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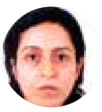
Community Eye Health Journal

South Asia Edition

A patient getting checked for refraction. INDIA
RAJESH PANDEY, DRROP INDIA INITIATIVES

Saumya Yadav
Senior Resident, Ophthalmology, Dr Rajendra Prasad Centre for Ophthalmic Sciences, AIIMS, New Delhi, India.



Radhika Tandon
Professor, Ophthalmology, Dr Rajendra Prasad Centre for Ophthalmic Sciences, AIIMS, New Delhi, India.

Comprehensive eye examination: what does it mean?

A routine comprehensive eye examination helps to screen for and diagnose common eye diseases.

As an eye health professional, it is important to talk to patients and public about:

- consulting an ophthalmologist early when experiencing eye or vision-related problems and
- regular, periodic eye examination for early detection and treatment of eye diseases

In addition, it is a good practice to talk about basic measures for prevention of common eye diseases.[1-3] A routine CEE presents a good opportunity to fulfil the above objectives. It helps to screen and diagnose common eye diseases, thus helping to reduce morbidity and the costs associated with eye diseases. A CEE is done when a patient with ocular symptoms seeks medical advice and also when a simple routine eye check-up is sought. This article explains what a CEE includes.

A CEE consists of a series of tests that assess the different aspects of eye health. Ideally, a CEE should be done not just for patients seeking medical advice but also for individuals above the age of 40 as a yearly check-up.

Continues overleaf ➤

About this issue

Eye diseases are common and can go unnoticed for a long time. A comprehensive eye examination helps to screen and diagnose common eye diseases, thus helping to reduce vision loss. What does a comprehensive eye examination include? In this issue, we will discuss what it should include, how you can perform one and current best practices in diagnosis and treatment of eye conditions prevalent in south Asia.

Contents

R.P CENTRE, AIIMS

Figure 1 Snellen's visual acuity chart

In case, a routine annual review is not possible for the entire population, it should be recommended for those with:

- a known chronic eye disease
- a family history of glaucoma or
- a systemic disease known to affect the eyes such as diabetes mellitus

Do note, that these tests may vary depending upon the population examined and the infrastructure available at a clinic. (Table 1 lists various tests in a CEE).

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Table 1 Components of a comprehensive eye examination

Components	Tools
External ocular examination	• Torch light
Visual acuity test	• Snellen's chart • Near vision charts
Visual fields test*	• Central 30-2 full threshold Humphrey visual field analyser • Frequency doubling perimeter • Goldmann kinetic perimeter
Colour vision test*	• Ishihara test
Binocular vision*	• Bagolini's striated glasses • Worth four dot test • Red filter test
Stereopsis*	• Random dot stereoacuity test • TNO and Lang's stereo test
Refraction	• Self- illuminated/mirror retinoscope • Trial frame • Set of trial lenses • Cycloplegic drugs • Jackson cross cylinder • Automated refractometers
Anterior segment and pupillary examination	• Torch light • Slit lamp biomicroscope
Gonioscopy*	• Goniolens (Goldmann two, three and four mirror)
Intraocular pressure	• Tonometer (Goldmann, Tono-pen, Perkins, Shiotz)
Fundus evaluation	• Direct and indirect ophthalmoscope • +90D/+78D lens

History

A detailed medical and treatment history is essential before beginning a CEE. Make a note of:

- family history of illnesses and working and living conditions to get an idea of the symptoms
- systemic illnesses like diabetes, hypertension, thyroid or inherited disorders. Such illnesses may affect the eyes and need appropriate investigations

Visual acuity (VA) is a measure of the eye's ability to distinguish shapes and the details of objects at a given distance. To measure VA, ask your patient to read letters on Snellen (Figure 1) or an E chart. Note the type of correction (spectacles/contact lenses) used by the patient. Any reduction in VA can show an underlying pathology. Write the results of the VA test as a fraction (20/40). The top number in the fraction is the standard distance at which a patient stands/ sits (20 feet). The bottom number is the smallest line of letter-size that the patient can read. Normal distance VA is 20/20. A pinhole test can distinguish if the reduced vision is due to refractive errors or other causes. Record the best corrected VA after you identify full correction of refractive error.

