VISION 2020

The Right to Sight

A Manual for VISION 2020 planning short course .

Contents

WHAT DO WE

KNOW ABOUT

BLINDNESS?

Visual impairment and blindness – WHO fact sheet 282

Key facts

- About 314 million people are visually impaired worldwide, 45 million of them are blind.
- Most people with visual impairment are older, and females are more at risk at every age, in every part of the world.
- About 87% of the world's visually impaired live in developing countries.
- The number of people blinded by infectious diseases has been greatly reduced, but age-related impairment is increasing.
- Cataract remains the leading cause of blindness globally, except in the most developed countries.
- Correction of refractive errors could give normal vision to more than 12 million children (ages five to 15).
- About 85% of all visual impairment is avoidable globally.

There are four levels of visual function:

1. normal vision
2. moderate visual impairment
3. severe visual impairment
4. blindness.

Global trends

Global trends since the early 90s show reduced rates of visual impairment worldwide, and a shift in the causes. Visual impairment and blindness caused by infectious diseases have been greatly reduced (an indication of the success of international public health action), but there is a visible increase in the number of people who are blind or visually impaired from conditions related to longer life expectancies.

Globally about 314 million people are visually impaired, 45 million of them are blind.

Presbyopia, the inability to read or perform near work that occurs with ageing, causes visual impairment if it is not corrected. The scope of the problem is

not known, but preliminary studies indicate that the problem could be vast, especially in developing countries.

Who is at risk?

By age: About 82% of all people who are visually impaired are age 50 and older (although they represent only 19% of the world's population).

Increasing numbers of people are at risk of age-related visual impairment as the global population grows and demographics shift to a higher proportion of older people, even in developing countries.

Child blindness remains a significant problem globally. An estimated 1.4 million blind children below age 15 will live in blindness for many years. In addition, more than 12 million children ages five to 15 are visually impaired because of uncorrected refractive errors (near-sightedness, far-sightedness or astigmatism): conditions that could be easily diagnosed and corrected with glasses, contact lenses or refractive surgery.

By gender: Studies consistently indicate that females have a significantly higher risk of being visually impaired than males, in every region of the world, and at all ages.

Geographically: Visual impairment is not distributed uniformly throughout the world. Approximately 87% of visually impaired people live in developing countries.

Source: WHO/Prevention of Blindness

Causes of blindness

Globally, the leading causes of blindness, in order of frequency, are:

- cataract (a clouding of the lens of the eye that impedes the passage of light),
- uncorrected refractive errors (near-sightedness, far-sightedness or astigmatism),
- glaucoma (a group of diseases that result in damage of the optic nerve),
- age-related macular degeneration (which involves the loss of a person's central field of vision).

Other major causes include corneal opacities (eye diseases that scar the cornea), diabetic retinopathy (associated with diabetes), blinding trachoma, and eye conditions in children such as cataract, retinopathy of prematurity (an eye disorder of premature infants), and vitamin A deficiency.

Prevention

Globally, about 85% of all visual impairment and 75% of blindness could be prevented or cured worldwide.

Since the 90s, areas of significant prevention progress on a global scale include:

- further development of eye health care services, which has led to increased availability and affordability;
- increased commitment to prevention and cure from national leaders, medical professionals and private and corporate partners;
- higher awareness and use of eye health care services by patients and the general population; and
- implementation of effective eye health strategies to eliminate infectious causes of vision loss.

Brazil, China, Ethiopia, the Gambia, India, Mauritania, Mexico, Morocco, Nepal, Oman, Pakistan, and the United Republic of Tanzania, among others, have reported notable progress.

Global partnerships of Member States, nongovernmental organizations and community groups (such as Vision 2020 the Right to Sight and Global Elimination of Blinding Trachoma by 2020) have played key roles in eliminating avoidable visual impairment.

WHO response

WHO works with Member States and public and private partners to prevent blindness and restore sight in every part of the world. WHO provides technical assistance, monitoring and coordination among partners to strengthen country-level efforts to eliminate avoidable blindness, treat eye diseases, expand access to eye health services, and increase rehabilitation for people with residual visual impairment (including tools and skills for daily life).

Questions about Blindness?

There are 4 important questions to be asked when considering prevention of blindness; these are:

What is blindness? - DEFINITION

How many people are blind? - MAGNITUDE

Why are people blind? - AETIOLOGY

What can be done to reduce blindness? - CONTROL

Question 1. What is blindness and visual impairment?

The World Health Organisation has classified visual impairment and blindness into various grades. These are as follows:

VISUAL ACUITY IN BETTER EYE		
From	To	Category
6/6	**6/18**	**'NORMAL'**
<6/18	**6/60**	**'VISUAL IMPAIRMENT'**
<6/60	**3/60**	**'SEVERE VISUAL IMPAIRMENT'**
<3/60	**N.P.L.**	**'BLIND'**

Note that :

- All visions are the better eye
- All visions are with available correction
- Less than 10 degrees central field is equivalent to "blindness"
- <6/18 to 3/60 is sometimes called Low Vision
- NPL – no perception of light

Exercise 1

Categorise these people according to their visual acuity>

	VISION RE	VISION LE	CATEGORY
1	6/18	2/60	
2	P.L.	1/60	
3	6/60	6/60	
4	NPL	3/60	
5	6/24	4/60	

Question 2. How many people are blind?

In the year 2002, the estimated numbers of people who were blind, severely visually impaired, and visually impaired were - **These figures do not include the more recent figures with refractive errors included . See fact sheet 282 above .**

CATEGORY OF VISION	NUMBER	VISUAL ACUITY
Blind	37 million people	< 3/60
Low Vision	124 million people	<6/18-3/60
Normal	6052 million people	6/6-6/18
Total global population	**6 213 million people total**	

In the year 2002, the estimated number of blind people (prevalence) per WHO region was:-

REGION	APPROXIMATE POPULATION (millions)	APPROXIMATE NO. OF LOW VISION (mill.)	APPROXIMATE NO. OF BLIND PERSONS (mill.)
Africa	672	20	6.8
Americas	853	13	2.4
Eastern Mediterranean	503	12	4
Europe	878	13	2.7
South East Asia	1590	34	11.6
Western Pacific	1717	32	9.3
Total	**6213**	**124**	**36.8**

In the year 2002, the estimated number of blind people by age group was:-

AGE GROUP	POPULATION (millions)	NO. BLIND (millions)	PREVALENCE
0 – 14	1,652	1.37	0.03-0.12/100
15 – 49	4,561	5.18	0.1-0.2/100
49+		30.31	0.4-9.0/100
Total	**6213**	**50**	**8/1000**

The prevalence of blindness in different countries and in different regions correlates closely with the economy and level of health care :-

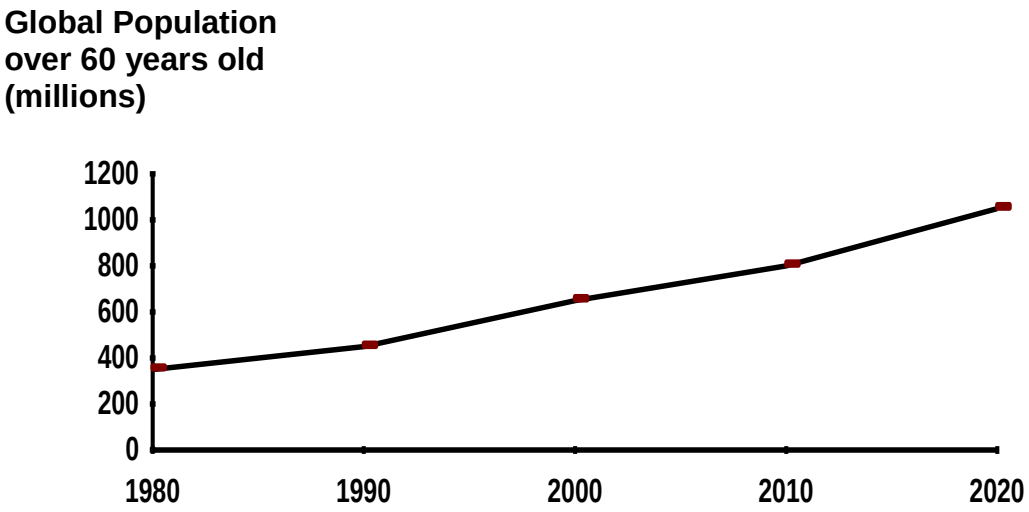
ECONOMY / HEALTH CARE	% BLIND	NUMBER BLIND PER MILLION
Good	0.1-0.29	2 500
OK	0.3-0.59	5 000
Poor	0.6-0.79	7 000
Very Poor	0.8 and above	9,000+

The number of blind people in the world was increasing year by year.
Recent data suggests that VISION 2020 activities may be having an impact.

YEAR	PROJECTED NUMBER BLIND	ACTUAL NUMBER BLIND
1980	30 million	30 million
1990	38 million	38 million
2000	50 million	-
2010	60 million	37 million (45 million if RE is included)
2020	75 million	-

The cause lies in part in ageing :-

Ageing Population (over 60 Years): Trends to the Year 2020



Exercise 2

Why do you think the number of blind people is increasing?

1……

2……

3……

Exercise 3

Why do you think there is more blindness in poor areas of the world?

1……

2……

3……

4……

Exercise 4

a) Indonesia has 210 million people and a blindness prevalence of 1.5%.
How many people are blind?
……

b) In a population based survey of 8000 people,
64 people where found to be blind.
What is the prevalence of blindness?
……

c) List the major demographic "risk factors" for blindness.

1……

2……

3……

4……

Question 3. Why are people blind?

The causes vary in different countries and regions, depending on their economies and levels of health care -

The major causes of blindness in Africa are cataract, trachoma, corneal disease, glaucoma, onchocerciasis and vitamin A deficiency.

In Asia the major causes are cataract, corneal scar, glaucoma and retinal diseases.

In Latin America and Eastern Europe the major causes are cataract, glaucoma and diabetic retinopathy.

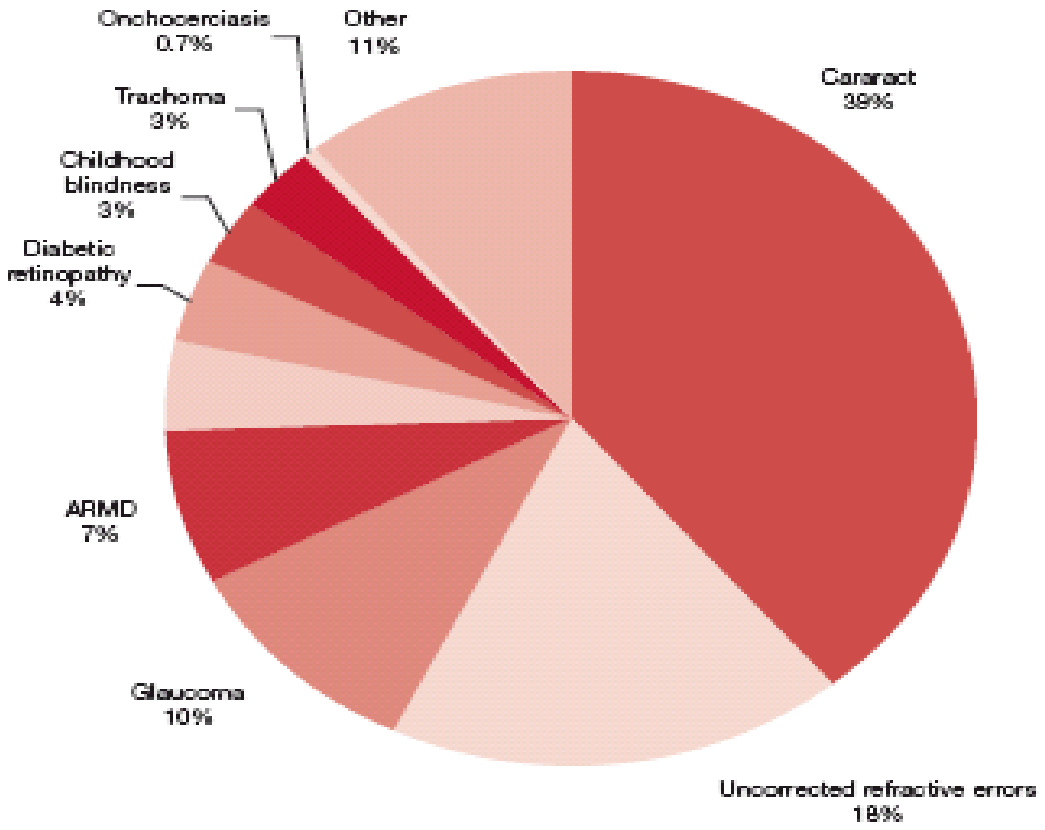
In North America and Western Europe the major causes are senile macular degeneration, diabetic retinopathy and glaucoma.

REGION	APPROX. NO. OF BLIND PERSONS (millions)	MAJOR CAUSES OF BLINDNESS
Africa	6.8	Cataract, Glaucoma Corneal Scar
Americas	2.4	Cataract, Glaucoma Retinal disease
Eastern Mediterranean	4	Cataract, Glaucoma Corneal Scar
Europe	2.7	Cataract Glaucoma Retinal disease
South East Asia	11.6	Cataract, Glaucoma Corneal scar
Western Pacific	9.3	Cataract, Glaucoma Retinal disease
Total	**36.8**	

2002 Estimates

DISEASE	BLIND (millions)	%	TREND
Cataract	17.6	48	?Increasing
Glaucoma	4.5	12	Increasing
Trachoma/Scar	3.2	9	Decreasing
Child Blindness	1.4	4	Stable
Onchocerciasis	0.3	<1	Decreasing
Diabetic Retinopathy	1.8	5	Increasing
ARMD	3.2	9	Increasing
Others	4.8	13	Stable
TOTAL	36.8	100%	

Global causes of blindness



Blind person years

This is a measure of disability over time.

= Numbers blind X Average number of years a person lives blind

Global Figures

Cataract	25m	x	5yrs	=	**125 million blind years**
Child Blindness	1.4m	x	50yrs	=	**70 million blind years**
Trachoma	5m	x	12yrs	=	**60 million blind years**
Glaucoma	6m	x	10yrs	=	**60 million blind years**
Diab. Retinopathy	3m	x	5yrs	=	**15 million blind years**

Exercise 5

IN A HEALTH REGION OF 1,000,000 PEOPLE -

The prevalence of blindness is 1%
Cataract is responsible for 50% of blindness
Glaucoma is responsible for 10% of blindness
Childhood Blindness is responsible for 2% of blindness

How many people are blind due to cataract? ……...

How many people are blind due to glaucoma? …….……...

How many children are blind? ……

How many blind person years are due to cataract? ……..…...

How many blind person years are due to glaucoma? ……..

How many blind person years are due to childhood blindness? ……....

Exercise 6

Complete the boxes for YOUR situation

Magnitude of blindness

COUNTRY/ PLACE	
POPULATION	
PREVALENCE OF BLINDNESS	%
NUMBER OF BLIND (TOTAL)	

Causes of Blindness

	Cause	% All Blindness	Number Blind
1		%	
2		%	
3		%	
4		%	

Question 4. What can be done to reduce blindness?

Having defined blindness, estimated the size of the problem and understood the major causes, the next step is to consider what can be done to control the problem. This will be discussed under the following headings:

Dilemmas between ophthalmology and eye care
Terminologies in the prevention of blindness
VISION 2020 for eye care programmes

DILEMMAS - OPHTHALMOLOGY OR EYE CARE SERVICES

There are certain dilemmas in decision - making to consider:

1. **A Profit OR Service Approach.**
   Modern medical care is rapidly becoming a business with the purpose of making a profit. Prevention of blindness involves a service approach, often to people in rural and poor areas, for which good financial management and resources (subsidies) are required to assist poor patients.

2. **The Practice of Ophthalmology OR Comprehensive Eye Care.**
   There is a difference between the practice of ophthalmology in a clinic and the provision of eye care at all levels of health care delivery. Eye care will include health education and prevention of diseases such as vitamin A deficiency and trachoma.

3. **An Individual OR Community Approach.**
   Clinical medicine is targeted at the care of the individual. Prevention of blindness involves assessment, planning, and delivery of services for communities as well as individuals.

