year. We were told that in most eye hospitals, each surgeon did about 300 surgeries per year, while in Aravind hospitals, it was about 2500 surgeries per year. Exhibit 6 gives the details of OP visits and major surgeries done in each hospital unit of the Aravind Eye Care System.

Said Dr. Aravind:

We work like this for six days a week. Most of the Sundays we go out to the eye camps, and spend at least half a day testing the patients. Sometimes if one is lucky, one may get one Sunday off in a month.

He continued:

Besides surgery, we do OP work, and many do research as well. To us, this hospital is our life. We have dedicated our lives for this one mission.

The paying wards had regular beds on cots but the free wards had “beds” in the form of mats on the floor. Two types of mats were used to distinguish the eye camp patients from the walk-in free patients. The use of mats enabled better utilization of floor space — about 30 patients could be accommodated in one room.

The Aravind Eye Hospital, Madurai had an excellent IT system that kept track of all the patients. The system generated daily schedules taking into account the load on that day,

patients' preferences for doctors, and the pending work. This enabled the hospital administration to keep track of the workload in different units. The details of complications in terms of categories of patients and the surgeons were maintained. The abstracts of medical records of patients were entered into the system, including their past clinical visits, and this enabled a history sheet to be generated for an old patient quickly.

The Aravind Hospitals were very particular about the quality of the surgeries done, as revealed by the complication rates. Though some of it was beyond the control of the hospitals, the Aravind management kept a very close track of the intra-operative as well as post-operative complication rates. The major complications were very much under control and were considered highly satisfactory, according to the doctors at Aravind. All the same, each case of complication was traced to the operating team that had performed it, and the reasons identified. Corrective action, including training of whoever was found deficient, was undertaken. Exhibit 7 gives the complication rates experienced at Aravind Hospital, Madurai in 2002.

Eye Camps and Community Outreach Programmes

The Aravind Eye Care System considered its community outreach programmes as absolutely vital to its mission. The only way people in many rural areas could get access to eye care was through eye camps. Eye camps were organized by different agencies and conducted differently. Aravind organized about 1500 eye camps per year.

Each Aravind Hospital had its own set of camp organizers who planned their activities for each calendar year. Generally each district had a camp organizer who set a target for the year based on the population, estimated percentage of blind people, estimated turn out at the camps and percentage needing surgeries. The camp organizers then had to find the needed sponsors. The case writers were told that finding sponsors was not a problem. Generally, local NGOs, Lions and Rotary Clubs, local industrialists and businessmen and philanthropists were the sponsors. Sponsors took care of the expenses connected with publicity such as posters, pamphlets, banners, announcement from vehicles and the organization of the camps (usually in some school or public place). The camps were held usually on Saturdays and Sundays and started early in the morning. Lunch arrangements were made for those who were to go for surgery to the hospital. Patients requiring surgery were provided free transportation to and from the hospital in addition to the free surgery, stay, and food in the hospital. These expenses were also borne by the sponsors. All medication that was needed for 40 days after surgery was also provided free by the hospital.

Doctors (mostly post graduate residents) and paramedical staff usually reached the previous evening and camped for the night depending on the distance. They saw the patients in the morning. The patients were registered with the help of local volunteers, and given a case sheet and an identity card. The identity cards helped in future follow-up. The paramedical staff did the preliminary tests for refraction and all patients above 40 years of age were tested for their intra-ocular pressure to screen for glaucoma. Doctors examined the patients and gave their advice (for surgery, glasses etc.). Senior doctors evaluated the test findings, performed the final examination, reviewed the patient records,

made the final diagnosis, and prescribed the treatment. An optician also accompanied the team and based on forecasts took a stock of ready lenses and a wide selection of frames. The grinding equipment required to edge and fit the lens to the selected frame was also taken along. Thus those who were advised glasses could purchase them on the spot and the glasses could be delivered within one hour right at the site. About 75 to 90 percent of those prescribed glasses opted to purchase them at the camp site itself. Over 85 percent of those who opted to purchase the spectacles at the camp site got them immediately. For the others, the optician took the order and delivered the spectacles the next week at the same campsite, or couriered it to the patient at the optical shop's cost. This innovation of having a mobile optical shop was devised after a study of barriers to refractive correction. Mr. R.D. Thulasiraj, Executive Director, LAICO who was earlier the Administrator of the Madurai Hospital said:

We found that the costs associated with activities involved in procuring a pair of glasses such as going to the shop at least twice, going to the doctor for a final check etc. were higher than the cost of the pair of glasses themselves. If the cost of time, cost of travel, and other incidental costs were put together, getting a pair of glasses became prohibitively expensive. As a result we found out that many people who were checked at the camps did not end up getting a pair of glasses and the cycle of needless blindness/poor sight continued.

It was thus decided that if the cycle of refractive error blindness had to be circumvented it was important to be able to provide glasses to the eye camp patients soon after their refractive errors were detected. It was found through an analysis of data that the most time-consuming part of readying the spectacles was preparing the glasses correctly as per the prescription. Based on the large data AEH had of the probable refractive needs of patients, a forecast was made before each eye camp as to how many lenses in each power should be taken to the camp to meet the projected need. The fitting of the glass to the frame was done at the campsite and spectacles were provided there and then to the patients. However, patients did have the choice to not buy spectacles at the camp.

In the advertisement of the camp, the blind patients were usually advised to come prepared to go to the base hospital for surgery. Thus most came with their bags and, often, with relatives who would accompany them. The persons needing surgery and willing to undergo it were then counselled regarding the procedure, length of stay, and facilities at the base hospital. If they agreed to go to surgery then they were taken to the base hospital after lunch. After rest, they would either be operated the next day or the day after depending on the workload. Their basic needs such as food during their stay were taken care of by AEH

The persons from one camp belonged to the same or adjoining villages travelled together, were operated on the same day, and stayed together in the hospital. They thus formed a network of mutual support. This group of patients and relatives returned after about three days in a common transport. The hospital met the cost of surgery including cost of IOLs, sutures and post-operative medication for forty days, of which the government

reimbursed to the extent of Rs.500 per patient.¹² The cost of the doctors' travel to and from the campsites was mostly met by the hospital.

The cost of an eye camp to the sponsor varied with the nature of the camp. A "small" camp with 300 outpatients (leading to about 60 patients for surgery) cost Rs.6700 while a large camp, with 1000 outpatients and 200 surgeries cost Rs.42,500 to the sponsor.

The Theni hospital did eye camps in two districts in the adjoining state of Kerala. The hospital opened in Pondicherry was expected to reach out to some of the villages in Andhra Pradesh, another adjoining state.

Exhibit 8 gives the number of camps organized by Aravind Hospitals in the last five years from 1998-2002 and the numbers of patients treated from camps (apart from "walk-in" free patients at the hospitals).

Other Community Outreach Programmes

Diabetic Retinopathy Management Project: Started in 2000, this project aimed at creating awareness about diabetic retinopathy in communities. In the year 2002, 46 eye camps were organized in which 11,644 persons were examined. Of these, 3,443 were diabetics, who all were screened for retinopathy. Of the persons screened, 533 turned out to have retinopathy. Patients needing surgery were so advised. Extensive campaigns were also conducted through leaflets, posters, and booklets on diabetes and its effect on retina.