In young children, use Tellers and Cardiff acuity cards or optokinetic nystagmus. Measure the presenting and corrected near visual acuity with hand-held test cards by placing them at a distance of 40 cm.

Visual field can be tested using a simple procedure known as confrontation test. A confrontation test checks the peripheral and central visual fields (VF) and is the most used VF test done during a CEE. Each eye is tested for all four quadrants (upper and lower, temporal and nasal). In the confrontation test the eye examiner moves a target (usually a finger) from the periphery towards the centre and asks the patient when they see the target.

Perimetry tests are used for a more detailed and systematic evaluation of VF. Amsler grid is a useful tool for macular disorders with central field defect (age-related macular degeneration). Testing the visual field is useful in the management of patients with glaucoma, neuro-ophthalmic and retinal disorders. of colour blindness.

Contrast sensitivity is the measure of the eye's ability to

Figure 2 A trial frame. INDIA

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Community Eye Health Journal South Asia, Indian Institute of Public Health, Plot no.1, ANV Arcade, Amar Co-operative Society, Kavuri Hills, Madhapur, Hyderabad - 500033, India.
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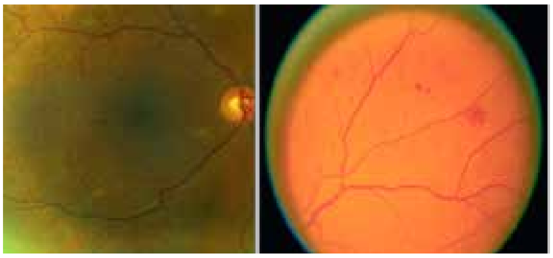
detect an object against its background. A Pelli Robson chart is used to test for contrast sensitivity. The Pelli Robson chart consists of horizontal lines of capital letters in contrast of one colour. Glaucoma, diabetic eye disease, and cataracts have shown to reduce contrast sensitivity in patients.

Colour vision deficiency is the inability to distinguish between certain shades of colour. It is a genetic disorder more common in men. Red-green deficiency is most common. Conditions like diabetes, glaucoma, optic neuritis and use of certain drugs (chlorpromazine, thioridazine, ethambutol) may lead to colour vision deficiencies. Many patients are unaware of their deficiency unless tested. We recommend use of colour vision charts for screening and detecting specific types of colour blindness.

Binocular vision is the vision achieved by the coordinated use of both eyes together. Simultaneous perception, fusion, and stereopsis are the three grades of binocular vision. Binocular vision can be tested using Bagolini's striated glasses, Worth four dot test and red filter test.

Figure 4: Non-proliferative diabetic retinopathy. INDIA



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Refraction is a test that determines the type (myopia, hypermetropia, and astigmatism) and the amount of refractive error (RE). It also tells us the required lens power needed to compensate for it. For a correct estimate of RE, the patient's accommodation should be minimal. Accommodation is the ability of the eye to change focus from distant to near images. Dry retinoscopy is the technique of refraction done without using cycloplegics. Here you can control the accommodation by asking the patient to fixate at a distant target. In wet retinoscopy, cycloplegic drugs are used to paralyse the ciliary body and remove the influence of accommodation during the test. Use a self-illuminated or mirror retinoscope to measure refractive error by placing a series of lenses in trial frames (Figure 2) in front of the eyes. You can also use automated refractometers for an initial estimate of RE. You can fine-tune your estimates using Jackson cross-cylinder and lenses to help the patient gain clearest vision.

We recommend cycloplegic refraction followed by a post- mydriatic test for adequate assessment of RE in infants and young children. For correction of presbyopia, we prescribe adding a plus lens over the patient's distance refractive correction.