TERMINOLOGIES

1. <u>Primary Prevention</u>
Prevent the disease ever occurring, for example:

- Vitamin A deficiency — correct nutrition
- Trachoma — clean water and good sanitation
- Rubella and measles — immunisation

2. <u>Secondary Prevention</u>
Prevent loss of vision from established disease, for example:

- Cataract — surgery when vision is down but better than < 3/60
- Glaucoma — sight preservation; surgical or medical treatment
- Diabetic retinopathy — sight preserving laser treatment
- Vitamin A deficiency — if keratomalacia, saving the sight of the other eye
- Onchocerciasis — treatment with ivermectin

3. <u>Tertiary Prevention</u>
Restore vision to a blind patient, for example:

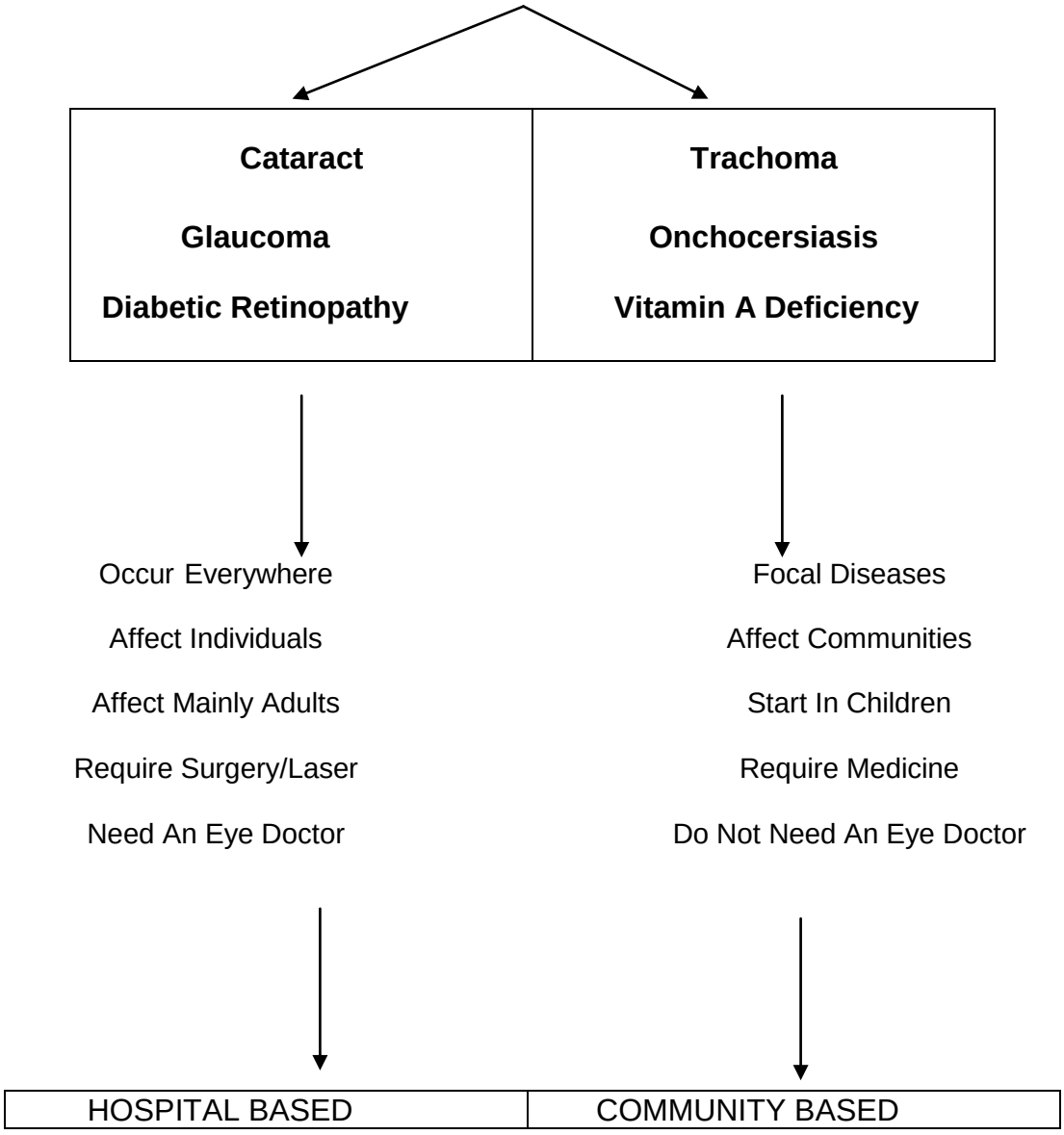
- Cataract — surgery when vision is <3/60
- Corneal scarring — keratoplasty
- Low vision — low vision aids

Exercise 7

Complete the table

Disease	Primary Prevention	Secondary Prevention	Tertiary Prevention
Cataract			
Glaucoma			
Diabetic Retinopathy			
Trachoma			
Onchocerciasis			
Vitamin A Deficiency			
Refractive Errors			

BLINDING EYE DISEASES



BOTH ARE ESSENTIAL

VISION 2020 - Vision 2020 action plan 2006 -2011 in CD

VISION 2020 AIM

The elimination of avoidable blindness and preventing the doubling of avoidable blindness by 2020. The ulitimate goal of the initiative is to integrate a sustainable , comprehensive , high quality equitable eye care service into a strengthened health care system.

VISION 2020 EXPECTED RESULTS

1. To reduce the projected blindness estimate of 75+m in 2020 to less than 25m.
2. Saving an estimated 100m. people from going blind and 400m person yrs of blindness.
3. Resulting in an expected economic saving of over $150 billion between 2000 and 2020.

VISION 2020 – PARTNERSHIP under the IAPB (International Agency for the Prevention of Blindness)

1. WHO + ministries of health.
2. NGDOs + professional groups.
3. People involved in eye care delivery.

VISION 2020 - THE REQUIREMENTS

1. The know how (strategy and planning)
2. The resources (financial and human).
3. The motivation (ownership).

VISION 2020 - THE STRATEGY

Implement V2020 in manageable units.
This can be for a population of between 250,000 to 2 million people.
This is usually called District level health care.

VISION 2020 - THE COMPONENTS

1. Human resource development - People.
2. Infrastructure development - Financial resources.
3. Disease control - effective interventions, delivered efficiently and equitably

VISION 2020 - HUMAN RESOURCES

Minimum requirements

Community worker-	1 per 10 000.
Ophthalmic assistant/nurse -	1 per 100 000.
Ophthalmologist/cataract surgeon -	1 per 250 000. In Africa , 1 :50,000 in Asia

VISION 2020 – GLOBAL PRIORITIES FOR 2000 - 2005

The diseases that are prioritised for phase 1 are -

- Cataract
- Refractive error + low vision
- Trachoma
- Onchocerciasis
- Vitamin A deficiency and childhood blindness.

If strategies are already in place for the elimination of blindness due to these diseases, then attention should be given

- Glaucoma
- Diabetic retinopathy.

CATARACT

BLINDNESS

Contents

CATARACT BLINDNESS - DEFINITIONS

Lens Opacity
Any opacification of the lens.

Cataract
Lens opacification causing ”significant” visual loss.

“Operable Cataract”
Cataract requiring surgery, according to the patient’s visual requirements.

Cataract Blindness
Visual acuity less than 3/60 (in the better eye with available correction) due to cataract.

Exercise 1 - Definition of Cataract Blindness

In an eye clinic, the visual acuities in 10 people identified with cataract are -

	Right eye	Left eye
1.	HM	6/9
2.	6/9	6/12
3.	6/18	6/6
4.	CF	6/6
5.	6/60	6/24
6.	5/60	3/60
7.	2/60	PL
8.	PL	3/60
9.	6/6	6/9
10.	6/24	6/24.

What are the categories of vision in each eye and in each person?

How many eyes are blind?

How many people are blind?

How many eyes / people should have cataract surgery?

CATARACT BLINDNESS – MAGNITUDE

Prevalence And Incidence

1. Prevalence (Backlog)

1.1. People blind due to cataract:-

People with visual acuity <3/60 in the better eye.
0,50%.
5 000 per million population.

1.2. People not blind due to cataract but requiring cataract surgery:-.

People with visual acuity 5/60-3/60 in the better eye (severe visual impairment).
People with unilateral cataract causing blindness.
People with second eyes for surgery.
4 x prevalence of cataract blindness.
2,00%.
20 000 per million population.

1.3. Total backlog of people requiring surgery:-

2,50%.
25 000 per million population.

2. Incidence (New Cases)

The mean life expectancy of a person who is blind due to age related cataract is 5 years. The annual incidence approximates to 20% of the prevalence.

2.1. People blind due to cataract:-

0,10%.
1 000 per million population per year.

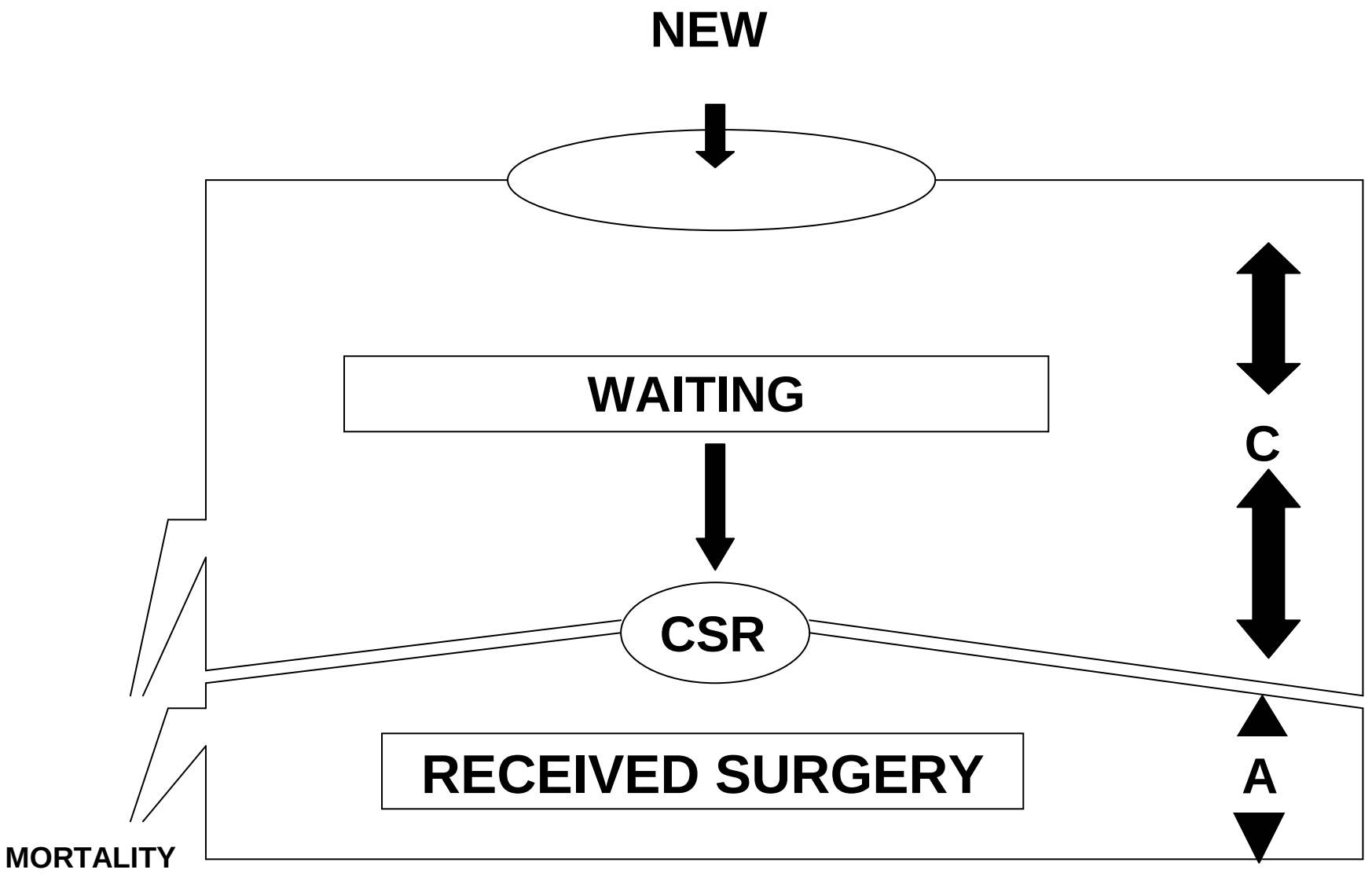
2.2. People not blind due to cataract but requiring cataract surgery:-

4x incidence of cataract blindness.
0,40%.
4 000 per million population per year.

2.3. Total number of new cases requiring cataract surgery each year:-

0,50%.
5 000 per million population per year.

Cataract Can



Exercise 2 - Prevalence And Incidence Of Cataract

What is the population of your health district?

How many people in your health district are blind due to cataract?
This is the prevalence (backlog) of people who are blind due to cataract.

How many people in your health district become blind due to cataract each year?
This is the incidence (new cases) of blindness due to cataract each year.

How many people in your health district are not blind due to cataract but need cataract surgery?

How many new people in your health district need cataract surgery each year, even though they are not blind?

What is the total backlog of cases in your health district needing cataract surgery?

What is the total number of new cases in your health district needing cataract surgery each year?

Description of Rapid assessment for avoidable blindness – in CD

CATARACT BLINDNESS - CONTROL

Barriers To Cataract Surgery

Only 1 out of 10 people who are blind due to cataract attend for surgery.

Only 1 out of 30 people with cataract who are not blind but who should have surgery attend for surgery.

There are 2 problems :

1. The blind cannot see and stay at home.
2. We stay in our clinics and do not see the blind!

The barriers precluding attendance for surgery can be -

On the side of the patient
On the side of the family
On the side of the community
On the side of the eye hospital.

They may be summarised as -

A - Awareness (lack of)

B - Bad service

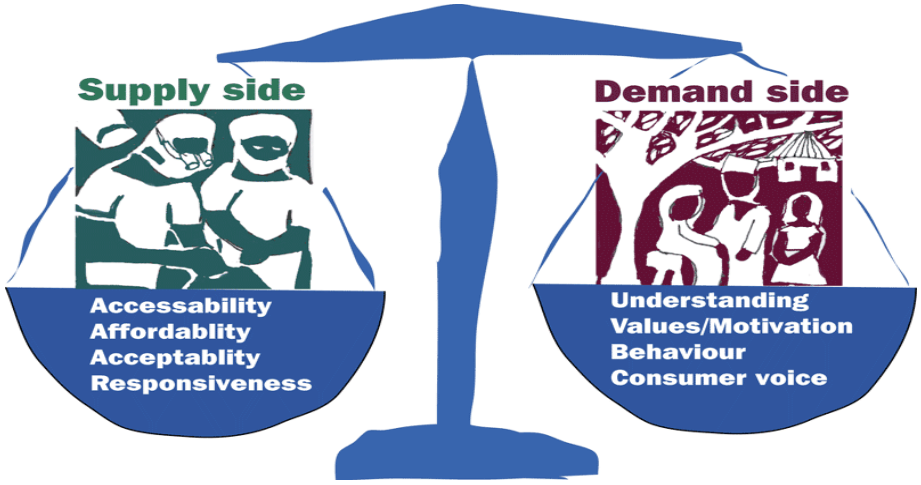
C - Cost

D - Distance

E - Expectation (lack of).

Overcoming The Barriers - Cataract Case Finding

The use of cataract case finders in the community is a specific strategy that is recommended to case find people who need surgery and to overcome the barriers precluding surgery uptake.



Exercise 3 - Overcoming The Barriers

What do you think are the important barriers precluding cataract surgery uptake in your health district?

What strategies do you propose to overcome these barriers?

Cataract Surgery Efficiency, Volume, And Capacity

Surgery Efficiency, Surgery Volume, And Surgery Capacity

Efficiency = number of cases per hour per surgeon.
Low efficiency = 1 case per hour per surgeon.
Medium efficiency = 2-3 cases per hour per surgeon.
High efficiency = 4+ cases per hour per surgeon.

Volume = efficiency x time x number of surgeons.
Low volume = <20 surgeries per week (<1000 per year).
Medium volume = 20-40 surgeries per week (1000-2000 per year).
High volume = >40 surgeries per week (>2000 per year).

Capacity = maximum possible volume.

Principles Of An Efficient Cataract Surgical Service

1. Committed OR team.
2. Staff well trained and well motivated, with clear job descriptions.
3. OR appropriately laid out (1 operating microscope + 2 tables per surgeon).
4. Good patient flow system in place (ward → preparation room → operating room → recovery room → ward).
5. Good standard surgical technique.
6. Good quality standard microsurgical instruments.
7. Good quality operating microscope.
8. Good spares back up, especially of essential instruments.
9. Good power back up.
10. Regular internal monitoring of the OR organisation.
11. Adequate stock of consumables.
12. Instrument technician available on stand by.

OR Team - Job Descriptions

1. Preparation Room -

CADRE	NUMBER	JOB DESCRIPTION
Ophthalmic Nurse	1	Over all supervision Local anaesthesia
Nurse	1	Check consent Pupil dilation Clean eyes IOP reducer
Counsellor	1	Pre- + post-op counselling

2. Operating Room -

CADRE	NUMBER	JOB DESCRIPTION
Surgeon	1	Surgery
Scrub Nurse	2	Laying of instrument trolleys Assisting surgeon
Floor Nurse	1	Passing of consumables SOS
Sterilisation Nurse	1	Cleaning + autoclaving of instruments
Porter	1	Patient flow Removal of waste Cleaning of OR

3. Recovery Room

CADRE	NUMBER	JOB DESCRIPTION
Nurse	1	Reception of patients

4. Post Surgery Activities

Cleaning of OR
Cleaning of instruments
Disposal of waste
Replacement of laundry
Checking of consumable stocks

Exercise 4 - Improving The Surgery Capacity

What is the cataract surgery efficiency, volume, and capacity in the surgical centre in your health district?