Community Based Rehabilitation Project, a project undertaken by Theni unit since 1996 and supported by Sight Savers International aimed at rehabilitating incurably blind persons through community based support. House-to-house identification of eye problems and screening camps were organized and patients with eye problems were treated. Rehabilitation consisted of teaching the incurably blind people skills in orientation, mobility and activities of daily living. Some were economically rehabilitated through building of appropriate skills.

Eye Screening of School Children was another program aimed at screening school children for eye defects and taking corrective measures early. Teachers were trained to measure visual acuity and identify signs of squint and vitamin deficiency and screen the children. The identified children were then tested by ophthalmic assistants and later by ophthalmologists. In 2002, 68,528 children in 80 schools were screened and 3,075 given glasses to correct refractive errors.

Use of IT Kiosks for Tele-advice. This initiative was launched with the help of the Indian Institute of Technology (IIT), Chennai. Under the guidance of Dr. Ashok Jhunjunwala, a professor at IIT, Chennai, a number of IT kiosks were being put up all over Tamil Nadu by a company called n-Logue. In one cluster of villages near Melur, about 40 kms. from Madurai, the IT kiosks were provided with web cameras which enabled patients to the

¹² Actually, this was reimbursed based not on the number of patients operated but who turned up at the follow up camp. Since many did not turn up in these camps, the hospitals were denied reimbursement to that extent.

picture of their eyes and send them as attachments to E Mails along with a voice description of the problem to doctors at AEH, Madurai. One doctor was nominated to take care of these E Mails. The doctor would make the diagnosis based on the description given by the patient and the picture sent, and give the advice to the patient. This was not, however, an on-line service.

Other Units and Activities of Aravind Eye Care System

Aurolab

The cost of surgery was always a central concern at AEH. As noted earlier, AEH had decided on the IOL technique as the standard technique to be adopted in all cases (except where this could not be done). But in the eighties, the cost of IOL lenses (all of which were imported) was very high, about \$80-100, and this made the cost of surgery quite high. Hence in 1991, AEH set up a facility to manufacture lenses. Named Aurolab, this was set up as a separate no-profit trust with the mission of achieving “local production at an appropriate cost”. Some of the members of the Aurolab Board were common with Govel Trust. The technology was obtained from “IOL International”, Florida, USA., with a one-time fee paid to the company for technology transfer. This venture was also supported by Seva Foundation, Sight Savers International, the Combat Blindness Foundation USA, Canadian International Development Agency (CIDA) through Seva Service Society, and Mr. David Green, an Ashoka Fellow and Executive Director of Project Impact Inc. situated in California.

Aurolab employed 220 people out of whom 10 percent were diploma or graduate engineers, pharmacists, and marketing personnel, and 90 percent were specifically trained women. Girls with 12 years of formal education from rural areas were selected along with the selection of the ophthalmic assistants for AEH. For 6 months they received the same training as the ophthalmic assistants and in the next 18 months specific training was given for manufacturing of lenses.

Raw material for the lenses was imported from US/UK. The rigid IOL were produced for less than US \$5 at Aurolab. In 2002, Aurolab produced about one fifth of the total number of low end lenses produced in the world. However, it also produced rigid and foldable lenses as well as superior categories such as acrylic lenses. Aurolab had been able to get the CE Mark (a mark of quality) and ISO 9002 certification. As on 2003, Aurolab produced about 700,000 lenses per year (with single shift working). Large non-governmental organizations such as Lions and Rotary also bought IOL lenses from Aurolab and supplied it to various eye hospitals all over the world. This increased sales worldwide and 33 percent of the IOL's produced were exported. Of the 67 percent consumed domestically, 20-25 per cent was by AEH and the rest were sold in the open market. Since inception Aurolab had supplied more than 2 million lenses to non-profit organizations in India and 85-90 countries.

In 1998 Aurolab diversified into manufacturing of sutures used in the IOL surgery. The sutures are made from silk and nylon and come attached to a tiny stainless steel needle. The cost of the sutures at Aurolab was one fourth of the price of imported sutures.

The Managing Director of Aurolab, Dr. Balakrishnan, Ph.D. was proud in saying that

Aurolab was responsible in driving down the prices of IOL all around the world. Our lenses are high quality, low price, and take us nearer to our goal of eliminating needless blindness.

Over the years Aurolab had been organized into four distinct divisions: the IOL Division, the Sutures Division (both described above), a Pharmaceutical Division, and a Spectacle Lens Division.

The Pharmaceutical Division of Aurolab produced pharmaceuticals used in cataract surgery and for other eye-related needs at a reasonable cost. They were usually those items not easily available or available at a high cost. The total number of drugs formulated by Aurolab was 25 in 2002. It was the sole Indian manufacturer for Econazole, Coltrimazole, and Prednisolone Sodium Phosphate eye drops¹³. Aurolab pharmaceuticals and suture needles were covered under the Indian Drug Control Act and were WHO GMP certified. The international certification also made it possible to sell its formulations in the international market.

The Spectacle Lens Division provided technical support services for the production, quality control, and training for the optical shops located inside the Aravind Eye Hospitals. Since detection and correction of refractive errors through spectacle lenses had been identified as a major requirement for reducing avoidable blindness by the World Health Organization (WHO), the spectacle lens division was set up in 1999 to improve the prescription and provision of spectacles. A laboratory with plastic lens surfacing and computerized edging facility was established to research and refine the process. Lens edging facilities were established close to the optical shops for quicker delivery. Technology for scratch resistant coating system to provide hard coating on both sides and providing colour tints to satisfy the needs of low vision patients had also been acquired and were being used to produce the needed lenses.

Lions Aravind Institute of Community Ophthalmology (LAICO)

In the early 1990s, Aravind started collaborating with Lions Club International Foundation, a voluntary organization for community service. LAICO was established in 1992 with the support of Lions Club International Sight First Program and Seva Sight Program. The objective of LAICO was to improve the planning, efficiency, and effectiveness of eye hospitals with a special focus in the developing countries. LAICO contributed to eye care through teaching, training, research, and consultancy. LAICO offered long term courses in hospital management as well as short duration skill development courses in the area of community outreach and social marketing and instruments maintenance. These courses were offered at very reasonable prices. The list of courses, their duration, and the fees charged in March 2003 are shown in Exhibit 9. LAICO had already worked with 149 eye hospitals in India, Africa, and South East Asia.

¹³ Information taken from 2001 Activities Report.

It was Asia's first international training facility for blindness prevention workers from India and other parts of the world.

LAICO also worked closely with identified eye hospitals in their capacity building. The AEH staff first visited the hospitals requesting such support to understand "the ground realities" regarding their problems, bottlenecks, and constraints. Then it invited some personnel from the hospitals for training at LAICO. The training consisted of visiting the Aravind hospitals as well as its outreach camps to study the workflow. At the end of the training, a full action plan had to be made and the progress assessed after six to nine months.