Torchlight external eye exam

An external torchlight examination helps to inspect:

- alignment and position of the eyes, eyelids, adnexa, conjunctiva, sclera, cornea, iris, pupils and extraocular movements
- palpebral symmetry, lid abnormalities, redness or growths on the conjunctiva and presence of any discharge (see Table 2)
- cornea for any abnormalities
- pupils for their size, shape, location, and reactivity

Figure 3: Slit- lamp biomicroscope. INDIA

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You can test the eye movements (versions and ductions) by asking the patient to look in nine cardinal positions of gaze. Use cover/uncover test to look for underlying heterophoria. Prism bar alternate cover test measures the total amount of deviation. In cases where prism bar can't measure the deviation, you can use Hirschberg and modified Krimsky tests.

Slit-lamp biomicroscopy for anterior segment

A slit-lamp (Figure 3) examines the anterior and posterior segment of the eye, which includes conjunctiva, cornea, anterior chamber, pupil, lens and retrolental space (see Table 2). Gonioscopy is the technique of visualising anterior chamber angle structures at the SL. Findings from gonioscopy include the width of angle, presence of peripheral synechiae, goniosynechiae, hyperpigmentation, and neovascularisation.

Intraocular pressure

Tonometry is used to measure intraocular pressures (IOP) and to evaluate patients with or at risk of glaucoma. Different types of tonometers include:

- applanation tonometry (Goldmann and Perkins applanation tonometry, non-contact tonometry, ocular response analyser)
- indentation tonometry (Schiotz tonometer, pneumotonometer, tono-pen)
- rebound tonometry
- Pascal dynamic contour tonometer

Preliminary assessment of the posterior segment with distant direct ophthalmoscopy

Distant direct ophthalmoscopy (DDO) is performed routinely before a dilated fundus examination. DDO helps in diagnosing media opacities. Use a self-illuminating retinoscope or ophthalmoscope in a semi-dark room at a distance of 20-25 cm from the patient's eye. Note the features of red glow in the pupillary area. You may see abnormal greyish pupillary reflex in cases of cataract or some retinal detachments.

Detailed fundus exam with a direct, and indirect ophthalmoscope and slit lamp biomicroscopy

Direct ophthalmoscopy provides an upright and monocular image of the retina. It is very useful for examining optic disc changes and foveal pathologies at higher magnification. A dilated fundus evaluation using a binocular indirect ophthalmoscope or SL biomicroscope with a +90Dioptres (D)/+78D lens is essential to record pathologies affecting the peripheral

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retina. Limited field of view is one limitation of direct ophthalmoscopy.

A dilated fundus examination helps to rule out diseases like diabetic retinopathy (DR) which have a high prevalence. Non-mydriatic fundus cameras are also available for peripheral centre-based screening of DR.

After a CEE, consider the results of the examination to determine a diagnosis. Sometimes more investigation may be needed to confirm or rule out the suspected diagnosis and to develop a treatment plan. Make appropriate referrals if your patient needs specialist consultations.

Table 2 Ocular structures and related disorders to look for during a comprehensive eye examination

Ocular structures	Disorders
Eye brows	• Madarosis (Leprosy, Myxedema)
Eye lids	• Ptosis • Lid retraction • Lagophthalmos • Entropion • Ectropion • Trichiasis • Distichiasis • Blepharitis • Chalazion • Stye
Palpebral aperture	• Blepharophimosis • Ankyloblepharon
Lacrimal apparatus	• Fistula • Punctual stenosis • Regurgitation
Eye balls	• Proptosis • Anophthalmos • Enophthalmos • Heterotropias
Conjunctiva	• Discolouration • Conjunctivitis • Chemosis • Circumcorneal congestion • Pterygium • Pinguecula • Follicles • Papillae • Symblepharon • Foreign body
Sclera	• Discolouration • Episcleritis • Scleritis • Staphyloma • Perforations

Ocular structures	Disorders
Cornea	• Microcornea • Megalocornea • Keratoconus • Keratoglobus • Cornea plana • Dry Eyes • Edema • Scarring • Degenerations • Ulceration • Vascularisation • Guttae • Keratic precipitates • Keratitis
Anterior chamber	• Shallow/irregular depth • Aqueous cells/flare • Hypopyon
Iris	• Heterochromia • Synechiae • Iridodonesis • Rubeosis iridis • Transillumination defects
Pupil	• Shape (festooned pupil) size (anisocoria, traumatic mydirasis), • Colour (leucocoria, greyish reflex) • RAPD (swinging torch light test) • Correctopia
Lens	• Dislocation • Subluxation • Cataract
Optic disc	• Glaucoma • Papilledema • Papillitis • Optic atrophy
Macula	• Macular hole • Haemorrhage • Cherry red spot • Oedema • Hard and soft exudates • ARMD
Retinal vasculature	• Diabetic and hypertensive retinopathy • CRVO • CRAO • Vasculitis