What strategies could be implemented to increase the capacity?

Cataract Surgery Rate

What Is The Cataract Surgery Rate (CSR)?

CSR = Number of cataract operations per million population per year.

The CSR can be calculated from -
1. The number of cataract surgeries (numerator, obtained from hospital OR records)
2. The population (denominator, obtained from census data).

What Should The CSR Be?

In order to eliminate blindness due to cataract, the CSR needs to equal the incidence (new cases) of cataract blindness.
Because not all the surgery that is done is on people who are blind due to cataract, it needs to be somewhere between 1 000 and 5 000.

The CSR that is required to equal the incidence is 2 000-3 000 cataract operations per million population per year.

If the CSR is less than 2 000, the surgery rate will not keep up with the incidence, some people who become blind due to cataract will remain untreated and will remain blind until they die, and the backlog will continue to increase.

If the CSR is 2 000-3 000 or more, the CSR will keep up with the incidence, people who become blind due to cataract will be treated and will be cured of their blindness, and the backlog will be abolished over a period of 5 years.

This applies if we use a visual acuity of <6/60 as the indication for cataract surgery.
If a better visual acuity is used as the indication, the required CSR increases -

VISUAL ACUITY INDICATION FOR CATARACT SURGERY	CSR REQUIRED TO ELIMINATE CATARACT BLINDNESS
<6/60	2000
<6/36	3000
<6/24	5000
<6/18	10000
<6/12	20000

What Are The CSRs?

The 2002 CSRs in 5 representative countries are -

COUNTRY	CATARACT SURGERY RATE
Tanzania	
Phillipines	
Brazil	
India	
Australia	

The estimated 1999 CSR's in all the WHO regions are –

WHO REGION	APPROXIMATE POPULATION (MILLIONS)	APPROXIMATE RANGE IN CATARACT SURGERY RATE
Africa	672	<100 - 2000
Americas	853	500 - 6000
Eastern Mediterranean	503	<100 - 4000
Europe	878	<1000 - 6000
South East Asia	1590	<500 - 4500
Western Pacific	1717	<500 - 7000

Exercise 5 - Cataract Surgery Rate

Calculate the CSR for your district or country.

How does this compare to neighbouring areas and other parts of the world?

In order to achieve a CSR of 2000 in your district or country, how many cataract surgeries need to be done each year?

Cataract Surgery Coverage

Definition

The cataract surgery coverage (CSC) is the proportion of people in the district that need cataract surgery that have had cataract surgery.

$$CSC = \frac{\text{Number of people with operated cataract}}{\text{Number of people with cataract + Number of people with operated cataract}}$$

Measurement

The CSC can be measured from a rapid assessment of 1000 people aged 50 years and older (20 clusters of 50).
The CSC should ideally be 100%, but it may be as low as 10%.
It provides a quantitative measure of cataract surgery in the community.

The rapid assessment of CSC can be combined with -
Rapid assessment of prevalence of all blindness (in people aged 50 years and over)
Rapid assessment of prevalence of cataract blindness (in people aged 50 years and over)
Rapid assessment of barriers to cataract surgery
Rapid assessment of cataract surgery outcome
Cataract case finding
Marketing of cataract surgery.

Twenty clusters are randomly selected, at each of which 50 randomly selected people aged 50 years and over are screened by an eye nurse and 2 assistants.

The assistants screen the selected individuals by -
Testing whether or not the visual acuity in each eye is 6/60 or better.
Asking whether or not they have had an eye operation.

All the people whose visual acuity in one or both eyes is less than 6/60, or who report having had an eye operation, are referred to the eye nurse for examination.

The eye nurse examines those people referred by -
Retesting the visual acuity in each eye.
Examining the eyes with a torch and / or ophthalmoscope, to ascertain whether or not there is a cataract or other significant eye pathology; and whether or not the eye has had cataract surgery.

Those people who are found to have cataract who have not had surgery are interviewed to ascertain why they have not attended for surgery.

Those people who are found who have had cataract surgery are interviewed to ascertain whether or not they are satisfied with the results of their surgery.

Someone from the district who has had successful surgery speaks to those people who need surgery about the availability and benefits of the surgery, and they are given a referral

Exercise 6 - Rapid Assessment Of Cataract

In a rapid assessment of cataract -
1000 people aged 50 years and older were screened.
172 were found to have cataract with visual acuity less than 6/60.
156 were found to have cataract with visual acuity <3/60.
56 had had previous surgery.
Of these 56, 12 had a visual acuity between 6/6 and 6/18, 29 between 6/24 and 6/60, and 15 less than 6/60; 46 said they were happy with the results of the surgery, and 10 said they were unhappy.
Of the 172 found to have cataract with visual acuity less than 6/60, 86 said they did not know of the availability of cataract surgery services in the district.

What is the prevalence of blindness due to cataract?

What is the cataract surgery coverage?

What recommendations might you make to overcome the barriers to cataract surgery uptake?

What is the cataract surgery outcome?

What recommendations might you make to improve the outcome?

Cataract Surgery Outcome

What Factors Determine The Outcome Of Cataract Surgery?

1. The pre existing condition of the eye. Is there other significant pathology which may affect vision?
2. The expertise of the surgeon. Is it necessary for the surgeon to undergo additional training?
3. The surgical technique used. Is IOL implantation part of the surgery? Is biometry done?
4. The surgical facilities available. Are the operating microscope and microsurgical instruments adequate?
5. The follow up of the patient? Is there adequate post operative management? Is there adequate correction of residual refractive error post operatively?

What Should The Cataract Surgery Outcome Be?

The WHO recommendations for acceptable outcomes are -

1. Intraoperative complications - 5%-.

2. Visual acuity day 1 post op -

Visual Acuity	Result	%
6/6 - 6/18	Good	40%+
6/24 - 6/60	Okay	50%
<6/60	Poor	10% (5%- due to surgical complication)

3. Visual acuity week 8 post op -

Visual Acuity	Result	%
6/6 - 6/18	Good	85%+
6/24 - 6/60	Okay	10%
<6/60	Poor	5%-

How Should The Cataract Surgery Outcome Be Monitored?

Record any intraoperative complications in all patients after surgery.
Record the vision in the operated eye of all patients on day 1 after surgery + of all patients who return for follow up after 8 or more weeks.
If the vision is poor (<6/60), record the cause for this.
Samples of the forms for this monitoring are attached.

What Is The Purpose Of Monitoring The Outcome?

Monitoring of outcome is for self comparison of a surgeon or hospital over time.
It is not for comparison of one surgeon or hospital with another.
The purpose is to improve the quality of outcome over time.
It is guaranteed to facilitate this improvement.

CATARACT SURGERY OUTCOME
FORM A - DISCHARGE VISUAL ACUITY

HOSPITAL: **SURGEON:** **PERIOD:**

Serial Number	Patient Name	Patient Number	Surgeon	IOL Y/N	Surgical compli-cations	Visual acuity outcome			Cause of poor outcome (<6/60)		
						Good 6/6-6/18	Okay 6/24-6/60	Poor <6/60	Selection	Surgery	Spectacles
Totals											

CATARACT SURGERY OUTCOME
FORM B- WEEK 8 VISUAL ACUITY

HOSPITAL: **SURGEON:** **PERIOD:**

Serial Number	Patient Name	Patient Number	Surgeon	IOL Y/N	Visual acuity outcome			Cause of poor outcome (<6/60)			
					Good 6/6-6/18	Okay 6/24-6/60	Poor <6/60	Selection	Surgery	Spectacles	Sequelae
Totals											

Exercise 7 - Monitoring Of Cataract Surgery Outcome

The discharge visual acuities for 20 cataract surgeries done by 2 surgeons at a Vision 2020 surgical centre are shown on the attached monitoring forms.

What percentage have a good outcome?

What percentage have a poor outcome?

What percentage of poor outcome is due to other pathology ("selection")?

What percentage of poor outcome is due to intraoperative complication ("surgery")?

What percentage of poor outcome is due to refractive error ("spectacles")?

Which surgeon has the better results?

Which surgeon is the better surgeon?

Is the outcome within WHO recommendations?

What recommendations might you make to improve the outcome?

CATARACT SURGERY OUTCOME
FORM A - DISCHARGE VISUAL ACUITY

HOSPITAL: **SURGEON: 1** **PERIOD:**

Serial Number	Patient Name	Patient Number	Surgeon	IOL Y/N	Surgical compli-cations	Visual acuity outcome			Cause of poor outcome (<6/60)		
						Good 6/6-6/18	Okay 6/24-6/60	Poor <6/60	Selection	Surgery	Spectacles
1							6/60				
2							6/36				
3						6/18					
4					PC rupture			3/60		Corneal oedema	
5							6/60				
6							6/60				
7							6/60				
8							6/24				
9						6/12					
10							6/60				
Totals											

CATARACT SURGERY OUTCOME
FORM A - DISCHARGE VISUAL ACUITY

HOSPITAL: **SURGEON: 2** **PERIOD:**

Serial Number	Patient Name	Patient Number	Surgeon	IOL Y/N	Surgical compli-cations	Visual acuity outcome			Cause of poor outcome (<6/60)		
						Good 6/6-6/18	Okay 6/24-6/60	Poor <6/60	Selection	Surgery	Spectacles
1							6/60				
2								3/60	Glaucoma		
3								4/60	Diabetic retinopathy		
4						6/18					
5							6/60				
6							6/60				
7								5/60			PH->6/24
8							6/24				
9							6/36				
10							6/60				
Totals											

Cataract Surgery Cost

Cost And Price

Cost = cost of surgery to the provider
Price = price of surgery to the receiver
Price < cost → subsidy
Price > cost → profit
Price = cost → break even.

Breakdown Of Cost For Cataract Surgery

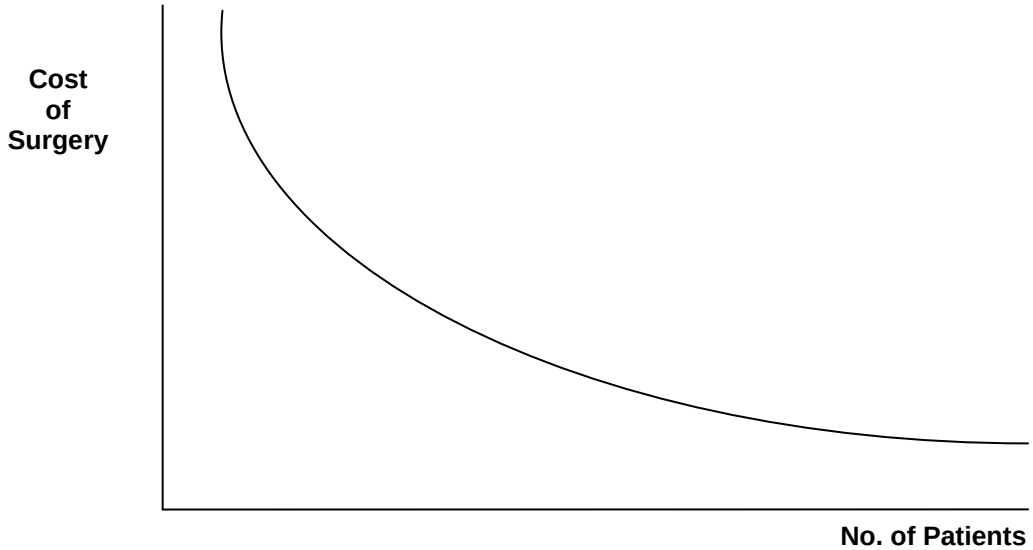
Capital -	Buildings	
	Instruments and equipment	
Running -	Fixed / overheads -	Salaries
		Utilities
	Variable -	Consumables.

How Can We Make Cataract Surgery More Affordable?

Step 1 - Cost containment
Step 2 - Cost recovery
Step 3 - Income generation.

Cost Containment - Increased Number Of Surgeries (Economy Of Scale)

The fixed / overhead costs remain the same, however many operations are done.
Therefore, increased number of surgeries → decreased unit cost per surgery.
This is achieved by increasing the uptake + the capacity.



Cost Containment - Purchase Of Cheap Consumables

Strategies include -
Low cost technologies
Sourcing of cheap consumables
Bulk purchases.

Cost Recovery Model

A model from LV Prasad Institute in Hyderabad, India for cost recovery and cost sharing is -

VIP	$100	5%	Profit
De luxe	$60	10%	Profit
Economy	$30	20%	Break even
Non paying	Free	65%	Internal subsidy / cost sharing.

The profit from the patients paying the “VIP” and “de luxe” rates is used to subsidise the non paying patients.
The non clinical care varies between the 4 grades.
The clinical care is standardised for all 4 grades.

Income Generation And External Subsidy

Income generation (independent) - Fees for less essential clinical services - Non surgical
Surgical
Other business activities
External subsidy (dependent) - Government
Local NGO
International NGO.

Income generation should be used to cover running costs.
External support should be used for capital costs.

Cost Of Cataract Surgery And Vision 2020

1. The total cost per cataract surgery should be US$100 (2000 cataract surgeries per year, US$1 million total cost to fund a Vision 2020 programme for 5 years).
2. This cost should be shared 50-50 between MOH and the NGO / donor agency, with increasing financial responsibility being taken by the MOH over a 5 year period, so that donor funding can be withdrawn after 5 years.
3. Because of economy of scale and the exponential increase in unit costs with decreased numbers of surgeries done, it is not possible to reduce the unit costs of cataract surgery to an acceptable level of US$100 if the cataract surgery numbers are less than 2 000.

Exercise 8 - Cost Of Cataract Surgery

Because of budget constraints, the management of a district hospital has decided to curtail all elective surgery.
The population of the district is 1 million.
Last year, 750 cataract surgeries were done.
This year, the cataract surgeon has been restricted to doing 20 cataract surgeries per month.
The cost of the consumables for each operation is US$25.
The estimated annual fixed costs (overheads) are US$150 000.

What should the CSR be for the district?

What was the CSR last year?

What will the CSR be this year?

What was the total cost for cataract surgery last year?

What will the total cost for cataract surgery be this year?

How much money will the hospital save?

What was the cost per cataract surgery last year?

What will the cost per cataract surgery be this year?

What would the cost per cataract surgery be if -
0 cataract surgeries were done?
500 cataract surgeries were done?
1000 cataract surgeries were done?
1500 cataract surgeries were done?
2000 cataract surgeries were done?
Plot these costs on a graph.

To meet the cost recommendations for Vision 2020, what is the minimum number of cataract surgeries that should be done at the hospital each year?

What recommendations might you make to the hospital management?

Improving Cataract Services

Recommendations

The objectives of our cataract services are -
High quality (outcome)
High quantity (output)
Low cost (outlay).

The recommendations are -

1. Outcome (quality) -

Day 1 visual acuity -	6/6 - 6/18	40%+
	6/24 - 6/60	50%
	<6/60	10% (5%- due to surgical complication).
Week 8 visual acuity -	6/6 - 6/18	85%+
	6/24 - 6/60	10%
	<6/60	5%-.

2. Output (quantity) -
   2 000 per million population per year.

3. Outlay (cost) -
   US$100 per surgery total cost.
   US$25 per surgery consumables.
   Self sustaining, with no external support.

Improving Outcome

1. Monitor outcome NB NB NB.
2. Convert to IOL surgery.
3. Include biometry.
4. Consider small incision surgery.

Improving Output

Is there a waiting list?

No → Increase demand → Consider barriers to delivery -

Awareness -	Health education
Accountability -	Improve quality of patient care
Affordability -	Decrease cost
Accessibility -	Take surgery to the patient, or patient to the surgery.

Yes → Increase capacity → Consider surgery efficiency + surgery volume -

Surgery efficiency -	OR lay out
	OR division of labour
	OR routines
Surgery volume -	Number of surgeons
	OR time.

Reducing Cost

1. Cost containment - Increase number of surgeries
   Purchase cheap consumables.
2. Cost recovery and cost sharing - Multi tier system, with cross subsidisation.
3. Income generation from other sources.
4. External support, only as a last resort.

Exercise 9 - Improving Cataract Services

As a district Vision 2020 programme manager, you have the task of improving the cataract surgery services in your district - quality, quantity (uptake + capacity), and cost.

How do you plan to do this?

Childhood Blindness

and

Visual Loss

Definition

Childhood blindness is defined as a best corrected visual acuity of <3/60 in the better eye of an individual under the age of 16 years.