LAICO had made interventions in UP, West Bengal, Orissa, Delhi, and a few other states in India. It had also made interventions abroad in different countries among which were Malawi, Kenya, Zimbabwe and Zambia. In some countries, in addition to the training of doctors, the nurses from Aravind were sent for a month to impart rigorous training. In most interventions, quite dramatic improvements were recorded. Relating the experience in Chitrakoot, MP, Mr. Saravanan, a Faculty member of LAICO said:

In Chitrakoot, they were doing 20,000 to 25,000 surgeries per year. Ninety percent of this was done in a three-month period. Of the surgeries, 70 to 80 percent were non-IOL surgeries. Only in slack periods would they take up IOL. After our intervention, they were able to do 25,000 to 30,000 surgeries per year, all IOL. Our aim in such interventions was to enhance not only their capabilities but also their skills.

The performance of hospitals before and after intervention may be seen in Exhibit 10. The data are for 40 hospitals two years after an intervention.

LAICO in collaboration with International Agency for Prevention of Blindness (IAPB) had committed to achieving the "Vision 2020: The Right to Sight" global initiative. Mr. Thulasiraj was the regional chairman of IAPB, Southeast Asia Region and was thus able to involve in policy making for eradicating blindness at both the international and the national level.

Aravind Medical Research Foundation

A number of clinical, population based studies and social and health systems research were conducted using the data readily available in the hospitals and the community outreach programs. The Aravind Medical Research Foundation coordinated the research needs. Many of these research projects were supported by different agencies and some by AEH itself. The research covered a variety of fields such as "clinical trials" to evaluate alternate surgical techniques and drug therapies, impact of vitamin supplements on morbidity and mortality of infants and children, beneficiary assessment, impact assessment of cataract intervention, barriers experienced by patients in accessing eye care sources and infrastructure utilization in eye care. Dr. VR. Muthukkaruppan, who was earlier a professor of immunology at the Madurai Kamaraj University and a former Vice

Chancellor of Bharathidasan University, Tiruchirapalli, had been appointed to provide leadership to the research efforts of Aravind Medical Research Foundation.

Exhibit 11 gives the research projects, ongoing as well as completed, at Aravind.

Aravind Centre for Women, Children and Community Health (ACWCCH)

The centre, started in 1984, aimed at reducing nutrition related blindness in children through programs of preventive health care. It worked with government public health programs of immunization, education programs on nutrition and training programs to create awareness. It conducted regular village health programs and training programs for village health care workers.

Rotary Aravind International Eye Bank

This Eye Bank established in 1998, was one of the four eye banks in the country affiliated to the International Federation of Eye Banks. Till 2003, the Bank had processed 4383 eyes; the hospitals had conducted 2181 transplants.

Aravind Post Graduate Institute of Ophthalmology

As part of its efforts to train ophthalmologists, AEH introduced the Residency (post graduate) Program in 1982 and with this the name of Aravind Hospital, Madurai was changed to Aravind Eye Hospital & Post Graduate Institute of Ophthalmology (AEH&PGIO). AEH&PGIO admitted around 30 resident doctors as of 2003. All admissions were strictly on merit and no admission or capitation fee was collected while the going rate in 2003 was about Rs.1.5 to 2 million at other private teaching hospitals. Affiliated to Dr. MGR Medical University, Chennai, it offered the Diploma in Ophthalmology (DO), and the MS in Ophthalmology (MS). Eight candidates earned their DO and four graduated with MS in 2001; in 2002, six graduated in D.O. and four in M.S. In affiliation with the National Board of Examination, New Delhi, the Aravind Eye Care System offered the Diplomate of the National Board. Nine students qualified in 2001 and 13 in 2002. In affiliation with The Royal College of Ophthalmologists, London, UK, membership of the Royal College of Ophthalmologists (MRCOph) and FRCS was offered. Four candidates passed Part 1 of the MRCOph in 2002¹⁴ and four candidates received their FRCS. It also took Fellows for further “super” specialization in such fields as retina-vitreous, cornea, paediatric ophthalmology, glaucoma, anterior chamber, and uvea. In addition it conducted programs on various short-term courses for practicing ophthalmologists and many areas generally connected to ophthalmology.

Recruitment and Training in the Aravind Eye Care System

AEH laid great stress on the kind of people it recruited. Said Dr. Natchiar, who was in charge of training of paramedical staff, to the case writers:

We have a ratio of about 1: 6 between doctors and nurses. Then we have also about 40 counsellors. We have about 900 girls between our four hospitals and Aurolab. We recruit girls from rural backgrounds; generally we do not prefer

¹⁴ In 2002, 11 candidates appeared from India, of whom 5 were from Aravind. Of the 7 candidates who cleared that year, 4 were from Aravind.

urban girls. We take them between ages 17 and 19; very rarely more than 19. We look for girls from large families, probably farmers' families, with the right attitudes. Knowledge and skills are important, but they come second. We never advertise: usually once a year, we put up a notice in our hospitals indicating our intention to recruit, and word of mouth carries the news. Between the selection cycles about 400-500 applications are received. We take about 60 - 100 girls per year. Selection for all the hospitals is done only in Madurai and Tirunelveli. I along with Dr. Usha (a younger ophthalmologist and a member of the family who was being groomed to head recruitment and training of nurses) and the head nurse are involved in all selections. Parents are always called for the interview as well.

We look for the right kind of person. We give no consideration at all to any letters of recommendation from anyone.

After recruitment, we give them two years' training. The training is considered to be excellent and is recognized in U.S.A., and the Government of India is considering adopting our training syllabus for nurses' training. During the training period, we rotate them among all our different hospital units.

The ophthalmic assistants in the first 4 months were trained in basic sciences and details about human anatomy and physiology. By the end of the first four months, the trainers and Dr. Usha, who headed the training of nurses, selected the ophthalmic assistants for the different tasks, such as, out patient department, operation theatre, counselling, etc. The criterion for making such decisions were not very clearly articulated but were clearly understood by the team. In the next eight months they received special training for the department they were chosen for. Following this, the next six months were spent in apprenticeship with a trainer nurse working in the same department. There was one-on-one training at each step. During the last six months they worked on their own with some guidance from senior nurses and doctors. The training for the nurses was essentially in Tamil (the vernacular language spoken in the state); they were also taught some basic medical terminology in English and trained in basic conversational English.

This training was designed after the training program for ophthalmic assistants that Dr. V. coordinated in 1973 for rehabilitation work funded by USAID. The training program did not lead to a degree recognized for the ophthalmic assistants. There were efforts underway in February 2003 to formalize and write up the training modules with the help of qualified volunteers from USA.

Dr. Natchiar also added that

At the end of two years, we ask the parents to accompany the girls who would like to be absorbed permanently. Parents' consent is always taken. In our experience, 99 percent of the trainees stay on with us. Those who we consider to be unsuitable, mainly due to their attitude, are not given job offers.

During the three years of their service as permanent employees, the ophthalmic assistants were also imparted training in cooking, housekeeping, tailoring, etc. This helped them to

be prepared for becoming good housewives in the future. The cost for these programs was borne by the Aravind Eye Care System. Voluntary *bhajan* (devotional songs) and yoga sessions were also organized in the evening. The nurses were encouraged to be kind to the patients at all times and approach them with thankfulness for providing them an opportunity to serve. The nurses were asked to save a part of their salary, saved in a bank account in their name, so that they had a sizeable sum saved for their marriage.