How to measure distance visual acuity

Janet Marsden
Former Nursing Advisor: *Community Eye Health Journal*, International Centre for Eye Health, London School of Hygiene & Tropical Medicine, UK.

Sue Stevens
Former Nursing Advisor: *Community Eye Health Journal*, International Centre for Eye Health, London School of Hygiene & Tropical Medicine, UK.

Anne Ebri
West Africa Sub-Regional Manager: Brien Holden Vision Institute, Calabar, Nigeria.

Adapted from:

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Hennely ML. How to detect myopia in the eye clinic. Comm Eye Health J 2019;32(105):15-16.

Visual acuity is a measure of the ability of the eye to distinguish the details of objects.

Visual acuity testing is part of every eye examination. It is important that it is done well, and accurately, as an incorrect measurement can lead to inappropriate decisions and management.

It is important to assess visual acuity in a consistent way in order to detect any changes in vision. One eye is tested at a time.

Equipment

- Multi-letter Snellen chart or tumbling E (or C) chart
- Plain occluder, card or tissue
- Pinhole occluder
- Patient's documentation

Preparation

- Ensure good natural light or illumination on the chart.
- Explain the test to the patient.
- Tell the patient it is not a test that they have to pass. Tell them not to guess if they cannot see.
- Position the patient, sitting or standing, six metres away from the 6-metre Snellen or tumbling E chart (or 3 metres away from the 3-metre Snellen or E chart).

Testing and recording visual acuity

- Test the eyes one at a time, usually starting with the right eye, without any spectacles.
- Ask the patient to cover the left eye with the plain occluder, card or tissue.
- Ask the patient to read from the top of the chart and from left to right. For children or adults who cannot read the letters, use a tumbling E or C chart and ask them to point in the direction that the 'legs' of the E (or the opening in the C) are facing. There is a one in four chance that the patient can guess the direction; the patient should therefore correctly indicate the orientation of **most** letters of the same size, e.g., three out of four.
- Record the visual acuity for the examined eye. Visual acuity is expressed as a fraction e.g. 6/18. The top number is the distance the patient is from the chart in metres (6). The bottom number is the **smallest** line on the chart the person can read accurately. For example the 18 line (6/18), or the 6 line (6/6).
- Incomplete lines can be added to the last complete line. e.g. 6/12+3, indicating that the patient read the '12' line at 6 metres and three of the letters on the '9' line.

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Visual acuity should be measured from a standard distance, using a standard chart. INDIA

If the patient cannot read the largest (top) letter at 6 metres, either:

- move them closer to the chart, 1 metre at a time, until the top letter can be seen – the VA will then be recorded as 5/60 or 4/60, etc. or
- hold up your fingers at varying distances (5 metres, 4 metres etc. and record the vision as counting fingers (CF) at the maximum distance they can see between 5 and 1 metre, i.e. **VA = CF 5m or VA = CF 1m**.

If the patient cannot count fingers at 1 metre, wave your hand and check if he/she can see this. This is recorded as hand movements (HM): **VA = HM**.

If the patient cannot see hand movements, shine a torch in the eye and ask if they can see the light. If they can, record 'perception of light': **VA = PL**. If they cannot see the light, record 'no perception of light': **VA = NPL**.

- After testing and recording the VA for the right eye repeat now for the left eye.
- If the patient wears spectacles for distance vision, now test the VA in each eye with the spectacles on.
- If the visual acuity in either eye is less than 6/6, one can measure the visual acuity with a pin hole (see panel).
- The VA is recorded for each eye in the patient's notes. For example:

  Right VA = 6/18 without spectacles
  Right VA = 6/6 with spectacles
  Left VA = HM without spectacles
  Left VA = HM with spectacles

The pinhole test

Using a pinhole reduces the need to focus the light that enters the eye, and people with a refractive error, such as myopia, can usually see better with the pinhole than without it.