Prevalence

Blindness and Severe Visual Impairment in Children in Different Countries

Region	Country	Reference	Year	Prevalence/ 1,000 children	Age group (yrs)	Source of data
Europe	Iceland	Halldorsson	1980	0.36	0-14	Survey
	England	RNIB	1985	0.10	0-4	Registration
	England	RNIB	1985	0.22	5-9	Registration
	England	RNIB	1985	0.23	10-14	Registration
	UK	Stewart-Brown	1988	0.34	10	Cohort study
	Eire	Goggin	1991	0.20	0-16	Estimate
	Scandinavia	Riise	1992	0.15-0.41	0-15	Registration
Asia	Nepal	Brilliant	1980	0.63	0-14	Survey
	Bangladesh - rural	Cohen	1985	0.64	0-5	Survey
	Bangladesh - urban	Cohen	1985	1.09	0-5	Survey
Africa	Malawi	Chirambo	1983	1.10	0-5	Survey
	The Gambia	Faal	1986	0.70	0-19	Survey
	Benin	WHO	1991	0.60	0-15	Survey
	Morocco	WHO	1994	0.30	0-15	Survey

SUMMARY

Country	**Prevalence**
Industrialised	0.3/1000 Children
Middle Developing	0.6/1000 "
Poor Developing	0.9/1000 "
Very Poor	1.2/1000 "

The global figure is estimated at 1.5 million (7/10,000 children).

Estimation/ million pop

= Total Population X Proportion of Population who are Children X Prevalence

Example:

1. Population 1,000,000
2. 40% Population aged 0-15yrs
3. Prevalence 0.5/1000 children
4. Number of Blind Children = $1{,}000{,}00 \times \frac{40}{100} \times \frac{0.5}{1000}$

= 200 Blind Children per Million population

Causes

It is difficult to obtain good epidemiological data because:

A POPULATION BASED SURVEYS

Problems:

1. Low prevalence - therefore large sample.
2. Case definition in babies and infants is often difficult.
3. Lost 'cases' in institutions.

B BLIND SCHOOL CHILDREN SURVEYS

Problems:

Selection bias against

1. rural blind
2. pre-school blind
3. multiple disabilities
4.

Summary

The simplest way to estimate the causes of childhood blindness is to examine approximately 200 blind children from blind schools and/or hospital clinics.

The causes of childhood blindness can be classified in two ways:

a) Anatomically - according to the anatomical site of lesion in the eye.
b) Aetiologically - relating to when the insult occurred which resulted in blindness
   i). hereditary
   ii). intra-uterine
   iii). peri-natal
   iv). childhood

Surveys conducted in various countries have shown a wide variation in the different causes of childhood blindness.

Corneal blindness may account for up to 50% of all childhood blindness in some poor areas of the world.

Cataract is responsible for between 10-20% of all childhood blindness. Glaucoma in childhood is responsible for between 1-2% of all childhood blindness. It is possible that some congenital cataract and glaucoma in childhood is a result of rubella infection in pregnancy. The extent to which the rubella infection, affecting the unborn child, influences childhood blindness is not yet clear although it probably constitutes somewhere between 5-10% of all cases of childhood blindness.

Retinal diseases are an important cause in the intermediate and more developed countries. Retinal diseases are due to certain hereditary conditions and also due to retinopathy of prematurity (ROP) which is becoming an increasingly important cause of childhood blindness in cities of the developing world due to the survival of low birth weight children.

Results of Blind School Studies

LATIN AMERICA		AFRICA		ASIA		E. EUROPE	
n = 830 7 countries		**n = 1407 10 countries**		**n = 2235 5 countries**		**n - 781 4 countries**	
RETINA	40%	CORNEA	31%	CORNEA	27%	RETINA	32%
ANOMALIES	13%	RETINA	24%	ANOMALIES	24%	CATARACT	23%
CORNEA	10%	CATARACT	10%	RETINA	23%	ANOMALIES	15%
GLAUCOMA	10%	ANOMALIES	10%	CATARACT	12%	OPTIC ATROPHY	10%
CATARACT	8%	OPTIC ATROPHY	10%				
GENETIC	25%	GENETIC	25%	GENETIC	25%	GENETIC	45%
PERINATAL	20%	CHILDHOOD	30%	CHILDHOOD	25%		

Control of Childhood Blindness

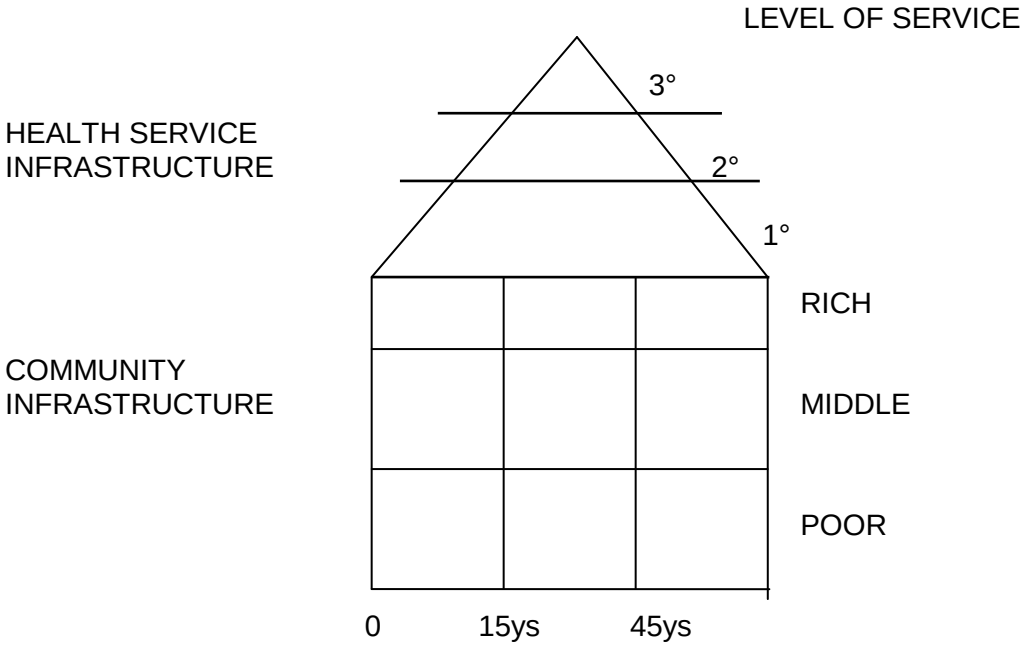
1. **Why are children blind?**
   Examine 200 blind children

2. **Which causes are avoidable?**
   Which can be prevented?
   Which can be treated?

3. **How can we prevent these diseases?**
   Primary prevention - prevent disease occurring
   Secondary prevention - prevent visual loss from disease
   Tertiary prevention - restore vision

4. **Methods of Control**

(a) **Integration in Health Care System**



(b) Specific disease control
This is considered as
preventive measures for CORNEAL diseases
surgical measures for CATARACT,GLAUCOMA and R.O.P.
optical measures for LOW VISION / REFRACTIVE ERRORS

Cataract in Children

Definition

A lens opacity which reduces vision in a child aged 0-15 years.

Magnitude

15% of childhood blindness = 30 children / million population are blind

Incidence
- at least 10 new cases / million population/ year
- 1/2000 live births

Causes

Non-traumatic

Hereditary (autosomal dominant)	25%
Rubella	20% (variable)
Others	5%
Unknown	50%

Traumatic (usually 1 eye)

Control

Primary	-	rubella immunisation
Secondary		treat aphakia and amblyopia
Tertiary	-	early, good surgery, excellent follow-up (low vision services)
		Role of IOL surgery is changing.

Glaucoma in Children

Definition

Raised intraocular pressure leading to optic nerve damage and decreased vision in children.

Magnitude

1-10% of childhood blindness = 2-20 children / million population are blind

Incidence - 1/10,000 live births = 1-2 cases / million population / year

Causes

Primary
- Hereditary
- Unknown

Secondary
- Rubella
- Anomalies (e.g., iris root abnormalities)

Control

Primary	-	Rubella immunisation / genetic counselling
Secondary		Early diagnosis and surgery Treat amblyopia + refractive errors
Teriary	-	Low vision services

Retinopathy of Prematurity

Classification

By Stage:

1. Demarcation line - thin white line within the retina separating avascular and vascular retinal regions.
2. Ridge - the line is larger than 1(above) and raised out of the plane of the retina
3. Ridge with extra retinal fibrovascular proliferation - the raised line is associated with fibrovascular proliferation out of the retina.
4. Sub-total retinal detachment.
5. Total retinal detachment.

PLUS DISEASE - tortuosity of the posterior pole retinal vessels which may be associated with iris engorgement and vitreous haze.

By Zone:

Zone 1 - posterior pole (central 30)°
Zone 2 - up to periphery of nasal retina
Zone 3 - up to periphery of temporal retina

The more posterior (by zone) the ROP, the greater the likelihood of progression to stage 3. ROP totally confined to zone 3 does not progress to stage 3.

CLOCK HOURS - each clock hour represents a 30° segment of the 360° circle.

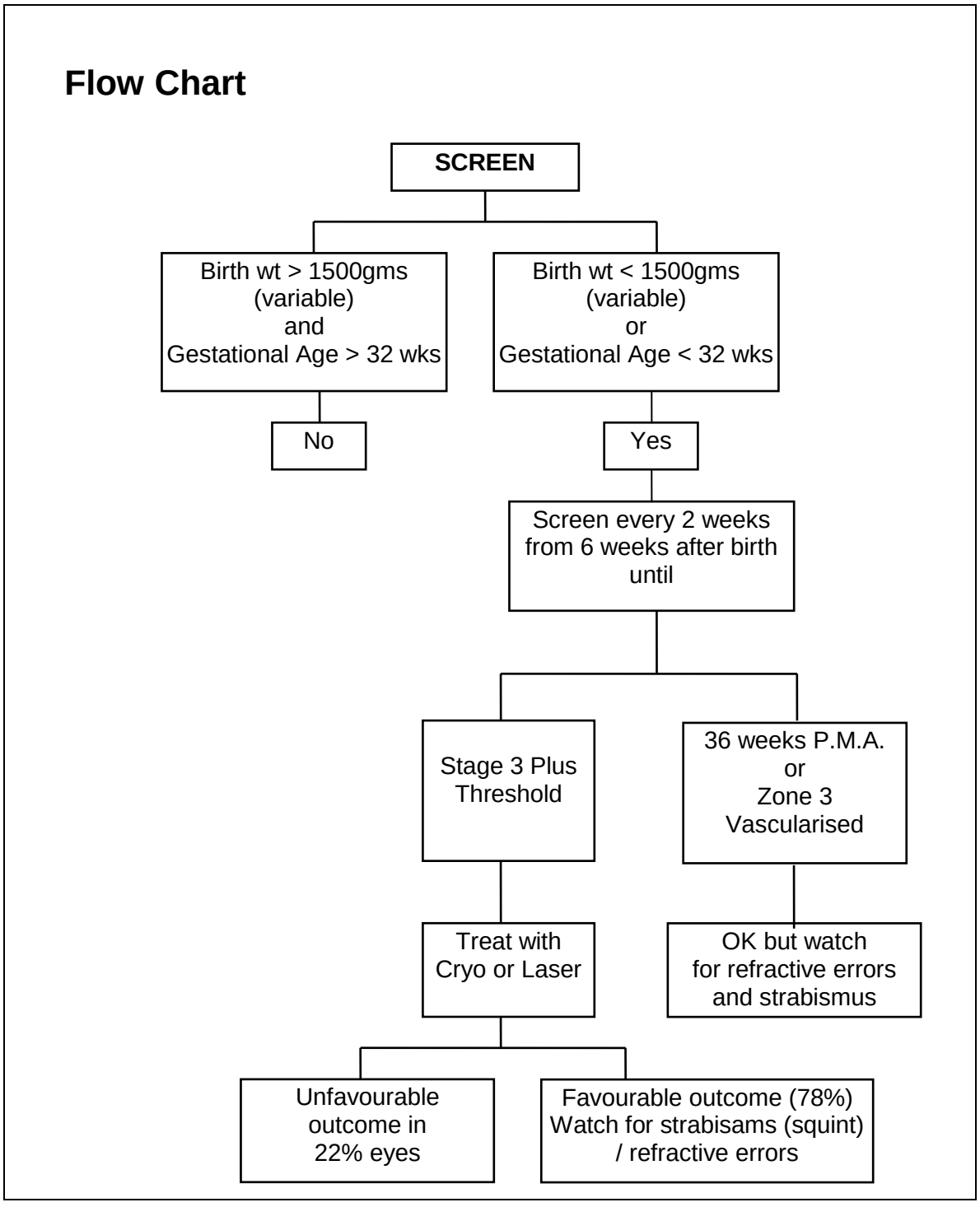
The more extensive the ROP by clock hour the greater the tendency to progress, and this goes with more posterior disease.

STAGE 3 PLUS DISEASE IDENTIFIES A CHILD IN NEED OF TREATMENT WHEN THERE ARE 5 OR MORE CLOCK HOURS OF CONTINUOUS; OR 8 OR MORE CUMULATIVE CLOCK HOURS OF STAGE 3 DISEASE. THIS IS KNOWN AS ‘THRESHOLD DISEASE’.

Screening for ROP

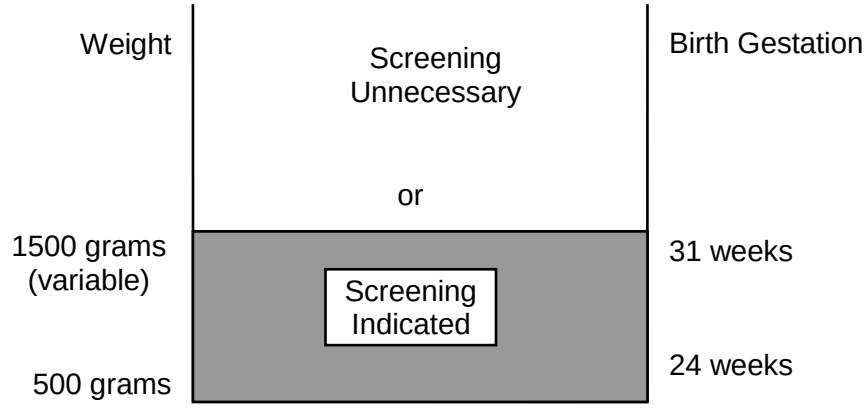
Consider screening if:

1. ROP accounts for more than 10% of new admissions/registrations of blind children.
or
2. In a neonatal unit where, each year,100 babies (or more)with birth weights of less than 1500gms who are surviving to 6 weeks of age.

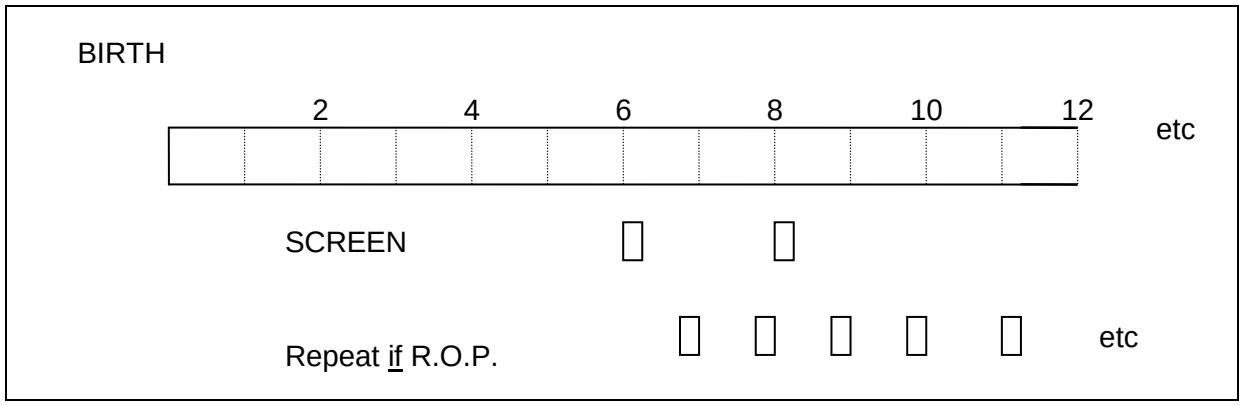


ROP Screening

Indication



ROP: Schedule for Screening



Discharge: no ROP at second screen
or: ROP regressing
or Retina vascularised to periphery
Treat ROP stage 3 threshold

Treatment of ROP

Stage 3 plus threshold disease should be treated as soon as possible after diagnosis and within 1 week at the latest. The time window available for treatment, and retreatment if necessary, is short - about 2-3 weeks. Treatment is usually around 36-44 weeks postconceptual age (mean 37.7 weeks).

Treatment can be performed in the neonatal unit under sedation and local anaesthetic drops. It is important to have a neonatologist present when treatment is being given.