In reply to a question on what these nurses found good in this hospital, Dr. Natchiar replied:

More than salaries, it is the recognition that they get in society. They get a lot of respect. Then they also get very good training and experience here. Opportunity to go abroad, even for short periods, is also seen as a positive factor.

The nurses felt very proud to work at AEH. One of the senior nurses said:

I work more than the government hospital nurses do; I get paid a little less or at par with them, but I get much more respect in the society. When I go in the bus, someone will recognize that I work in AEH and offer me a seat or be nice to me. I really feel happy about it.

Dr. Usha said:

The ophthalmic assistants are at the core of our success. They add so much to the Aravind Eye Care System.

Dr. V. said:

The senior nurses appreciate the atmosphere of peace and quiet efficiency and set an example for the junior staff.

All staff members were expected to imbibe the right culture and values. The photographs of Aurobindo and the Mother could be seen ubiquitously everywhere in the hospital. When the new unit was opened in Pondicherry, two old time “founder” sweepers from Madurai were sent to train other sweepers in the right attitudes and values.

Doctors were crucial at AEH. Most were inducted as Residents. The Residency Program led to a Masters’ degree in Surgery (MS) and was for three years during which period they were given a stipend. MS degree was almost essential for further practice. AEH took about 30 residents every year in its various training programmes. During Residency, the residents were given full exposure and training in all branches of ophthalmic surgery. At the end of training, many were offered jobs as permanent Medical Officers in the Aravind Hospitals. Most of the residents accepted the offer.

In addition to the Residency Program, AEH had a Fellowship Program as well. Fellows were those who already had an MS degree but who wanted to specialize in a particular branch say, retina-vitreous, cornea, paediatric ophthalmology, glaucoma, uvea or orbit. Fellowships were usually for 18 months and did not lead to any degree. During

fellowship, the candidates got a stipend. There were 15 Fellows in Aravind, in various specializations.

Said one Fellow who was interviewed by the case writers:

I already have an MS degree. But we did not get adequate exposure to surgery in our course. Also here we have a large number of specializations not available elsewhere easily.

Said another:

We did not get adequate surgical exposure in MS. This is usually the case in many colleges, especially North India. I get exposed to different kinds of IOL surgeries as well as plastic surgery. In Delhi, where I studied we did not have so many cases of varied nature. They did not have a phaco machine there. There we did about one or two cases of surgery per month; here we do some 30 cases per day!

Most of the Fellows did not join AEH after completion of their training, since they were from different parts of India and had come to AEH to get trained in particular specialties. Those who joined were largely from the local area.

There was also a focus on the professional growth of all the doctors. Attendance in “Journal Rounds” for all medical officers and fellows was a must. At this forum, a medical officer or Fellow picked up an article of interest from a journal and presented it to all others. There were also the “Grand Rounds” where doctors of all the units of AEH discussed pre-decided topics through tele-conferencing.

There was strict monitoring of quality. Morbidity meetings were organized every week in a non-threatening manner. Complication rates of individual surgeons as well as that of the hospital were calculated every month. Dr. V and others stressed very much on the quality of eye care provided at AEH.

Dr. Nam said:

Our destination is “good sight”. We provide our doctors with the best that is available in the world. We train them through exchange programs with prestigious medical schools all around the world. With several universities we have set up very rewarding collaborative research programs.

One of the residents from Harvard Medical School who was in Madurai during the visit by one of the case writers said:

Here I get more clinical experience than any of my classmates at Harvard. I also get to see many instances of rare eye diseases. In Harvard, I would only read about them. Here I see them.

Said one Medical Officer:

I see the following plus points here. I am at my home place. We get a very good exposure to the latest surgical techniques. We also get opportunities to practice

tele-medicine with eminent people¹⁵. If you want to be abreast of latest techniques in ophthalmology, this is the best. We get opportunities to do research, attend international conferences and present papers. We can attend one or even more than one conference each year.

I am in charge of the newly set up Vision Rehabilitation Centre. My long term mission will be to develop this centre, using new techniques such as magnifying devices and developing skills for the visually handicapped to improve the quality of their life. I plan to set up similar rehabilitation centres in other hospitals too.

Asked whether he found time for research in the midst of all these activities, he said:

Time is not a problem. Those interested can find the time.

But this was not the view of another:

It is all right to say you have a lot of opportunities to do research. But after a long day of 12 or 13 hours, how many can find the energy to do research? We have full days here.

Said another doctor:

We do commit ourselves totally to the cause of eradication of avoidable blindness. That means we have to do a certain number of surgeries every day. But subject to this, we have quite a lot of flexibility.

We have a unique culture based on service. All the doctors speak softly to patients and nurses. No shouting here. If a doctor behaves in an unacceptable manner, word goes around the hospital in no time, and the doctor will be in trouble. We believe in mutual respect as a core value.

Going for camps together with ophthalmic assistants and other administrative staff of the hospital also increased bonhomie and understanding among the different categories of staff.

Said Mr. Thulasiraj, who had an MBA from Indian Institute of Management, Calcutta, and who had left a lucrative job in the private sector to serve as the administrative officer in Aravind Hospital, Madurai (now in charge of LAICO).

Doctor turnover is a problem. The retention is only for about three to four years. Every year we lose 20 to 25 doctors. India produces about 800 ophthalmologists per year. Can we get from that pool? We have also the Fellow pool, about 25 or so.

Tele medicine was done in the Aravind network through video conferencing sessions. In such sessions, where the administrative problems of different units were discussed, the doctors in other units could consult senior people on particular problems and cases. They could also show the patient through videoconference to get the opinion of other doctors.

Mr. Thulasiraj stated (this was confirmed by Dr. Nam) that though in the earlier years doctors were paid less than the market rates, now this was not so. Doctors' salaries were at par with what they could get elsewhere. Of course, with private practice people could make much more money.

Said Mr. Thulasiraj:

What we can offer is a good work environment, a good name, and a status based on our high integrity. We also offer good salaries and opportunities for personal growth. But we should be able to retain enough doctors, all the same.

Financials of Aravind Eye Care System

Despite having a majority of patients as free patients, the Aravind Eye Care System had always been financially self-supporting. Even from the beginning it did not depend on government grants or donations (except for the support given by the government towards eye camp patients), and till now it had not applied for any other government grants for service delivery. Exhibit 12 gives the income and expenditure from 1997-98 till 2001-2002, Exhibit 13 gives the income and expenditure statement for the year 2001-02.