Steps

- Position the patient 6 metres from the chart.
- Ask the patient to cover one eye with the occluder.
- Position the pin hole over the eye to be tested so they can see the chart through the pinhole.
- Test one eye at a time by following the same procedure used to test visual acuity.

If the person can read more letters with the pinhole than without, they are likely to have a refractive error, such as myopia. All patients (adults and children) whose acuity improves with a pinhole should undergo a full refraction to see whether they require spectacles, and of what power.

Advances in anterior segment examination

Ritika Mukhija
Senior Resident: Dr Rajendra Prasad Centre for Ophthalmic Sciences, AIIMS, New Delhi, India.

Noopur Gupta
Associate Professor of Ophthalmology, Dr Rajendra Prasad Centre for Ophthalmic Sciences, AIIMS, New Delhi, India.

Corneal imaging techniques are used to assess the structure and function of the cornea and anterior segment. They are crucial for diagnosing and treating a wide variety of ocular diseases.

Corneal and ocular surface imaging is an ever-advancing field in ophthalmology. There have been several innovations in imaging technologies, such as rotating Scheimpflug, anterior segment optical coherence tomography (ASOCT) and confocal microscopy. Investigative technologies like ocular surface analysers have helped to understand and manage anterior segment diseases in newer ways. In this article, we discuss various techniques, their advantages, and their limitations.

Corneal topography and tomography

The growing popularity of refractive surgeries has prompted rapid advancements in corneal imaging. Corneal topography helps to map the shape and features of the corneal surface. Placido's disc-based and slit-scanning system are two common technologies in use today. Tomographers, generate 3D images of the anterior segment of a cornea which gives information about its thickness. Scheimpflug imaging and optical coherence tomography (OCT), are two examples of tomography.[1]

Placido disc-based keratoscopy

Placido's disc-based videokeratoscopy (Figure 1) is a common and easy-to-perform topography technique to study the anterior corneal surface. It provides information on cornea's shape (central power, simulated keratometry, corneal asphericity.) and aberrometry. It is useful in the diagnosis of corneal ectatic disorders like keratoconus and while fitting contact lenses. It also helps in intraocular lens power calculation for cataract surgery in patients with irregular corneas, follow-up, and management of post-keratoplasty (corneal transplantation) astigmatism and dry eye assessment (with non-invasive tear break up time).

A limitation with this technique is that it covers a limited corneal surface area (about 60 per cent). It does not provide information about the posterior corneal surface, which is important in the early diagnosis of ectasia.

Slit-scanning

Slit-scanning elevation topography combines projection of a slit of light with Placido's disc keratoscopy to get anterior and posterior corneal curvature measurements. The final image represents a 3D topography that includes various colour-coded maps (curvature, elevation, pachymetry) of the entire

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Figure 1 Placido disk with alternate light and dark concentric rings

Pentacam is a device that uses a rotating Scheimpflug camera to generate a 3D model of the anterior segment. It provides information, such as corneal and lens densitometry for opacification, keratometry, colour-coded maps for corneal thickness, elevation, curvature, or refractive power (or four maps refractive), pupil diameter and anterior chamber analysis. A popular feature, known as Belin-Ambrósio enhanced ectasia display (BAD) helps in detecting early cases of ectasia and is useful in screening candidates for refractive surgery.

Pentacam also helps in patients with previous refractive surgery and cataract, and in determining corneal aberrations. Galilei is a newer device that uses a dual Scheimpflug camera and incorporates Placido disc technology to improve curvature information on the central cornea.

The advantages of these devices are their accuracy, ease of use, repeatability, speed, quality and holistic anterior segment analysis.

The initial steep learning curve for data and image interpretation is a limitation for using Scheimpflug imaging. Image resolution, visualisation of iris and anterior chamber details may be better with ultra-high-resolution OCT. Pentacam's accuracy in the case of corneal scars is limited, in which case ultrasound bio-microscopy (UBM) may be a better option to visualise the anterior segment structures.