Cryotherapy or laser is applied to the whole of the area of avascular retina. If cryo is used, freeze anterior to the ridge, immediately on seeing white, stop, thaw and move to the adjacent new site. Usually two rows are required.

Following treatment the infant should continue to be seen at regular intervals for follow-up. The results of cryotherapy for stage 3 plus disease reduce the progression to stage 4 and 5 disease from approximately 50% to 25%.

Surgically Avoidable Childhood Blindness

	ROP	Cataract in Childhood	Glaucoma in Childhood
Amount of blindness in blind schools	20%	15%	8%
Incidence /10,000 births	4	4	1
Cases/million population	10	10	2
Diagnosis	Stage 3 disease: Raised ridge with fibrovascular proliferation and posterior vessel tortuosity	Abnormal red reflex White pupil	Large eye Hazy cornea Raise IOP Cupped disc
Treatment	Cryo. or laser to the avascular zone, 360° circumference.	ECCE surgery with IOL	Goniotomy or Trabeculotomy or Others
Problems	Awareness Screening - paediatricians - ophthalmologists	Late diagnosis. Ref error correction Amblyopia	Late surgery Long-term Control

Strategy for Surgically Avoidable Blindness in Children

Disease	Activity	Manpower
ROP	Screen all babies less than 1500gms 9variable)	Ophthalmologist
Cataract Glaucoma	Screen all newborn babies	Paediatricians Parents
ROP Cataract Glaucoma	Treat 10 ROP /year Treat 10 cataracts/year Treat 2 glaucomas/year	Ophthalmologist Anaesthetist Paediatrician Nurse
ROP Cataract Glaucoma	Follow-up Low Vision Services * for at least 20 years * disease evaluation includes: * intraocular pressure * refraction * amblyopia treatment * optical - low vision devices * educational needs	Ophthalmologist Educationalist Optician Orthoptist

MATERIAL NEEDS
Indirect ophthalmoscope
Portable cryo unit or laser
Anaesthesia equipment for children
Instruments for aspiration/lensectomy/trabeculotomy
Spectacles (or contact lenses)
Low vision devices

Significant Refractive Error in School Children

Aim

To detect significant refractive errors which require spectacle correction.
Usually considered myopia of 1D, astigmatism 1.5D, hyperopia 3D or more in better eye.

Needs

Approximately 5000 children aged 5-15years / million total population have refractive errors greater than -1.00 dioptre sphere in both eyes. (Variable prevalence.)

Strategy

1. If possible, screen all children once between ages 10-15 years.
2. Use binocular vision of 20/40 (6/12) or less for assessing moderate to severe refractive errors. (Testing can be done by trained teachers/health workers.)
3. Spectacles to be given for:

Myopia	1 dioptre sphere or more both eyes
Astigmatism	1.5 dioptre cylinder or more both eyes
Hypermetropia	+3 dioptres spheres or more with symptoms

Low Vision Services

Definition
Best corrected Vision less than 6/18 in the better eye to P.L.

Aim
To reduce the time individuals spend with visual disability by providing optical and low vision services.

Resources Required

MANPOWER	Optometrist/Therapist/(Ophthalmologist)
MATERIALS	Magnifiers (hand, stand)
	Telescopes (hand, spectacles)

Priority
- Children
- Aphakes
- Myopes
- Albinism
- Macular disease

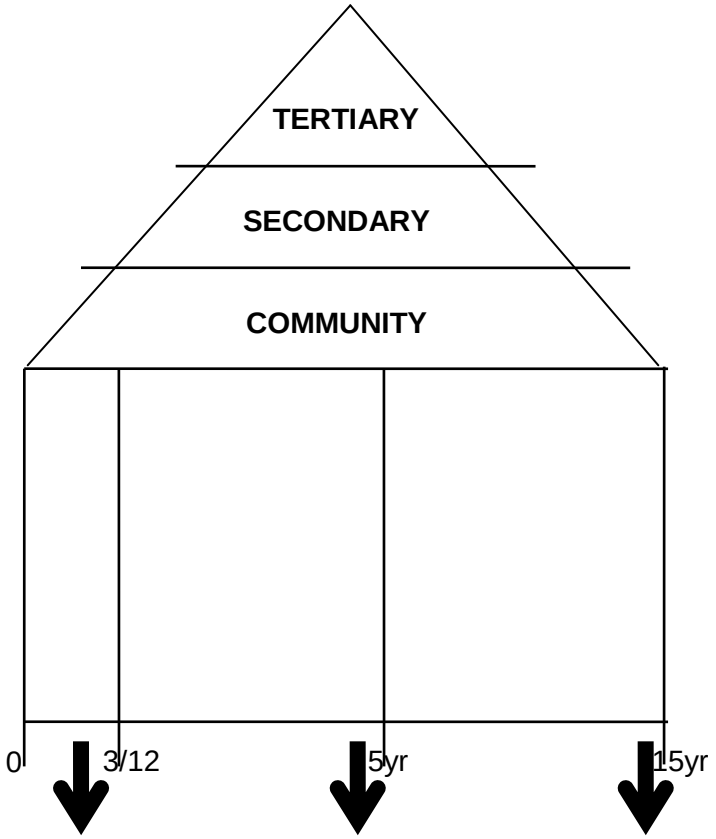
Strategy
1. Detect case
   In blind schools
   From ophthalmologists
2. Assessment
   Ophthalmologist - diagnosis, prognosis
   Optometrist - refraction ± magnification needs
   Therapist - skill/function needed
   e.g., reading
   distance from blackboard
   etc.
3. Prescription
   a) near, medium or distance
   b) spectacles, hand or stand magnifier, telescope
   c) low cost, locally made or expensive high-tech
4. Education, Motivation and Follow-up

Summary
1. Many children in blind schools can benefit from spectacles and/or low vision devices.
2. or more of children with 1/60 vision can read normal size print if provided spectacles and/or magnifiers.
3. Low vision services are important to maximise functional vision particularly in children.
4. Low vision devices (magnifiers and telescopes) can be made locally for less than $20 each.
5. Children with vision <6/60 - 1/60 are the priority group for treatment.

Summary of Control of Childhood Blindness (By Disease)

Anatomical Level	**Number/ million population**	**PRIMARY** (Prevent the disease)	**SECONDARY** (Prevent Visual Loss)	**TERTIARY** (Restore Vision)
CORNEA		Nutrition Education Measles immunisation	Early treatment of corneal Disease	Corneal grafting Low vision services
LENS		Rubella immunisation Genetic counselling	Early surgery Amblyopia treatment	Early good surgery Good follow-up Low vision services
RETINA		Avoid low birth weight Avoid hyperoxia	Screening for ROP and treatment	Low vision services
GLAUCOMA		Rubella immunisation Genetic counselling	Early, good surgery Good follow-up	Low vision services
OPTIC N /H.V.P		Good ante-natal and peri-natal care	———	Low vision services
WHOLE GLOBE		Avoid medication in pregnancy	———	Low vision services
Total	200-400	/million total population	or 0.5/1000 children	

Summary of Control of Childhood Blindness (By Age and Health Service)



LEVEL	NEONATES	PRE-SCHOOL	SCHOOL
Primary Community	Prevent ophthalmia neonatorum Examine babies eyes	Screen for amblyopia Prevent xerophthalmia	Screen visual acuity
Secondary Mid-level	Refer cataract and glaucoma	Treat corneal disease	Provide spectacles
Tertiary Referral	Screen & treat ROP Treat cataract and glaucoma	Specialist surgical Low vision services	Treatment of severe ocular injuries Low vision services

Conclusion

Nutrition education and measles immunisation programmes should result in the virtual eradication of corneal blindness in childhood.

Rubella immunisation may be effective in some countries preventing childhood blindness from congenital cataract and glaucoma.

Screening of newborn children for cataract, glaucoma; and screening of low birth weight children for retinopathy of prematurity, followed by the provision of specialist ophthalmological surgical services could prevent visual loss from these three potentially treatable surgical conditions.

Many children with severe visual loss/blindness can be helped to read normal print with spectacles and/or low vision devices.

The causes of childhood blindness are changing as corneal disease is gradually reduced and cataract and glaucoma become increasingly important causes, with ROP emerging as the most potentially preventable cause of childhood blindness in urban situations.

It is necessary to monitor closely the changing patterns of childhood blindness in each individual country so that appropriate preventive and therapeutic measures can be initiated to reduce the number of blind years from avoidable causes of blindness in children.

Vitamin A

Deficiency

Vitamin A Deficiency

Classification

XN - Night blindness
XF - Xerophthalmic fundus
XIA - Conjunctival xerosis
XIB - Bitot's spot
X2 - Corneal xerosis
X3A - Corneal ulcer, less than 1/3 of cornea
X3B - Corneal ulcer, 1/3 or more of cornea
XS - Corneal scar

Night Blindness XN

- cause is lack of rhodopsin in the retinal photoreceptors (rods)
- usually reversible in 48 hours with treatment
- other causes: retinitis pigmentosa; onchocerciasis

Conjunctival Xerosis XIA

- due to absence of goblet cells, with decrease in mucin and squamous metaplasia of conjunctival cuboidal epithelium
- often difficult to see, especially in inflamed eyes
- usually temporal then inferior conjunctiva
- improves in 2-4 days with treatment

Bitot's Spots XIB

- appearance due to keratinisation and secondary infection with gas forming *Corynebacterium xerosis*
- white or grey, cheesy or foamy spots usually at the temporal conjunctiva
- may take weeks or months to resolve with treatment, and some never resolve

Corneal Xerosis X2

- drying of the cornea
- first sign is a very fine punctate keratopathy usually infero-nasally
- there is decreased wettability of the cornea
- corneal oedema appears and there is marked punctate staining with fluorescein
- in severe cases keratin may form on the corneal epithelium

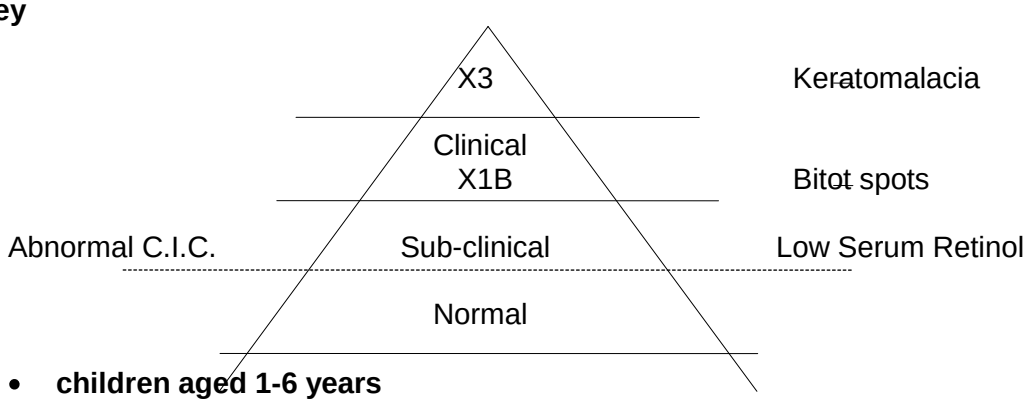
Corneal Ulceration X3

- it is likely that there are different mechanisms
    a) small sharply demarcated ulcers, usually infero-nasally
    b) stromal necrosis, localised or generalised, often beneath an intact epithelium; called keratomalacia
- these mechanisms are not definitely understood
- the mechanism in a) is possibly due to an epithelial 'cyst' rupturing, or possibly due to eyelid trauma over an area of metaplasia
- the mechanism in b) is necrosis of corneal matrix (collagen and mucopolysaccharides) usually without inflammatory sintrs:
- corneal ulceration takes 5-7 days to heal with scar formation providing that there is normal cornea left
    X3A - ulceration of less than 1/3 of the cornea
    X3B - ulceration of 1/3 or more of the cornea

Assessment of Vitamin A Deficiency

- are children **poor** and **under-nourished**?
- is **corneal scar (XS)** causing **10%** or more of new admissions to **blind schools**?
- is **keratomalacia (X3)** seen in **hospital records**?
- if **two or three** of the above are present, consider a **population based survey.**

Survey



- **children aged 1-6 years**
- **clinical**
  - Bitot's spot (X1B)
  - Corneal scar (XS)
  - Active corneal disease (X2, X3)
- **sub-clinical**
  - Conjunctival impression cytology (CIC)
  - Blood retinol (sub-sample)

Example:

Survey of 2000 Children for Bitot's Spots

- if ten or more Bitot's spot found: a problem exists (XIB = 10/2000 or 0.5%)
- Bitot's spots seem to be less common in Africa compared with South Asia

Risk Factors for Xerophthalmia

1 **Age**
   X2 / X3 1-4 years
   XN / X1B increasing from 1-8 years
2 **Males**
   Boys > Girls (even if they are on the same diet)
3 **Mother's Milk**
   Non breast feeding children 3 - 4 x greater risk
4 **Measles**
   Children with measles at greater risk
5 **Malabsorption - Diarrhoea**
   Children with recurrent, chronic diarrhoea at greater risk
6 **Malnutrition**
   Children who are 'malnourished' e.g., marasams, Kwashiorkor, at greater risk
7 **Maternal Education**
   Children of mothers with no schooling at greater risk

Effect of Vitamin A Supplements on Mortality of Children in Developing Countries.

Country	Number enrolled	Vitamin A Dose (IU)*	Interval Between Doses (months)	Outcome †	
				Ratio	P
Indonesia (N Sumatra)	25,200	200 000	6	0.73	0.024
Nepal (Lowland)	28,630	<200 000 (age graded)	4	0.70	0.003
Nepal (Highland)	7,197	<200 000 (age graded)	Once only	0.74	0.058
India (Tamil Nadu)	15,419	8333	0.25	0.46	0.01
India (Andhra Pradesh)	15,775	200 000	6	0.94	0.82
Ghana	21,906	<200 000 (age graded)	4	0.81	0.03
Sudan ‡	28,492	200 000	6	1.06	0.76
Measles Studies					
Tanzania	180	200 000	2 doses 1 d interval	0.50	0.13§
South Africa	189	400 000	Once only	0.21	0.046

*1 IU=0.3 µg retinol = 1.05 nmol retinol.

†Ratio = ratio of treated to control mortality rates; p=probability that treated and control group mortalities were equal. A ratio <1 indicates a positive effect of supplements.
‡ This study found a highly significant inverse correlation between dietary vitamin A intake and risk of mortality in children in same community.
§p<0.05 for children under 2 years.

Vitamin A supplementation to children in areas where vitamin A deficiency is likely to be a problem, reduces child mortality significantly.

Control of Vitamin A Deficiency

1 Short-term

Vitamin A capsules 200.000 i.u. to children at high risk, e.g., measles, malnourished.
Treatment of children with clinical xerophthalmia, (e.g., X3, X2, X1B, XN) one capsule on first, second and fifteenth day.
Vitamin A 400,000 i.u. to mother at childbirth.

2 Mid-term

Remove risk factors
Measles immunisation (more in Africa)
Diarrhoea control (more in Asia)

3 Long-term

Improve nutrition of children and pregnant mothers

- available, affordable, acceptable
- appropriate in different societies

Treatment of Xerophthalmia

The treatment schedules given below apply to all stages of active xerophthalmia, including night blindness, conjunctival xerosis, Bitot's spots, corneal xerosis, and keratomalacia. The oral administration of large doses of vitamin A is the recommended method of treatment. The first dose should be given *immediately* xerophthalmia is recognised. Patients with acute corneal lesions should be referred, whenever this is possible, directly to a hospital for treatment of their general condition as well as of their eye disease.

Children under 6 years old

Children over 1 year and under 6 years old treat as shown in the table below.
Xerophthalmia Treatment Schedule

Immediately on diagnosis	200.000 IU vitamin A orally
The following day	200.000 IU vitamin A orally
4 weeks later	200.000 IU vitamin A orally

Note: if there is persistent vomiting or profuse diarrhoea, an intramuscular injection of 100.000 IU of water-miscible vitamin A (but not an oil-based preparation) may be substituted for the first dose. The use of sterile syringes and needles is, of course, essential.

Children under 1 year old and children of any age who weigh less than 8kg
Treat with half the doses shown in the table above.

Notes on treatment of young children

Children with diarrhoea may absorb rather less of the vitamin A than other children, but if the doses recommended above are used they should still absorb enough for the treatment to be adequate. Xerophthalmic children with severe protein-energy malnutrition need to be carefully monitored because their vitamin A status is unstable and may rapidly worsen, even when they are treated with the doses recommended. Additional doses may then be required for them.