The Finance and Accounts function was managed by Mr. G. Srinivasan, an engineer by profession and the brother of Dr.V. He was also the Founder-Secretary of the Govel Trust. In the initial years, the Govel Trust borrowed some money from the State Bank of India by pledging the properties of the Trustees. The hospital or the trust didn't engage in any fund raising through donations. The Madurai hospital was self-supporting for all recurring expenditure from the beginning and after 5 years, it had accumulated adequate surplus for its own development for the establishment of new hospitals at Theni, Tirunelveli, Coimbatore and Pondicherry. Each of these branch hospitals were also meeting all their operational costs through patient revenues and generating a surplus to contribute to the development of the subsequent hospitals. Though donations were accepted and welcome, the hospital consciously chose to remain financially viable essentially through patient revenues for its core activities of patient care, community work and training. "Tight financial control, on time accounting, coupled with appropriate pricing and transparency are the reasons for this financial success", said Mr. Srinivasan.

Dr. V. and Dr. Nam stressed the point that not only was the Aravind Eye Care System self sufficient in terms of operational income and expenditure, but it also took care of capital expenditure for all expansion and new units. Said Dr. V:

You management people will tell me, why don't you go to the banks, take loans and grow faster? Cost of debt is low. But we, as a policy, will not go to the banks for loans, since it will compromise our freedom.

In a reply to a question whether that would mean that the next hospital would not be built until enough further surplus was accumulated, Dr. V. replied in the affirmative.

The case writer asked Dr. V. whether he saw any conflict with his objective of eradicating blindness as quickly as possible, with this policy of "gradual growth". There

were large areas in Tamil Nadu uncovered by any hospital, as for example, North Arcot and Dharmapuri areas. Dr. V. said:

We feel it is important to preserve our financial self sufficiency. Also there is a limit to the rate at which we can grow effectively without compromising on the basic values of the organization.

The rates charged by Aravind, both for operations and for the stay were quite moderate. Exhibit 14 gives the rate card for the Madurai hospital.

Organization Structure of Aravind Eye Care

Exhibit 15 gives the organization structure of the Aravind Hospitals. The system worked under a non profit trust named Govel Trust of which Dr. V. was the Chairman. Dr. Nam was the Director of this trust, and Dr. Natchiar was the Joint Director. Dr. Nam also served as the Director of the hospitals. There were senior Medical Officers, usually heads of different clinics, Residents, and Fellows. The Medical Officers were in most cases permanent employees of the hospital. The nursing and other paramedical staff were under the Joint Director. The various other units such as Coimbatore had their own heads who reported to Dr. Nam. LAICO and other such units had their own heads who reported to Dr. Nam.

Weekly meetings of all the heads of the hospital were a norm and provided an opportunity to discuss all operational as well as strategic matters. Dr. Nam either talked on the phone or travelled to the various other Aravind Eye Hospitals to meet with the heads of the respective hospitals.

The organization was very open and transparent. All information was freely shared with any one who wished to have the information on operational details. Dr. V.'s and many others leadership style was that of "leading by doing". It was observed by one of the case writers that both Dr. V. and Dr. Aravind picked up pieces of paper lying on the hospital floor and handed it over to the next sweeper they saw. They did not shout or get upset with the sweeper but by their action demonstrated the value of cleanliness and humility.

There was a conscious focus on bringing spiritual practice into the work place. In a meditation room at the Aravind Eye Hospital in Madurai the relics of Sri Aurobindo were kept. No one was compelled to go to the meditation room; however, Dr. V. visited it every day. Over the years many staff members and patients also had made it a habit to the meditation room voluntarily. In Dr. V's words, "There is an atmosphere of spiritual influence in the hospital".

The AEH in Madurai also had a small crèche for the very young children of all the staff of the hospital. The same care was given to both Dr. Aravind's (the doctor and the administrator mentioned earlier) daughter and a junior ophthalmic assistant's son at the crèche. The overall culture at the Aravind Eye Hospital was of service, humility, kindness, and equality.

AEH had only full time doctors; no part time or visiting doctors were employed (unlike in many large hospitals which gave facilities and time slots for doctors who would come and see the patients). Private practice was not allowed for any of the doctors.

Said. Dr. V:

We do not think part time or external doctors can develop institutional loyalties. They also may not develop the skills we need.

Broadly, on an average, medical officers did 60 percent clinical work, 20 percent teaching, and 20 percent research. But this varied considerably among doctors.

Doctors were encouraged to teach at LAICO and also do research. There was no compromise on the surgical work expected from them but they could take time off from O.P if they were pursuing research. Doctors could initiate projects on their own and get them supported by Aravind Eye Care System through Aravind Medical Research Foundation; they could also send proposals to outside funding agencies for research support.

The staff strength of the Aravind Eye Hospital, Madurai, as on February 2003, was 762. For about 113 doctors, there were 307 nurses, 38 counsellors, and 304 other staff. The pattern of staffing in other units was broadly similar. Exhibit 16 gives the break-up of staff strength for the different units of AEHs.

Aravind Eye Care System: Future Directions

Dr. V. was very happy and satisfied with his achievements. But he was thirsting for more. His vision was no longer focused on the Aravind Eye Hospitals but on the larger issue of how to make an impact on blindness and its cure. Said Dr. V:

I am now seriously wondering how to develop sustainable systems. Only strengthening existing hospitals can do this. I feel existing doctors in the country are heavily under utilized. They are engaged in many items of work not necessary to be done by them. We have to bring up the way of working with hospitals to bring up the productivity of doctors.

Despite all our efforts, only about seven percent of target population are coming to camps. We have to increase this percentage.

We have to upgrade the skills of doctors to perform IOL surgeries. This will make a huge difference in the recuperation time and subsequent ability to earn one's living. Postoperative care has to be improved; counselling is to be improved. It is in these areas that we at Aravind hope to make a difference.

Dr. Nam's vision was:

Keeping the mission of reducing needless blindness, Aravind would like to venture into other specialities with all its available expertise, skill, management capabilities and community involvement in ophthalmology in addition to cataract

in future. Just like we have established a model for cataract intervention which is recognized by all, we would like to put into action all programmes under Vision 2020 of the World Health Organization. Research to prevent blindness will also form an integral part of the system in future.

Said Mr. Thulasiraj:

I can see many management issues coming up. There is going to be a need to restructure ourselves. There is considerable geographical spread as well as functional diversity. How should we restructure?

We are still too centralized in our decisions. Too many decisions are taken here at Madurai. We also have to broad base our leadership. Too much energy is coming from Madurai. How do we stimulate similar efforts from other units?

A lot of our strength comes from what I call “unconscious competence” Our strength is really not our technical skills or equipment. This can be easily replicated. Values are our unique strength. Values are the real reason for efficiency. We must find ways of sustaining and strengthening our values and culture. Integrating the culture of all our units is very important.

Integrity is a hallmark of this place. We never give commissions to other doctors, chemists or other hospitals for special tests. We tell other diagnostic facilities what they should charge a poor patient sent from Aravind for a particular test (e.g. MRI or CT scan) and they oblige. We have been able to have our way. We should be able to keep this integrity intact.

Dr. Aravind also said:

One of our key strategic future steps is to develop dual specialties among our doctors. We would like to retain and get the best out of our doctors. One way may be to provide more meaning to their work. We are trying to help doctors to develop at least one other specialty. We can then also involve them in the running of the Aravind Eye Care System. We also need to find resources to fund our research projects. We need to build more linkages with other eye care institutions all over the world.