Optical coherence tomography (OCT)

Anterior segment OCT (ASCOT) captures dynamic high-resolution cross-sectional images of the ocular surface and anterior segment in a non-invasive manner.[2] OCT captures images with ease and interpretation of the images is not difficult. OCT is used for several investigations such as:

- Ocular surface disorder and dry eye disease: tear meniscus height and meibomian gland assessment
- Assessment of corneal opacities: endothelial gutta, depth of scarring, corneal thickness
- Keratoplasty workup and follow-up: assessment of corneal thickness and opacity, especially for lamellar/ partial thickness surgeries
- Keratoconus: evaluation of focal corneal thinning and asymmetry; epithelial thickness measurement; visualisation of depth of demarcation line after collagen cross-linking; diagnosis and management of hydrops in keratoconus
- Corneal infections: assessment of depth of infiltrates, areas of necrosis, endothelial plaque
- Refractive surgery: assessment of flap thickness, interface details; workup for phakic intraocular lens for myopia
- Anterior segment tumours: ocular surface squamous neoplasia, stromal iris cysts and conjunctival nevi
- Others: corneal deposits (Kayser–Fleischer ring, drug deposits) and intracameral foreign body
- Intra-operative OCT: integration with operating microscope helps in lamellar keratoplasty and ocular surface reconstruction (Figure 2A and B)

Ultrasound biomicroscopy (UBM)

Confocal microscopy

In vivo confocal microscopy (IVCM) is a minimally-invasive bio-imaging technique that allows high-resolution analysis of corneal microstructure and function.[3] IVCM is useful in:

- diagnosing and managing acanthamoeba and fungal keratitis
- detecting deep-seated infections thereby preventing corneal scraping for microbiological diagnosis diagnosing corneal dystrophies and deposits
- gaining a better understanding of dry eye disease
- studying long-term changes in corneal backscatter, corneal nerves, and cellularity

Confocal microscopy has provided more insights into visual quality after lamellar keratoplasty, excimer kerato-refractive surgery and corneal alterations after contact lens wear.

Ultrasound biomicroscopy (UBM)

UBM is a high-frequency ultrasound used to capture images of the anterior segment. The procedure involves placing a fluid-filled eyecup over the eye and immersing the probe into the fluid to visualise the anterior segment. It allows deeper penetration and imaging through corneal opacities, dynamic view of the anterior segment structures and visualisation of the ciliary body, which, may not be possible with an OCT examination.

UBM is a contact procedure, it requires patient cooperation, and a highly-skilled operator to get good quality images which might sometimes be a challenge.

Ocular surface analyser

Ocular surface analyser (OSA) is a new addition to the plethora of imaging devices. It helps in non-invasive analysis of tear film, enables quick and detailed structural research of the tear composition and tear film layers.[4] It also helps to identify the type of dry eye disease and determine targeted treatment for individual layers. OSA is helpful in several investigations such as:

- interferometry- measurement of tear film stability, thickness, and pattern of the lipid layer
- tear meniscus- helps to check its height, regularity, and shape
- non-invasive break up time (NIBUT)- using grids projected onto the cornea, it measures, the stability of the mucin layer and the entire tear film
- meibography- images the shape of the meibomian gland through transillumination of the eyelid with infrared light, helps in picking up drop-out areas, and diagnosis of the meibomian gland dysfunction
- others- ocular redness classification, blink rate, pupillometry (scotopic, mesopic, and photopic)

While we have come a long way with the available investigative modalities, a thorough clinical examination is crucial for correlation and appropriate management.