Oil-based preparations are the preferred formulation for oral administration of vitamin A, but water-miscible preparations may be used if the oily solution is not available. If large-dose capsules or concentrated syrup are not available, vitamin A in an equivalent dosage may be given by mouth in other forms, such as fish-liver oil. Oil-based preparations are normally well absorbed by the body when they are administered orally, but they should *never* be injected since oil-based vitamin A is liberated extremely slowly from the injection site. The only preparation suitable for injection, intramuscularly, is water = miscible vitamin A

Involvement of the cornea in xerophthalmia is a medical emergency. Vitamin A must be administered immediately according to the three-dose schedule in Table 1. In order to treat or reduce the risk of secondary bacterial or viral (measles) infection of the eye, which would compound the damage to the cornea, the topical application of an antibiotic eye ointment, such as tetracycline or chloramphenicol, is recommended.
Ophthalmic ointment containing steroids should never be used in this situation. To prevent trauma to a cornea already weakened by xerosis or ulceration, the eye should be protected by an eye shield (not occlusive), and it may be necessary to restrain the arm movements of young children by light bandaging.

Women of reproductive age, pregnant or not

For night blindness or Bitot's spot, treat with a daily dose of 10.000 IU of vitamin A orally (1 sugar-coated tabled) for 2 weeks.

When active corneal lesions of xerophthalmia occur in a woman of reproductive age, one has to balance the possible teratogenic or other risk to the foetus (should she be pregnant) of a large dose of vitamin A against the serious consequences for her of vitamin A deficiency if she is not given a large dose. It would appear reasonable, in these exception circumstances, to administer the full treatment for corneal xerophthalmia, as described above for young children.

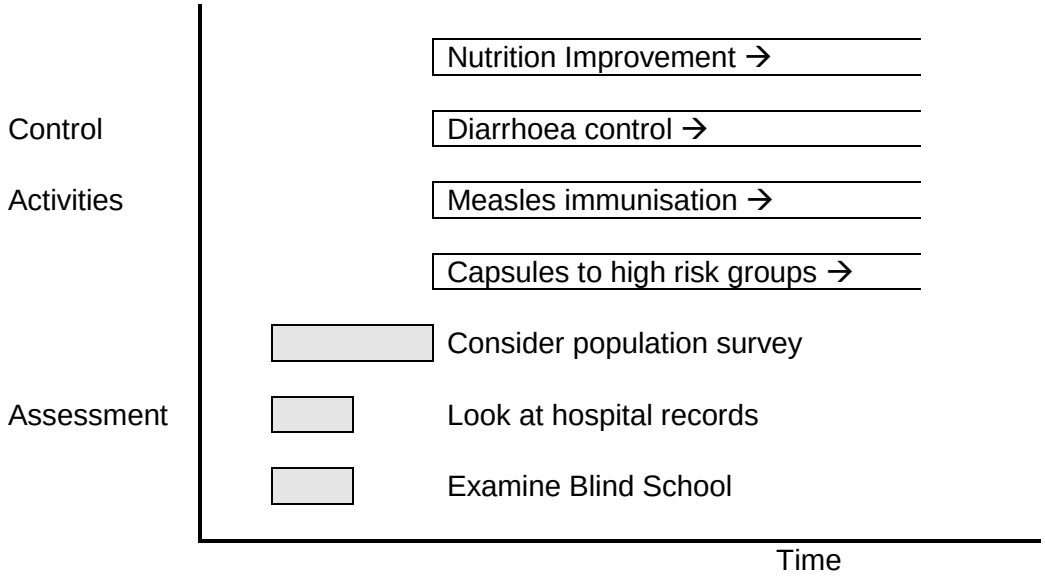
Vitamin A Supplements: Prevention of Vitamin A Deficiency

Universal-Distribution Prevention Schedule for preschool children and lactating mothers.

Children over 1 year and under 6 years old.	200.000 IU of vitamin A orally every 3-6 months.
Infants 6-12 months old and any older children who weigh less than 8kg	100.000 IU of vitamin A orally every 3-6 months. Immunisation against measles provides a good opportunity to give one of these doses (see Note).
Lactating mothers	200.000 IU of vitamin A orally once; at delivery or during the next 2 months. This will raise the concentration of vitamin A in the breast milk and therefore help to protect the breast-fed infant.

Note: When infants less than 6 months old are not being breast-fed, supplementation with 50.000 IU of vitamin A before they reach 6 months should be considered.

Steps in Assessing and controlling vitamin A deficiency.



THE

GLAUCOMAS

Definitions and Classifications

Definition

The Glaucomas are a group of diseases which have in common, characteristic damage of the optic nerve (pathological cupping and optic atrophy), resulting in loss of vision (visual field then visual acuity), which is often but not always associated with raised intra-ocular pressure.

Simple Classification

1. Congenital*
2. Primary angle closure
3. Primary open angle
4. Secondary

* Congenital glaucoma (buphthalmos) is relatively rare..

Various Classifications

1. Aetiological
   - 1.1 Primary - cause unknown
   - 1.2 Secondary - to another disease e.g. trauma, uveitis
2. Clinical
   - 2.1 Acute - sudden painful onset with a red eye
   - 2.2 Chronic - gradual loss of vision in a white eye
3. Patho-physiological
   - 3.1 Increased secretion - may occur in uveitis
   - 3.2 Decreased drainage
     - 3.2.1. Pupil block, e.g. occlusio pupil
     - 3.2.2. Angle block e.g. primary angle closure glaucoma (PACG)
     - 3.2.3. Trabecular block e.g. primary open angle glaucoma (POAG)

Magnitude

Global Prevalence of Glaucoma 1990 (W.H.O programme for Prevention of Blindness)

Type	Cases	Blind
POAG	13.5 million	3.0 million
PACG	6.0 million	2.0 million
Congenital	0.3 million	0.2 million
Secondary	2.7 million	Unknown
Total	**22.5 million**	**5.2 million (15% global blind)**

(A study by Harold A. Quigley MD (*Br J Ophthalmol* 1996; **80**: 389-393) estimates glaucoma worldwide by the year 2000 AD as affecting 66.8 million people with 6.7 million blind)

Prevalence of POAG

Age	UK USA	AFRICA CARIBBEAN
Under 40	rare	0.5%
40s +	1%	2-3%
50s +	2%	5-6%
60s +	3%	6-10%

Distribution of 13.5 million cases of POAG Worldwide

China 20%	= 2.5 million cases
Sub-Saharan Africa 20%	= 2.5 million cases
Western World 18%	= 2.5 million cases
India 13%	= 2 million cases
Eastern Europe 7%	= 1 million cases
Middle East 5%	= 0.5 million cases
East Asia/Pacific 10%	= 1.5 million cases
Latin America 7%	= 1.0 million cases

Risk Factors for the Glaucomas

	Primary Open Angle Glaucoma
1.	Age (increasing 4-5x from 40 to 70yrs)
2.	Race (Blacks 3-4x more likely than Whites)
3.	Family History (positive family history 5x more likely)
4.	Intraocular pressure (IOP over 20mms 5x more likely)
5.	Many others but less important
	Primary Angle Closure Glaucoma
1.	Age
2.	Race Eskimos +++; Chinese ++; Blacks rare)
3.	Females (females 3-4x more common than males)
4.	Hypermetropia
5.	Shallow anterior chamber (<2.5mm)

Control – Screening and Case Detection

A major problem in reducing visual loss and blindness from The Glaucomas is that most people do not know they have the disease, and many present late when they have already lost a great deal of vision in one or both eyes.

It would therefore be helpful if we could identify people with glaucoma at a relatively early stage so that treatment could be started before much vision has been lost.
The word “Screening” is used in public health when referring to the examination of a population at risk for a disease with a relatively simple test.
“Case detection” is used to refer to the opportunistic examination of people for disease when they present for a medical/eye examination.

Diagnosis of POAG

1. There are 3 classical features of POAG
    A. Raised IOP (25% to 50% can have normal pressure)
    B. Pathological cupping optic nerve head
    C. Typical visual field loss
2. The later (more advanced) the disease, the easier the diagnosis
3. The later (more advanced) the disease, the greater the visual loss
4. No one test is sufficient in early cases to diagnose the disease
5. Loss of vision is usually slowly progressive in both eyes, but usually one eye is more affected than the other. Patients therefore present late. The time of presentation depends on the availability of eye care services.

Screening

Ten needs to be considered before starting a Screening programme

<u>Disease</u>
1. The condition should be an important public health problem
2. There should be a recognisable latent stage
3. The natural history of the disease should be adequately understood

<u>Test</u>
4. There should be a valid screening test in terms of sensitivity and specificity
5. The test should be acceptable to the population

<u>Treatment</u>
6. There should be an accepted treatment
7. There should be an agreed policy on whom to treat
8. Facilities for diagnosis and treatment should be available

<u>General</u>
9. Cost effectiveness and opportunity cost should be considered
10. Case finding should be an on going process

Exercise: 1
Consider various eye diseases. Do they meet the criteria for screening?
e.g. macular degeneration, diabetic retinopathy, myopia, Vitamin A Deficiency, onchocerciasis, trachoma, amblyopia, cataract, glaucoma, poor vision.

Sensitivity/Specificity and Positive Predictive Values

In order to decide how good A TEST is at identifying patients in a population as having THE DISEASE, or being normal, one can measure the sensitivity, specificity and positive predictive value.

	DISEASE +VE	DISEASE - VE	Totals	Definitions
+VE TEST	A	B	A + B	A = True Positive
-VE TEST	C	D	C + D	B = False Positive
Totals	A + C	B + D	Total	C = False Negative D = True Negative

SENSITIVITY = Probability of a Diseased Person having a Positive Test
Or
DETECTION RATE = $\frac{A}{A + C}$

SPECIFICITY = Probability of a Normal Person having a Normal Test
Or
TRUE NORMAL RATE = $\frac{D}{B + D}$

POSITIVE PREDICTIVE VALUE = Probability of a Positive Test having the Disease
= $\frac{A}{A + B}$

	DISEASE Present	Absent	Totals
Test Positive	True Positive	False Positive	
Test Negative	False Negative	True Negative	
Totals			Total

Exercise 2:

	Glaucoma Positive	*Glaucoma Negative*	*Totals*	*1. How many people have glaucoma? What is the prevalence?*
IOP >21mm Positive	*10*	*90*	*100*	*2.How many cases of glaucoma did the test for an IOP of over 21 detect? What is the sensitivity of the test?*
IOP <21mm Negative	*10*	*890*	*900*	*3How many people had an abnormal test? How many of these had glaucoma? What is the positive predictive value of the test?*
Totals	*20*	*980*	*1000*	*4.What will happen if optometrists or ophthalmic assistants implement this screening test in the community?*

Points to consider:

- In recent surveys, more than half the newly detected cases of glaucoma had a normal pressure at the time of screening.
- In recent surveys, at least half the cases of POAG were not previously diagnosed.
- At present no one test for glaucoma is simple, sensitive and specific.

Alternative Screening Tests in the Community

Exercise 3
Consider each of these tests for glaucoma.
Give a grade 5 for very good and 1 for very poor
Grade each test for diagnosing glaucoma for use at the primary community level.

Method	**Sensitivity/ Specificity**	**Feasibility**	**Reproducibility**	**Cost**	**Total**
IOP (Applanation)					
IOP (Schiotz)					
Ophthalmoscopy					
Perimetry (Manual)					
Perimetry (Computer)					

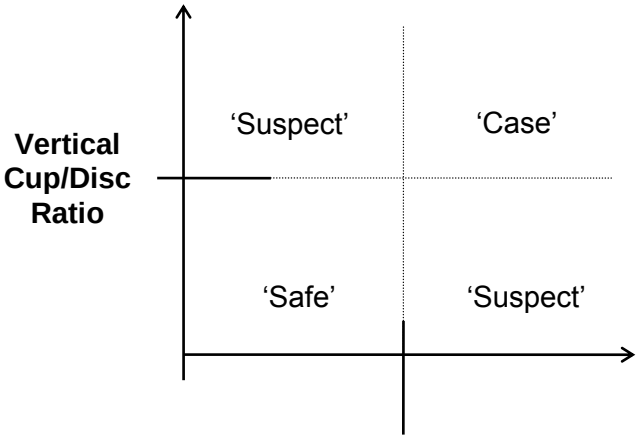
Case Detection of POAG in a Community

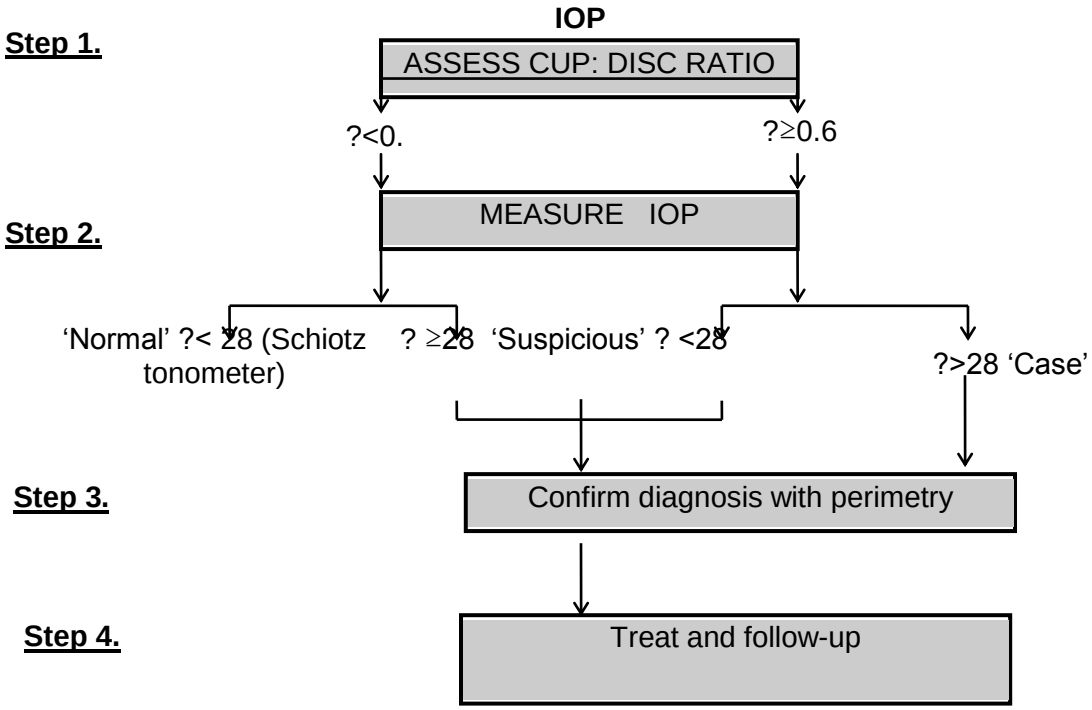
In practice to detect cases of undiagnosed glaucoma in a clinic most eye specialists use clinical judgement involving two tests, namely:

(a) measurement of intra-ocular pressure (IOP)

(b) assessment of the optic disc, particularly the ratio of the cup to the disc vertical diameter (C/D)

If there is a suspicion of glaucoma based on either of these two tests then further investigations are performed including visual field examination by perimetry.





Control – Treatment of Chronic Glaucoma

Principle of Treatment

The aim of glaucoma treatment is to stop further visual loss. Glaucoma treatment does not (usually) restore or improve vision.
The treatment aims is to reduce the “high” intra-ocular pressure, which is believed to reduce blood flow to the optic nerve head. This reduced blood perfusion of the optic nerve head damages the nerve cells in the retina resulting in progressive visual field loss.
There is no IOP which can be considered safe for all people. The “safe” IOP has to be estimated for each glaucoma patient and treatment targeted at achieving that IOP so that no further optic nerve damage will occur.
Research work is also looking at medicines to improve the blood flow to the optic nerve or protect the nerve cells from damage due to low blood perfusion.

Possible Strategies

1 Medical therapy
Medical therapy is for life.
It is therefore relatively expensive.
Many patients particularly in rural areas cannot access the medicines.
Many patients forget / stop to take their medicines as they see no improvement in vision.

1.1 Drops reducing aqueous production

Beta blockers	eg. timolol, betaxolol
Alpha agonists	eg. propine, brimonidine
Carbonic anhydrase inhibitor	eg. trusopt

1.2 Drops increasing aqueous outflow

Cholinergic	eg. pilocarpine
Prostaglandin analogues	eg. Latanaprost.

2 Laser trabeculoplasty
Usually argon laser applications to the trabecular meshwork in POAG.
This tends to be reserved for elderly patients who cannot undergo surgery and have poor compliance with long-term medications.
Other laser therapies to the ciliary body to reduce aqueous secretion are also being used.
Laser iridotomy is the treatment and prophylaxis used in primary angle closure glaucoma.

3 Filtration surgery
There are various forms of surgery to cause filtration of fluid out of the eye. They may also be used with chemical agents which reduce scarring at the operation site (anti-metabolites).
The commonest procedure is called Trabeculectomy.
Patients are afraid of eye surgery, particularly on a “seeing” eye.

Each strategy therefore has its advantages and disadvantages.