Exhibit 1

Aravind Eye Care System

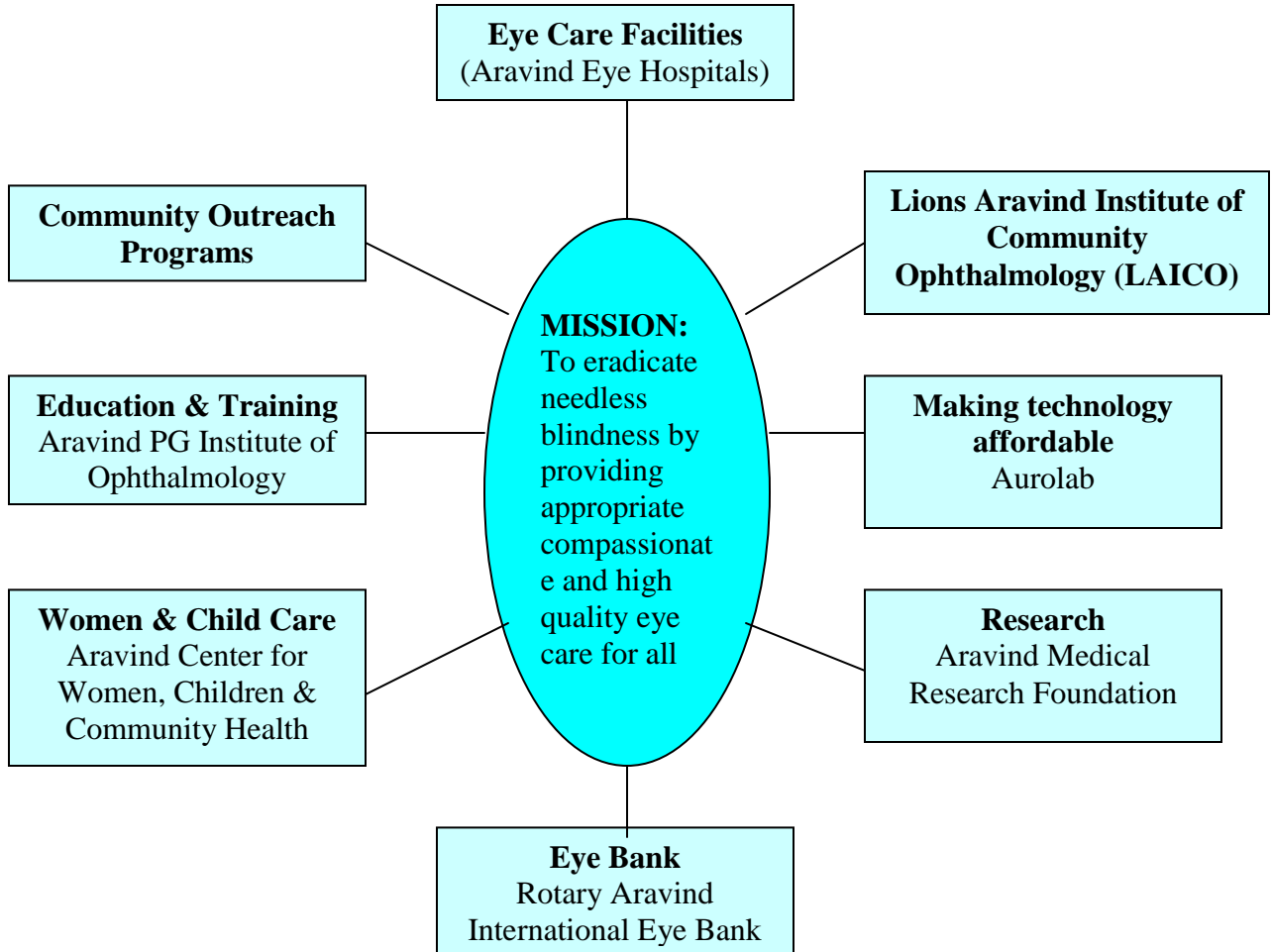


Exhibit 2
Aravind Eye Care System: Number of Beds in Different Hospitals

(As on 2003)

Unit	Free	No. of beds Paying	Total	Operation Theatres/Tables
Madurai	1100	315	1415	13/45*
Tirunelveli	300	130	430	3/9
Theni	150	30	180	1/3
Coimbatore	700	174	874	8/25
Pondicherry	600	150	750	8/25
Total	2850	799	3649	33/107

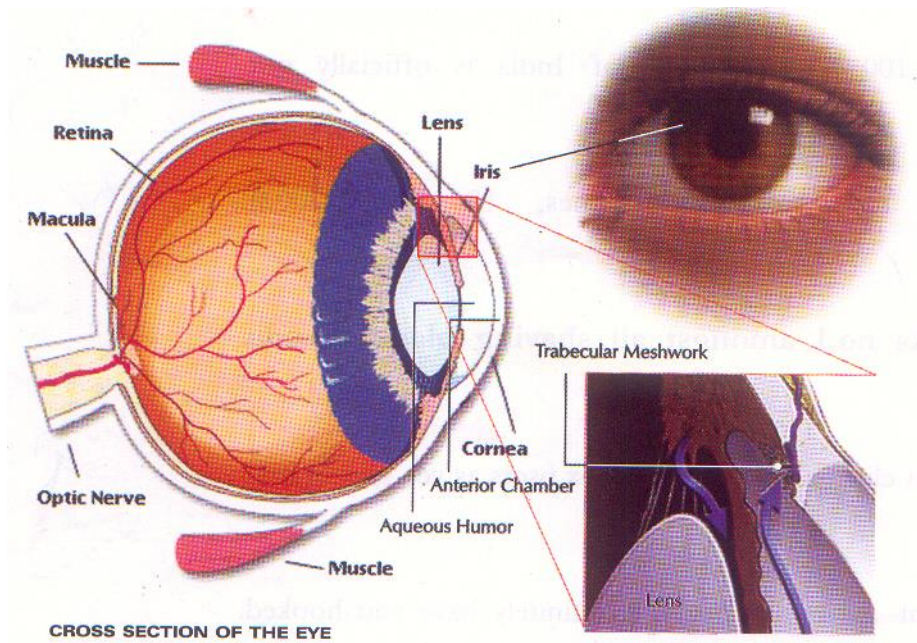
* Consisting of 25 tables in free hospitals and 20 in paying hospitals.
Source: *Promises to keep...*, Pamphlet of Aravind Eye Care System.

Exhibit 3
Categories of Blindness

Category	Definition	Prevalence in the 50 years and older age group	
		India	Tamil Nadu
Bilateral blindness	Both eyes < 6/60 – NPL	8.5	6.0
Social blindness	Both eyes < 3/60 – NPL	5.3	4.0
Economic blindness	One eye < 6/60 – 3/60; Fellow eye < 6/00 – NPL	3.2	2.1
Unilateral blindness	One eye < 6/60; Fellow eye ≥ 6/18	5.1	6.8
Low vision	One eye < 6/18 – 6/60; Fellow eye < 6/18 – NPL	23.8	28.5

Source: “National Survey on Blindness – 2001-2002, Summary”, published the *Quarterly Newsletter of National Program for Control of Blindness & “Vision 2020: The Right to Sight Initiative”*, 1(2), July-September 2002.