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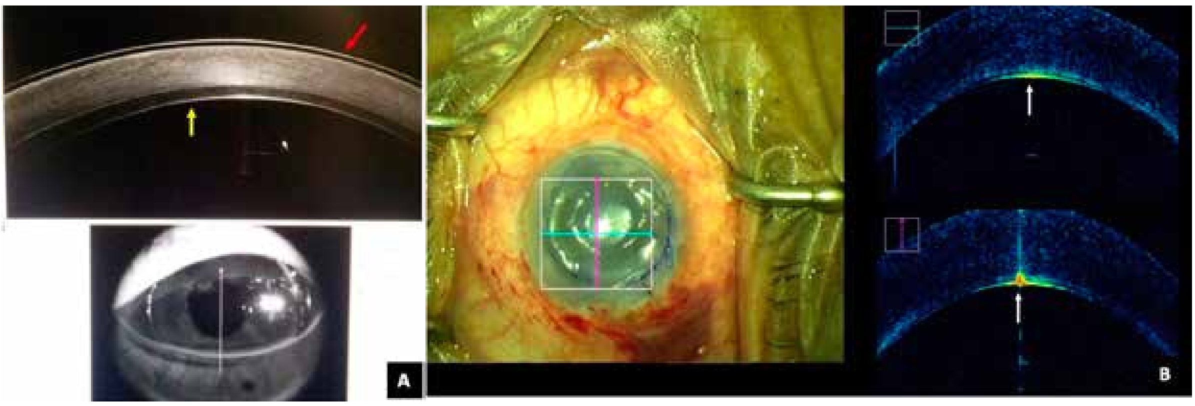


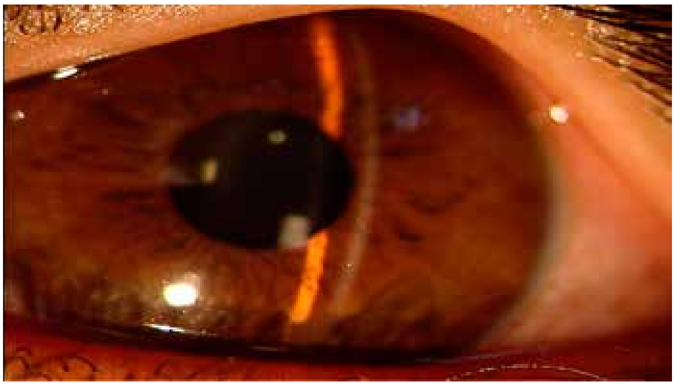
Figure 2A RTVue ASOCT image showing well attached DSAEK graft (yellow arrow) with a contact lens in situ (red arrow) Figure 2B Intraoperative OCT image with a well attached DMEK graft (white arrow) at the end of surgery.

R.P.CENTRE, AIIMS

Diagnosing glaucoma

Madhu Bhadauria
Director: CMO, Head of Glaucoma Services, Sitapur Eye Hospital, Sitapur, India.

Glaucoma is a condition that can lead to severe vision loss if not detected on time. Opportunistic screening is one way to screen for glaucoma.



MADHU BHADAURIA

Shallow anterior chamber seen with a torchlight. **INDIA**

Glaucoma is a disease that damages the eye's optic nerve. It is often a chronic, progressive and degenerative disease that can lead to visual defects. There may also be an acute presentation with redness, pain, tearing and photophobia due to acute raised intraocular pressure (IOP) in cases with angle closure.[1,2] The damage caused by glaucoma is irreversible. This is why it is important to diagnose the disease early to prevent further vision loss.

You can suspect glaucoma in a patient if the patient has:

- family history of the condition
- high refractive errors
- diabetes
- symptoms like coloured halos and/or pain,
- frequent change of glasses
- raised intraocular pressure
- occludable angles
- signs of optic nerve head damage

India is a country of nearly 1380 million people of which about 345 million people (25 per cent) are aged 40 years and above. This age group is eligible for opportunistic screening for glaucoma.

Opportunistic screening for glaucoma

Opportunistic screening involves checking those at risk for glaucoma when they present themselves for any eye examination. It can be done in outreach camps, vision centres and ophthalmology clinics. Opportunistic screening for glaucoma includes:

- checking for family history of glaucoma
- measuring IOP
- examining the anterior segment with torchlight, including relative afferent pupil defect (RAPD)
- evaluating the optic disc with direct ophthalmoscope

If available it can also include obtaining an image of the optic disc with smart phone photography.

Eye trained staff at outreach camps, vision centres and eye clinics can examine those at risk of glaucoma (anyone aged 40 years and over); this includes patients who may present with presbyopia, refractive errors or cataract. Proper family history, measurement of intraocular pressure, torchlight examination and optic nerve head assessment is recommended for all patients for opportunistic screening of glaucoma.