Treatment	Advantages	Disadvantages
Medical	'Easy' for doctor 'Easy' for patient	Patient compliance often poor Cost high Efficacy uncertain
Laser	Satisfactory for doctor Satisfactory for patient	Efficacy wears off Laser is required
Surgery	One time treatment Best efficacy	'Difficult' for doctor 'Difficult' for patient

Evidence for Treatment

The following 3 clinical trials compare the efficacy of treatment.

1.The Redmond Smith Study (1986)

Comparison of primary medical versus primary surgical groups for 54 mths. follow-up.

Conclusions:
1.Lower IOP with surgery: mean values 17mms v 22mms.
2.Less field loss with surgery after 3½ yrs follow-up.
3.No significant difference in visual acuities

Smith RJH,
The enigma of primary open angle glaucoma. Trans Ophthalmol Soc UK. 1986; ***105:*** *618-33*

2. The Jay Allen Study (1989)

Comparison of primary medical versus primary surgical treatment; mean follow-up time 54 months

Conclusions:
Less visual field loss with primary surgery (p= 0.027)

Jay JL, Allen D.
The benefit of early trabeculectomy versus conventional management in primary open angle glaucoma relative to severity of diseases. Eye 1989; ***3****: 528-35*

3. The Migdal, Gregory, Hitchings Study (1994)

Comparison of primary medical versus primary surgical versus primary laser treatment.

Conclusions:
1. Primary surgery gives lower IOP
2. Primary surgery gives greater success by 3y.
3 No significant difference in visual acuity

Migdal C, Gregory W, Hitchings R.
Long-term functional outcome after early surgery compared with laser and medicine in open- angle glaucoma.Ophthalmology 1994; ***101:****1651-7.*

Community Programme to Reduce Blindness from Glaucoma

The management of clinical glaucoma in a hospital or clinic setting is quite different from trying to reduce visual loss from glaucoma in a pubic health setting as part of a comprehensive eye care programme.

The principles of developing a community programme to reduce blindness from glaucoma are as follows:

1 Assess the magnitude and types of glaucoma in the community. This may be a population based survey or estimates based on previous surveys and hospital data from the population being served.
e.g. for a population of 1million people, the at risk population is those aged over 40 years, which is approximately 25% = 250,000. The prevalence rate over 40 years is 1% - 2% = 2500 - 5000 cases.
For black populations the population at risk is younger and the overall prevalence higher giving approximately 6000 – 10000 people with POAG in black populations.
These are crude estimates.

2 The people with glaucoma can usefully be divided into groups according to the degree of visual loss:

- early
- moderate
- late
- too late for sight preserving treatment

The actual definitions for these groupings may vary from situation to situation.

3 The priority for a community programme for glaucoma is to reduce the number of people in a population who end up with too late and late disease.
This means

- definitely finding those with late,
- trying to identify those with moderate
- possibly finding some patients with early disease

in the community so that they can be treated.
e.g. of the on average 5000 cases/million pop, some have early glaucoma, and 10% are already blind, so that maybe 50% have moderate or late, detectable and treatable glaucoma. This is the priority target group for community case detection. It is estimated at between 2000-4000 patients per million population.

4 The case detection is most usefully performed on people over 40 years of age. This age group may present to an eye clinic needing reading spectacles. This is a good opportunity to check the optic disc and measure the IOP. If either are suspicious then visual field examination can be considered.

5 Treatment at present is to lower IOP. There is no universal “safe” IOP. Each patient is unique. A target IOP should be set for each patient and then treatment given to achieve that IOP. In deciding whether to use medicines, laser or surgery consideration must be given to the patient’s ability to pay and comply with treatment and the likelihood of the patient coming for follow up examinations..

Diabetic

Retinopathy

Diabetic Retinopathy

Definition

Older descriptive terms have been substituted by new terminology from the Early Treatment Diabetic Retinopathy Study (ETDRS) (see table)

Classification

Diabetic Retinopathy	
Old Descriptive Term	**New Term (ETDRS)**
Background	Mild Non- Proliferative Moderate Non-Proliferative
Pre-Proliferative	Severe Non- Proliferative Very Severe Non- Proliferative
Proliferative	Proliferative
Maculopathy diffuse exudative ischaemic	Maculopathy (therapy based on "Clinically Significant Macular Oedema")

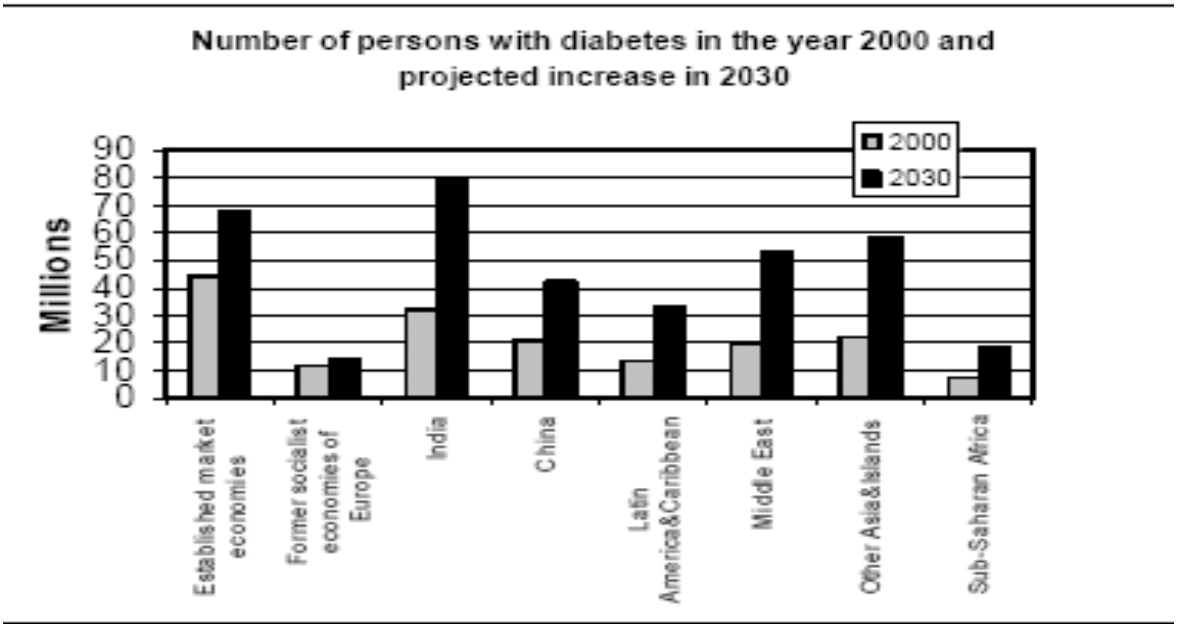
Clinical Features, Natural History and Management

Level of Retinopathy	Clinical Features	Natural History Rate of progression to PDR at 1 year	Management
Mild non-proliferative	More than 1 microaneurysm	5%	Review 12 mths
Moderate non-proliferative	Haemorrhage and microaneurysms in 1-3 quadrants; cotton wool spots, venous beading and IRMAs	25%	Review 6 mths
Severe non-proliferative	Haemorrhage, microaneurysms in all quadrants; or venous beading in more than 2 quadrants; or IRMA in 1 quadrant	50%	Review 3 mths
Proliferative	Neovascularisation		Pan-retinal photo-coagulation
Clinically Significant Macula Oedema	Maculopathy with visual acuity deterioration		Grid laser to macula

Ref: Journal of Community Eye Health, Volume 9, Issue No.20, 1996, Page 59

Magnitude

- There is an increase in diabetes mellitus throughout the world.
- Diab. Retinopathy accounts for 5-10% of all blindness in economically 'intermediate' countries
- It is becoming increasingly important in developing countries.



Prevalence

- Diabetic Retinopathy is associated with increased mortality.
- Prevalence of diabetes mellitus (I & II) = 3% -5%
  (= 30,000 – 50,000 diabetics/million population).
- Prevalence of any retinopathy in diabetics = 20%
  (= 6,000 – 10,000 with diabetic retinopathy/million population).
- Prevalence of blindness among these is 5%
  (= 300 - 500 blind/million population i.e., 5% all blindness).

Incidence

- Of the total population in the USA, 0.03% are new cases of diabetic macular oedema.
- Of the total population of the USA, 0.02% are new cases of proliferative retinopathy.
- Therefore in the USA, 0.05% of the population develop sight threatening retinopathy per year. That is, 500 people/million population/year

Aetiology

Risk Factors for Diabetes Mellitus

- age
- sex (F>M)
- obesity
- family history

Risk Factors for Diabetic Retinopathy

- age/duration of diabetes
- nephropathy (proteinuria)/neuropathy
- hypertension
- pregnancy
- glycaemic control
- ethnic/genetic determinants
- smoking antioxidants

Control

Screening for Diabetic Retinopathy

Who?	Ophthalmologist/optometrist/ ophthalmic assistant/ specifically trained general doctors
How?	Fundoscopy and/or photo, using ophthalmoscope and/or camera
When?	Type 1 yearly after 5 years or over 9 years of age Type 2 at diagnosis and then yearly
Cost	Screening is a repeated activity for the life time of a Diabetic and has to be at minimum cost and maximum detection.

Treatment of Diabetic Retinopathy

Type	Treatment
Mild/moderate non-proliferative ('background')	Nil
Circinate (lipid) maculopathy	Focal laser to centre of circinate (unless at fovea)
Clinically significant macular oedema ('diffuse')	Soft grid laser 50 micron
'Dry ischaemic' maculopathy	Nil
Proliferative retinopathy/ Disc neovascularisation	Pan-retinal laser treatment 1500-2000 x 500 micron
Proliferative retinopathy 'elsewhere'/peripheral neovascularisation	Pan-retinal laser treatment 1500-2000 x 500 micron
Vitreous haemorrhage	Vitrectomy
Tractional/Rhegmatogenus* retinal detachment	Vitrectomy/ Retinal detachment surgery
Non-responsive proliferative diabetic retinopathy	Vitrectomy

Exercise:

As programme managers, you have the task of organising a programme to deal with Diabetic Retinopathy for a population of 1 million people. How do you plan to do this?
How would you increase the number of patients seen and needing treatment?
Estimate:
the number of people needing treatment
the number of treatments per year
the time taken, people and equipment needed

Progression of Proliferative Diabetic Retinopathy

Diabetic Retinopathy Study (DRS) Visual Outcome:
Severe Visual Loss**

Severe visual loss defined as 5/200 or less - 2 or more consecutive visits

Severity of Retinopathy	Duration of Follow-up (years)	Control Patients (%)	Treated Patients (%)
non-proliferative	2	3	3
	4	13	4
mild proliferative	2	7	3
	4	21	7
high-risk proliferative	2	14	6
	4	28	12

Conclusion:
Treatment reduces severe visual loss by (65%-75%)

Progression of Diabetic Macular Oedema

EDTRS Visual Outcome:
Visual Loss = Doubling of the Visual Angle

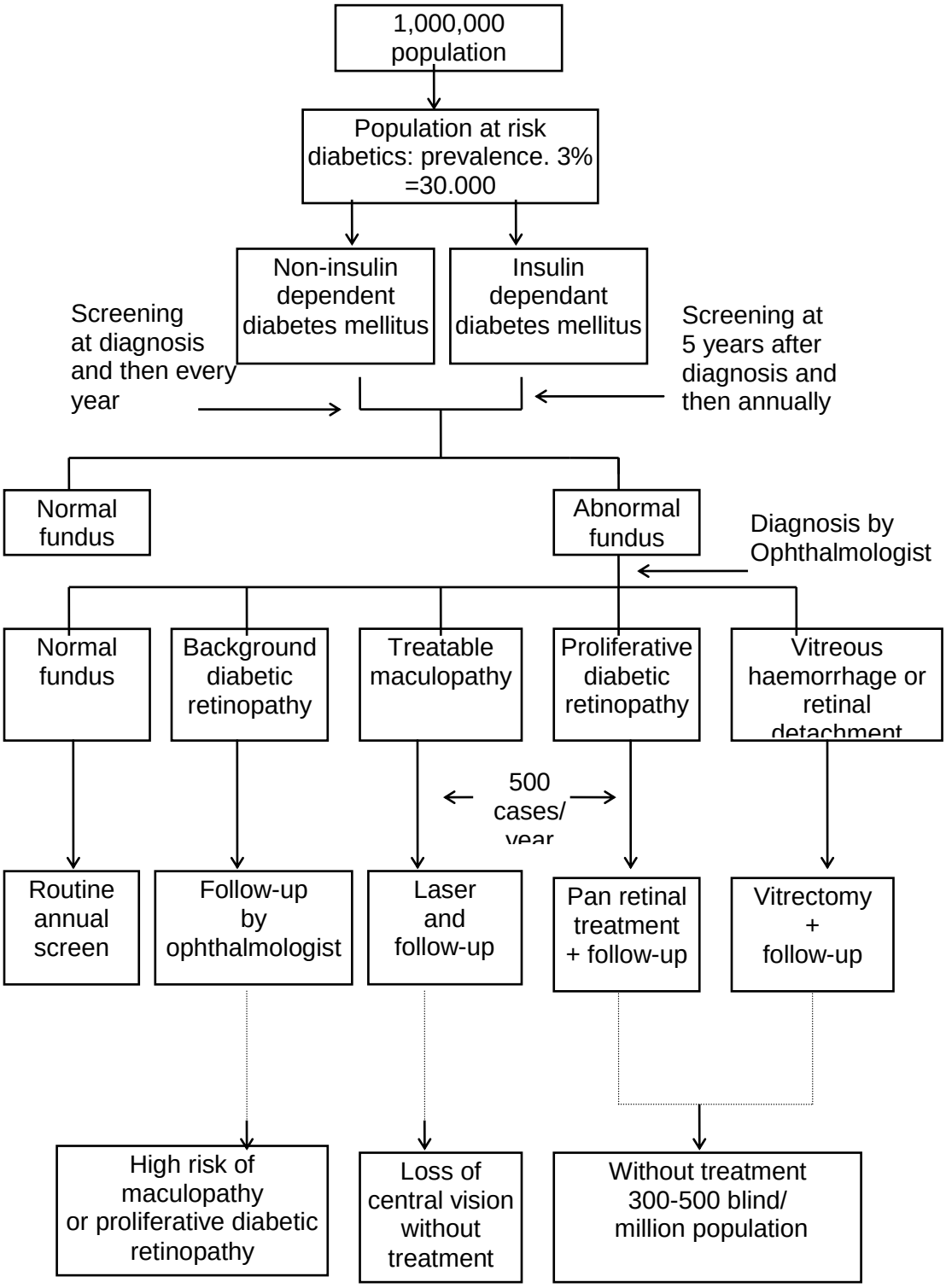
Logmar
(Log Mean Angle of Resolution)

Severity of Retinopathy	Duration of Follow-up (years)	Control Patients (%)	Treated Patients (%)
CSMO*	1	8	1
(centre of macula	2	16	6
not involved)	3	22	13
CSMO		13	8
(centre of macula	2	24	9
involved)	3	33	14

*** clinically significant macular oedema**

Conclusion:
Treatment reduces visual loss by 50% - 75%

Diabetic Retinopathy: Summary



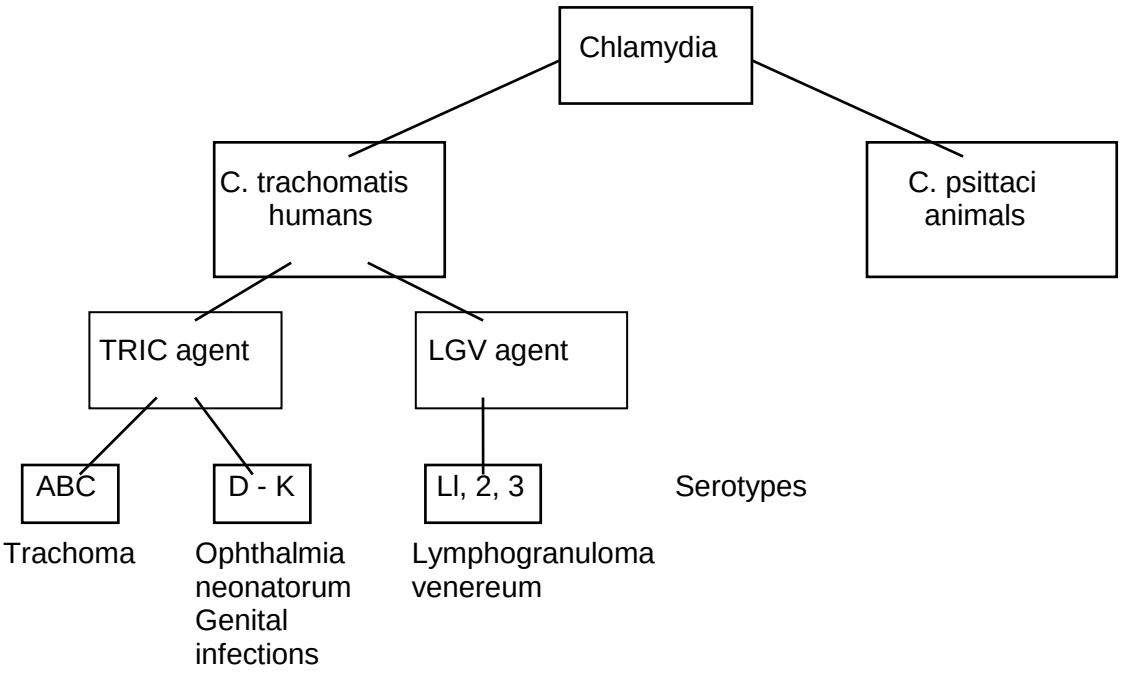
TRACHOMA

1.Definition

* a chronic granulomatous keratoconjunctivitis
* essential cause is Chlamydia trachomatis
* transmitted under conditions of poor hygiene
* inflammation leads to scarring, resulting in trichiasis and entropion

1.1 The Organism:

Chlamydia are closer to bacteria than viruses.
They are obligate intracellular organisms.
They have cell walls.
They have both DNA and RNA, and multiply by binary fission.
They are sensitive to some antibiotics.