Exhibit 4 Cross Section of Human Eye



Taken from *Jetwings*, March 2003- p 132.

Exhibit 5
Surgeries Done and OP Visits, 1997-2002

Year	Paying		Free including Camp		Total	
	OP visits	Surgery	OP visits	Surgery	OP visits	Surgery
1997	401,518	42,808	574,350	80,287	975,868	123,095
1998	465,496	49,275	697,649	108,552	1,163,145	157,827
1999	530,253	55,460	752,819	127,708	1,283,072	183,168
2000	567,105	58,267	763,888	134,498	1,330,993	192,765
2001	603,800	63,265	725,210	127,893	1,329,070	191,158
2002	650,047	68,055	749,324	128,384	1,399,371	196,425

Source: Data supplied by Aravind Eye Care

Note : The above figures are for all the hospitals of the Aravind Eye Care System.

Exhibit 6
Patient Statistics for Different Units of the Aravind Eye Care System, 2002

	Madurai	Tirunelveli	Theni	Coimbatore	Total
Outpatient Visits					
Paying	276,548	132,272	40,149	201,078	650,047
Free (Direct & Camp)	328,651	138,425	41,685	240,653	749,324
Of the above:					
Hospital OP visits	409,755	182,356	60,035	285,463	937,609
Eye camp OP visits	195,144	88,341	21,799	156,178	461,762
Total	605,199	270,697	81,834	441,641	1,399,371
# eye camps	591	364	132	463	1,550
Surgery					
Paying	34,510	12,107	1,863	19,575	68,055
Free (Direct & Camp)	66,363	19,719	5,273	37,029	128,384
Total	100,873	31,826	7,136	56,604	196,439
<i>Some major types of surgeries</i>					
ECCE without IOL	1,257	1,862	99	1,259	4,447
ECCE with IOL	40,962	4,383	6,084	9,651	61,080
ECCE IOL with phaco	9,900	3,569	262	7,626	21,357
Small incision cataract surgery	27,503	14,984	0	24,797	67,284
Laser photocoagulation	6,652	1,995	209	3,423	12,279

Source for Exhibits 5 and 6: Data supplied by Aravind Eye Care System.

Exhibit 7**Free Section Complication Details, Madurai Hospital, 2002**

Name	Intra-operative		Post-operative		Total	
	#	%	#	%	#	%
A/C Shallow	1	0.00	17	0.02	18	0.02
Blood Clot	0	0.00	53	0.08	53	0.08
Cornea Oedema	0	0.00	152	0.23	152	0.23
Cortex	0	0.00	2	0.00	2	0.00
Endophthalmitis	0	0.00	59	0.09	59	0.09
Hyphema	0	0.00	38	0.05	38	0.05
Hypopyon	0	0.00	63	0.09	63	0.09
Iridodialysis	0	0.00	1	0.00	1	0.00
Iris Prolapse	0	0.00	2	0.00	2	0.00
Pupillary Capsular Rent with IOL	670	1.02	1	0.00	671	1.02
Posterior Capture Rent (NO IOL)	87	0.13	0	0.00	87	0.13
Straight Keratitis	0	0.00	70	0.10	70	0.10
Vitreous disturbance	695	1.06	0	0.00	695	1.06
Zonular Dialysis	86	0.13	0	0.00	86	0.13

Total # surgeries done: 65180

Source: Data supplied by Aravind Eye Care System.

Exhibit 8
Eye Camps Organized and Patients Treated, 1997-2002

Year	No. of Camps Organized	Patients Seen	Surgeries of "Camp" Patients
1997	1041	287,571	40,389
1998	1346	373,997	65,926
1999	1488	413,580	87,084
2000	1548	426,350	93,519
2001	1480	422,373	88,585
2002	1549	461,762	92,372

Source: Data supplied by Aravind Eye Care System.

Exhibit 9
Training Courses Offered at LAICO and Fees

Courses	Duration	Course Fee¹⁶ for participants from India/Nepal	Course Fee for overseas participants
Management Training for Heads of Eye Hospitals	One week	Rs. 10,000	\$ 330
Management Training for Eye Care Programme Managers	Two weeks	Rs. 15,000	\$ 500
Management Training & Systems Development for Hospital Administrators/Managers	One month	Rs. 15,000	\$ 500
Certificate Course in Eye Hospital Management	Six months	Rs. 25,000	\$ 850
Certificate Course for Clinical & Supervisory Skills Development in Ophthalmic Paramedical Personnel	Three months	Rs. 25,000	\$ 850
Community Outreach Course	Four weeks	Rs. 7,500	\$ 250
Instruments Maintenance Technicians Course	Six weeks	Rs. 10,000	\$ 325
Instruments Maintenance Ophthalmologist Course	Five days	Rs. 2,000	\$ 70

Source: Data supplied by Aravind Eye Care System.

¹⁶ The fees does not include the cost of lodging and boarding

Exhibit 10
Result of Aravind's Intervention in Other Hospitals

# Surgeries Done			
	IOL	Non IOL	Total
1 year prior to intervention	18558	33948	52506
1 year after intervention	40055	36940	76995
2 years after intervention	51291	40154	91445

# Hospitals Performing Surgeries		
	1 year before intervention	2 year after intervention
< 1000 surgeries	21	9
1000 – 2999 surgeries	16	20
3000 – 4999 surgeries	3	8
> = 5000 surgeries	0	3

Cost Recovery Percentage (Income/Expenditure) # Hospitals		
	1 year before intervention	2 year after intervention
< 60%	10	4
60 – 79%	4	6
80 – 99%	6	5
> = 100%	5	10

Source: S. Saravanan (2003), "Organizational Capacity Building – A Model Developed by Aravind Eye Care System", Illumination, III(1) (January-March), pp.20-21.

Exhibit 11

Major Research Projects Completed and Ongoing

Major Projects Completed

- 1984: Study of Eales' disease
- 1986: Operations Research for Effective Delivery of Cataract Services
- 1986: Rapid Survey Techniques for Blindness and Cataract Assessment
- 1987: Effect of Small Doses of Vitamin A in Children Under Five Years of Age
- 1989: Safety and Efficacy of Vanadium Stainless Steel (VSS) Sutures in Cataract Surgery
- 1989: Study on Salt Pan Keratitis
- 1992: Madurai IOL Study
- 1993: Childhood Cataract in South India
- 1994: Aravind Comprehensive Eye Survey
- 1994: Series of Drug Trial with Ofloxacin on Patients with Suppurative Keratitis
- 1998: Vitamin A Supplementation in Newborns (VASIN) Study.