2.Magnitude

It is estimated that:-

150 million children have active infection (TF or TI).
300 million people have evidence of scarring showing old disease (TS)
30 million people have potentially blinding trichiasis (TT).
5 million people are bilaterally blind (blinding CO).

3. Aetiology

3.1.Transmission of trachoma

In trachoma. the severity of inflammation is directly associated with the frequency of repeated re-infection.
The frequency of re-infection depends on the factors which promote transmission.

The factors which favour transmission are-.-

A community environment which is:-
DRY - lack of water.
DUSTY - lack of water
DIRTY/DUNG - exposed animal/human faeces-

A family environment which has:-
DISCHARGES - ocular (including seasonal conjunctivitis)
nasal and possibly genital.

The agents of transmission are:-
FLIES
FOMITES
FINGERS

This transmission is occurring mainly within the
FAMILY or among close
FRIENDS

4. Control

There are two parts to “Control”- assessment and then management

4.1 Assessment

4.1.1 WHO GRADING OF TRACHOMA

TRACHOMA FOLLICULAR (TF)
There are 5 or more follicles in the upper tarsal conjunctiva.
(For this grading system. follicles must be at least 0.5mm in diameter)

TRACHOMATOUS INFLAMMATION, INTENSE (T1)
Pronounced inflammatory thickening of the tarsal conjunctiva will obscure half the normal deep tarsal vessels.

TRACHOMATOUS CONJUNCTIVAL SCARRING (TS)
The presence of scarring in the tarsal conjunctiva.
(These scars are easily visible as white lines, bands or sheets [fibrosis] in the tarsal conjunctiva.)

TRACHOMATOUS TRICHIASIS (TT)
At least one eyelash rubs on the eyeball.
(Evidence of recent removal of intumed eyelashes should also be graded as trichiasis.)

CORNEAL OPACITY (CO)
Easily visible comeal opacity is present over the pupil.
(This definition refers to comeal scarring which is so dense that at least part of the pupil margin is blurred when seen through the opacity.)

4.2 Management

The SAFE strategy

S Surgery for trichiasis

A Antibiotics for active infection
oc.tertacycline 1% x 2 for 6 weeks
or
azithromycin 1 dose by mouth stat

F Facial cleanliness through health education

E Environmental improvement with water and sanitation

Planning

A Vision 2020

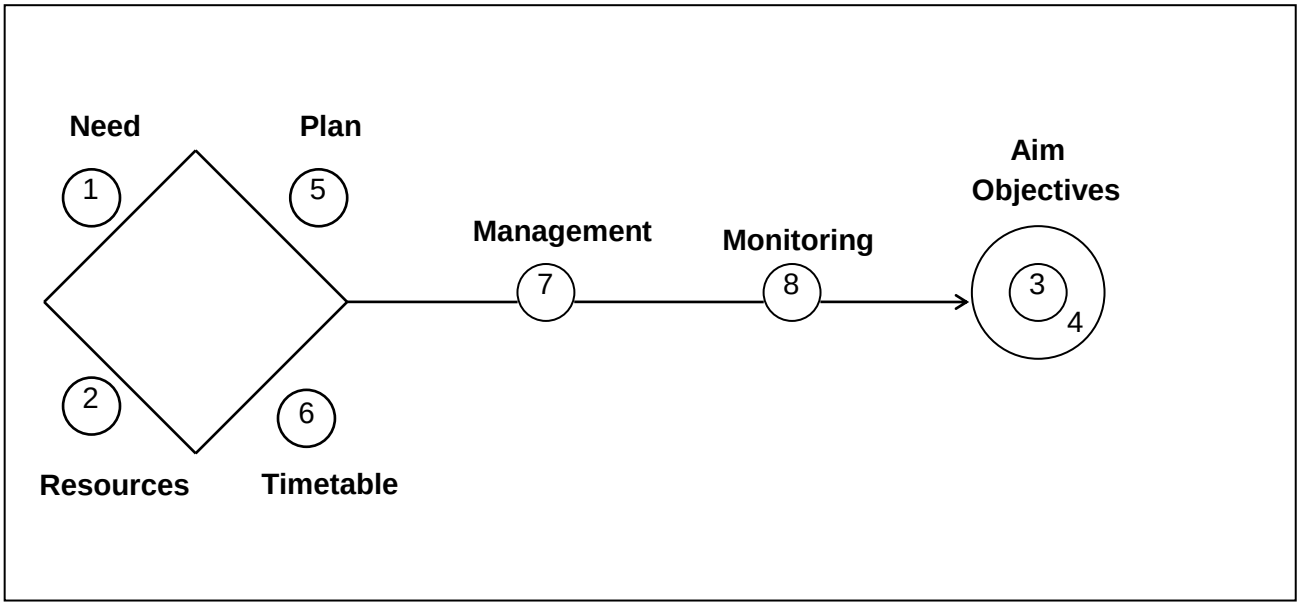
Programme

Planning a Vision 2020 Programme

The Concept

YOU ARE HERE	→	YOU WANT TO BE HERE

1	DECIDING WHERE YOU ARE	=	SITUATIONAL ANALYSIS OF NEED AND RESOURCES
2	DECIDING WHERE YOU WANT TO BE	=	AIM, PRIORITIES, OBJECTIVES
3	DECIDING HOW TO GET THERE	=	PLAN, TIMETABLE AND BUDGET
4	GETTING THERE	=	MANAGEMENT OF RESOURCES AND MONITORING



1. Assess Need

TARGET THE POPULATION

The population to be served must be defined.

MAP

The distribution of the population and characteristics of the area/geography should be known.

PREVALENCE AND CAUSES OF EYE DISEASE AND BLINDNESS

Estimate the prevalence, incidence and major causes of eye disease and blindness from survey data.

2. Assess Resources and Utilisation

MANPOWER
MATERIALS
MOBILITY
MANAGEMENT
MONEY

2.1. MANPOWER

2.1.1. Primary Level - Clinic Nurses
The number recommended is 1 per 10 000 population.
At least 1 clinic nurse in each residential clinic should be trained in primary eye care.

2.1.2. Secondary Level - Eye Nurses
The number recommended is 1 per 100 000 population.
At least 1 registered nurse in each district should be trained as an eye nurse.

2.1.3. Secondary Level - Optometrists
The number recommended is 1 per 250 000 population.
There should be at least 1 graduate optometrist in each region.
In addition, it is recommended that optometrists working in eye care programmes undergo a 3 month clinical / practical orientation at the regional eye clinic.

2.1.4. Tertiary Level - Ophthalmic Medical Officers / Ophthalmologists
The number recommended is 1 ophthalmic medical officer per 250 000 population and 1 ophthalmologist per 500 000 population.
There should be at least 1 ophthalmic medical officer or ophthalmologist in each region.
The training for an ophthalmic medical officer is a 6 month post-graduate training, leading to a diploma qualification in ophthalmology.
The training for an ophthalmologist is a 4 year post-graduate training, leading to a fellowship qualification in ophthalmology.

2.2. MATERIALS

2.2.1. Hard Materials (Instruments And Equipment)

Primary level -
The instruments and equipment recommended for the clinic nurses for primary eye care are :
Snellen chart
Torch.

Secondary level -
The instruments and equipment recommended for the eye nurses for secondary eye care are :
Snellen chart, reading card
Trial lens set, trial frame, cross cylinder, retinoscope
Direct ophthalmoscope
Schiotz tonometer.

Tertiary level -
The instruments and equipment recommended for the ophthalmic medical officers / ophthalmologists for tertiary eye care are :
Snellen chart, reading card
Trial lens set, trial frame, cross cylinder, retinoscope
Autorefractor
Direct ophthalmoscope
Indirect ophthalmoscope, 20D lens
Slit lamp, applanation tonometer
Gonioscopy lens, fundoscopy lens
Argon laser
Yag laser
Operating microscope
Microsurgical instruments x 2 sets
Hot air steriliser
Anterior vitrectomy - phacoemulsification unit.

2.2.2. Soft Materials (Drugs And Surgical Consumables)

The drugs required at the clinics, district hospitals, and regional hospital are according to the Essential Drug Lists.
The surgical consumables required at the regional hospital for (cataract) surgery are :
Blades
Cauteries
Intraocular lenses
Pads
Shields
Sponges
Sutures 4-0 silk + 10-0 nylon.

2.3. MOBILITY

The eye nurses require transport to get to their district clinics.
It is usually not possible for a vehicle in each district to be allocated wholly to the eye care programme. Transport should be shared with the other programmes in the district.

2.4. MANAGEMENT

The regional eye care programme should be managed by an eye care programme committee.

2.4.1. Functions of the Committee

Planning of the regional eye care programme
Mobilisation of resources for the programme
Implementation of activities of the programme
Evaluation of the progress and results of the programme.

2.4.2. Structure of the Committee

It should be small and active.
It should meet 3 or 4 times each year.
It should comprise representatives from -
Regional and district health management
Eye care professionals (eye nurses, eye doctors)
Community (traditional healers, community leaders)
Local NGOs / service organisations.

2.5. MONEY

The eye care programme should be a horizontal programme, integrated into the regional and district health services. There would therefore be no specific budget allocated for it. However, it still has a cost. Provision should be made in the regional / district budget for eye care / blindness prevention activities.

2.6. CURRENT EYE CARE AND BLINDNESS PREVENTION ACTIVITIES

Identify what eye care and blindness prevention activities are currently happening in the region at the primary, secondary, and tertiary levels.

3. Define the Aim

Prevention of Blindness
It may or may not have a final goal.

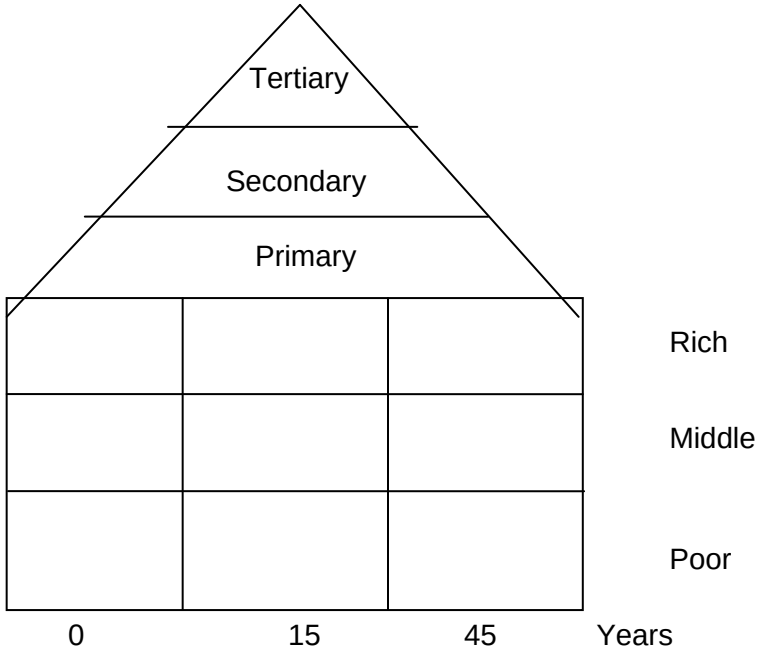
4. Specify the Objectives

They should be measurable and time limited.
They **may** include the following:

1. Human Resource Development:- primary, secondary and tertiary
2. Mobilisation / Utilisation of Resources
3. Cataract services
4. Control of ocular infections
5. Prevention of eye disease in children
6. School Screening and refractive errors

5. Define the Priorities and Strategy

The strategies for disease control, human resource development and provision of infrastructure need to be defined.
It is important to understand the needs of the community and the existing services.



6. Prepare a Timetable

List the activities that are necessary to reach each of the objectives. Prepare a timetable showing each of these activities, indicating when they will be undertaken and when they will be completed.

Activity	**Time**					
	Jan	Feb	Mar	Apr -June	July-Dec	Year 2
examples. planning meetings						
training mid-level						
ordering equipment						
train PECW						
out-reach clinics						

7. Prepare a Budget

The eye care programme is a horizontal programme integrated into the regional and district health services. There is no specific budget allocated for it. However, it is necessary to be able to present a budget for the programme to the regional management.

Prepare a budget→ Expenditure and Income

EXPENDITURE:
- a) capital (one time)
  - buildings
  - vehicle
  - equipment
- b) running (recurrent)
  - salaries
  - consumables
  - overheads

INCOME:
- a) fees
- b) government grants
- c) local support
- d) international donors

8. Management

Form a Project committee and if possible appoint a manager/administrator.
Monitor resource utilisation for efficiency.
The two main resources to "look after" are money and more importantly "people."

9. Monitoring

Keep and analyse **Specific Statistics** to monitor progress and achieve the objectives.
For example:

Number of outpatients seen
Quantity of cataracts
Quality of surgery - visual outcome
Cost of surgery
Trachoma statistics
Vitamin A deficiency statistics
Refractive errors / spectacles

Assessing needs, resources and priorities will enable you to plan your aim, objectives and strategy. This is necessary for **effectiveness,** i.e. doing the right thing.
Making a timetable of activities / targets and managing your resources (time, people, money) will improve **efficiency,** i.e. doing things in the right way.
A good programme is both effective and efficient.

Planning Committee

A Planning Committee may be at:
* National level
* Provincial level
* Project level

Functions of the Committee

1. Plan a PBL / eye care programme
2. Mobilise resources / Funding for the programme
3. Implement activities
4. Evaluate progress and results

Structure of the Committee

1. Small and active
2. Members from
   * Ministry of Health
   * Public health
   * Ophthalmology / eye care services
   * Community
   * Local NGO/Service Organisation
   * Possibly Intern Non-Governmental Development Orgs.
   * Possibly United Nations (UN) agencies

A Prevention of Blindness (PBL) Programme

Should:-

1. Meet communities' needs (not the providers interests alone).
2. Be continuous and sustainable (not a one time event).
3. Be comprehensive (to deal with important eye problems, not one specific disease).

Outline Proposal For Funding A Specific One Time Request

Summary

What are you requesting?
Why are you making the request?
What will it cost?

Background Information to the Project

Country
Project
Statistics

Rationale

Why do you need this?
What will it help you to do?
How will patients benefit?

Budget

Give specifications and estimated cost or proforma invoice

Local Support

Give details of what you can contribute: money?
maintenance?
running cost?
salaries?

Useful Addresses

American Academy of Ophthalmology
International Committee
655 Beach Street
Box 7424
San Francisco
USA CA94120-7424
FAX: 1 415 561 8533

Aurolab
Aravind Eye Hospital
1 Anna Nagar
Madurai
625020
INDIA
FAX: 91 452 630984

Fred Hollows Foundation
Box 561,
Kathmandu
Nepal
Fax 00977.1.474937

Helen Keller International
90 Washington Street
15th Floor
New York 10006
USA
FAX: 1 212 943 1220

International Centre for Eye Health
Bath Street
London
EC1V 9EL
UNITED KINGDOM
FAX: 44 171 250 3207

International Eye Foundation
7801 Norfolk Avenue
Bethesda
Maryland 20814
USA
FAX: 1 301 986 1876

Lions Club International
300 22nd Street
Oak Brook
Illinois 60521-8842
USA
FAX: 1 708 571 8890

O.N.C.E.
Ortega y Gasset 18
28006 Madrid
SPAIN
FAX: 34 1 575 5949

ORBIS
330 West 42nd Street
Suite 1900
New York 10036
USA
FAX: 1 212 244 2744

Sight Savers International
Grosvenor Hall, Bolnore Rd,
Haywards Heath
RH16 4BX,
UNITED KINGDOM
FAX: 44 1444 415866

World Health Organisation
Prevention of Blindness Programme
1211 Geneva 27
SWITZERLAND
FAX: 41 22 791 0743

Christoffel-Blindenmission
Nibelungenstrasse 124
D 64625 Bensheim
Germany
Fax: 49 6251 131165