Major Ongoing Projects

- 1995: Molecular genetics of congenital cataracts in man and mouse
- 1997: Newly recognized presumed Trematode induced ocular inflammation in children
- 1998: 1. Role of antioxidants in prevention of cataract
2. Vitamin A supplementation in newborns (VASIN) study
- 1999: Value of culture and serology in ophthalmic complication of leptospirosis
- 2000: 1. Diabetic retinopathy (action research project)
2. Molecular genetics for hereditary glaucoma
3. Paediatrics parasitic eye diseases
4. Trial study of lensectomy vs. lens aspiration and primary capsulotomy in children
5. Culture of rubella virus from proven cases of congenital rubella syndrome
6. Molecular and genetic basis of congenital contract
7. Trials on paediatric glaucoma
8. Certain drug trials in corneal ulcers and conjunctivitis
- 2001: 1. Molecular genetics of juvenile onset primary angle glaucoma
2. Genetics and structural analysis of myocillin protein involved in juvenile onset primary angle glaucoma
3. Aetiology and pathology mechanism of leptospirosis uveitis
4. Improving child health through health education project
- 2002: 1. Corneal epithelial stem cells for clinical and toxicological applications
2. Prevention of traumatic corneal ulcer: A multicenter intervention project in South East Asia

Source: The pamphlet, *Promises to Keep*..., pp.40-42; Annual Report of Aravind Eye Care System, 2001.

Exhibit 12
Income & Expenditure, 1997-98 to 2001-02
(Rs. million)

Year	Income	Expenditure	Surplus
1997-98	180.3	81.7	98.6
1998-99	239.5	123.2	116.3
1999-2000	276.3	143.2	133.1
2000-2001	340.4	156.6	183.8
2001-2002	388.0	177.5	210.5

Exhibit 13
Income Statement, 2001-2002
(Rs. million)

Medical service	15.35
Operation charges	227.30
Treatment charges	20.45
Consulting fees	21.10
X Ray & Laboratory charges	3.98
Tuition fees and course fees	3.58
Grants in aid	33.59
Donations	2.37
Interest received	49.37
Dividends received	3.12
Miscellaneous income	7.74
Total	387.96

Expenditure

Staff Salary	38.65
IOL cost	35.08
Medicines	17.03
Electricity	13.10
Hospital linen	0.73
Camp expenses	6.68
Interest expenses	0.14
Library books	0.09
Water supply	1.13
Depreciation	32.06
Miscellaneous expenditures	32.84
Excess of income over expenditure	210.43
Total	387.96

Source: Data supplied by Aravind Eye Care System.

Exhibit 14

**Rate Card for Aravind Hospital, Madurai
(Rs.)**

CATARACT WITH IOL	Surgery	Two days' room rent	Medicines	Total Costs
Suite AC	5500	2250	700	8700
Deluxe AC	4500	1200	700	6600
A Special	4500	600	700	6600
A	4000	360	700	5300
B	3250	240	700	4400
C	2750	90	700	3800

PHACO WITH IOL	Surgery	Two days' room rent	Medicines	Total Costs
Suite AC	6500	1500	700	8900
Deluxe AC	6000	800	700	7700
A Special	6000	400	700	7300
A	5500	240	700	6700
B	5000	160	700	6100
C	4750	60	700	5700

PHACO WITH FOLDABLE IOL	Surgery	Two days' room rent	Medicines	Total Costs
Suite AC	9500	1500	700	11900
Deluxe AC	8500	800	700	10200
A Special	8500	400	700	9800
A	8500	240	700	9700
B	8500	160	700	9600
C	8500	60	700	9500

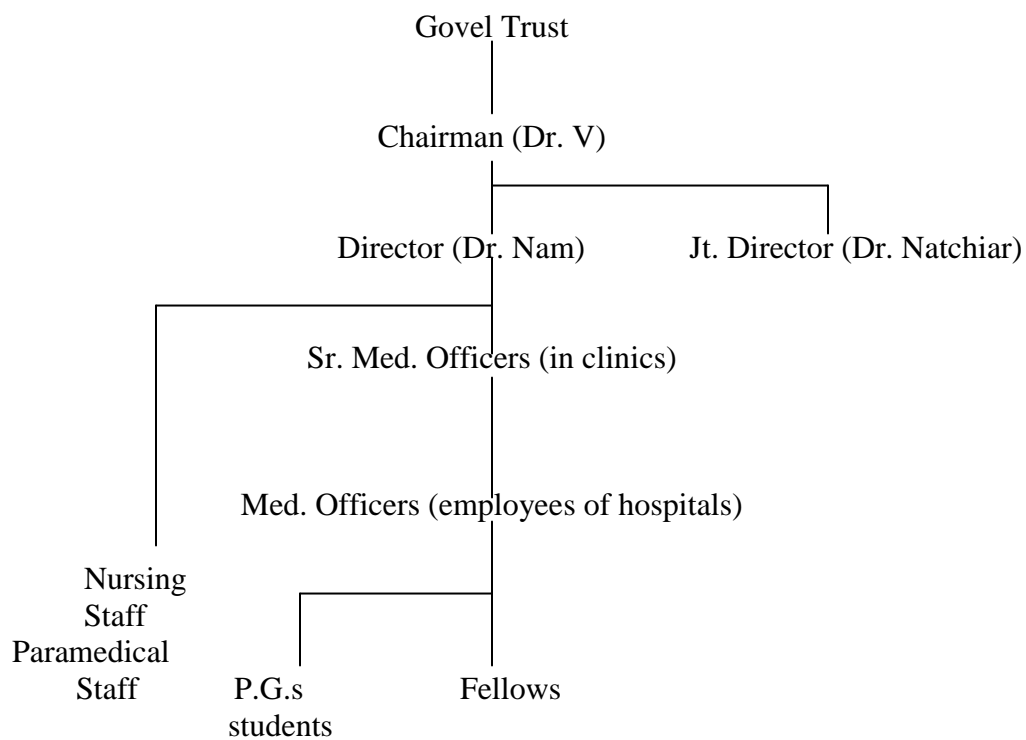
PHACO WITH ACRYLIC 3 PIECE IOL	Surgery	Two days' room rent	Medicines	Total Costs
Suite AC	12500	1500	700	14900
Deluxe AC	11500	800	700	13200
A Special	11500	400	700	12800
A	11500	240	700	12700
B	11500	160	700	12600
C	11500	60	700	12500

CATARACT WITHOUT IOL	Surgery	Two days' room rent	Medicines	Total Costs
Suite AC	3500	1500	700	5900
Deluxe AC	2000	800	700	3700
A Special	2000	400	700	3300
A	1500	240	700	2700
B	1250	160	700	2300
C	1100	60	700	2100

Source: Data supplied by Aravind Eye Care System.

Exhibit 15

Aravind Hospital: Organization Structure (Medical)



Note: The above is the structure of the Madurai Hospital. The structure of the other hospitals were similar. Compiled by the case writers after discussions with the executives of the Aravind Eye Care System.

Exhibit 16
Break-up of Staff Strength in Different Units of Aravind Eye Hospitals

Category	Madurai	Theni	Tirunelveli	Coimbatore
Medical Officers	43	2	13	18
Fellows & PGs	70	3	18	18
Paramedics	37	19	70	134
Counsellors	38	3	15	20
Others	304	21	78	84
Total	762	48	194	274

Source: Data supplied by Aravind Eye Care System.

Map 1
Location of Aravind Eye Hospitals
(Madurai, Theni, Tirunelveli, Coimbatore & Pondicherry)