Comprehensive ocular examination for glaucoma

Slit-lamp evaluation for glaucoma

Van Herick technique is used to evaluate anterior chamber depth with a slit-lamp to look for:

- pseudo exfoliation
- neovascularisation of iris
- iris atrophy
- presence of peripheral iridotomy
- blebs
- pigments of corneal endothelium (Kruckenbergh spindle)
- pigments on the anterior surface of the lens

Tonometry

Do remember to measure IOP of all patients above 40 years at every visit. Applanation tonometer is ideal but rebound or non-contact tonometer can also be used. Corrected IOP according to corneal thickness is useful in suspected cases of ocular hypertension and normal-tension glaucoma.

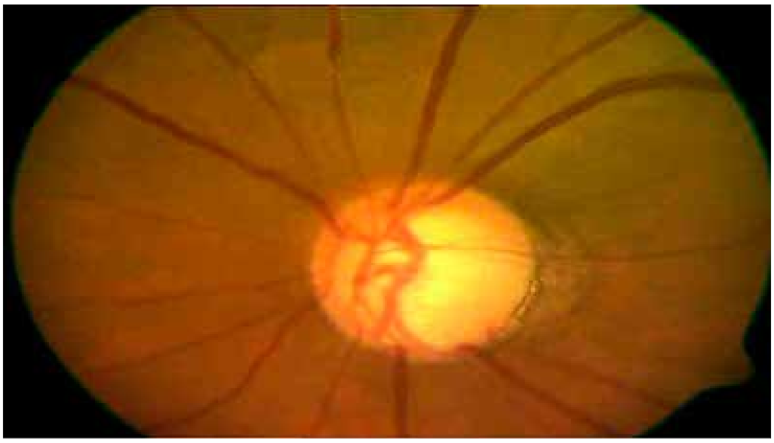
Gonioscopy

Gonioscopy is essential for all patients suspected of glaucoma. It examines the angle of the anterior chamber. It is best performed using four-mirror indentation gonioscope. The ophthalmologist should assess the angle as occludable or open as the treatment will depend on the assessment. An angle is occludable when posterior trabecular meshwork is not seen in 180 degrees of angle and more.

Dynamic or manipulative gonioscopy assesses if angle closure is only appositional or if peripheral anterior synechiae are formed. Evidence of blotchy pigments, neovascularisation, excessive pigments on trabecular mesh with wide open angle and concave iris are signs of pigmentary glaucoma.

Disc evaluation

The best way to evaluate a disc is with a 78 or 90 Dioptre non-contact fundus lens on a slit lamp. It gives a stereoscopic view of the disc to assess optic disc



MADHU BHADAURIA

Glaucomatous discs with thinning inferior disc rims. INDIA

size, cup and rim delineation. In patients suspected of glaucoma important signs to note are: cup size and depth, loss of rim, notches, slopes, and disc haemorrhage. A point to remember is that the margin of cup is where vessels bend and not the area of pallor.

The disc suspected for glaucoma may include:

- a vertical cup to disc ratio of more than 0.5
- asymmetric cups (that is a cup disc ratio between both the eyes of more than 0.2)
- notching of the neuro retinal rim and
- splinter haemorrhages at the disc

Disc damage likelihood score (DDLS) is a tool that can help to classify optic discs of different sizes as normal, disc at risk , glaucoma damage and glaucoma disability.

Visual field analysis

All the patients who are glaucoma suspects need perimetry to check for glaucomatous field loss.

Imaging in glaucoma

Visual field defects begin to be obvious after a loss of about 40 per cent of retinal ganglion cells. Hence structure imaging tools that can pick up abnormalities earlier have become popular. These tools include optic disc and retinal nerve fibre layer (RNFL) imaging for disc documentation and RNFL loss. The most popular technique is optical coherence tomography (OCT). OCT is a non-invasive test that provides images of disc, RNFL and ganglion cell count of macula. These are useful for early detection and to track progression.

Progression of glaucoma

Family history, refractive errors, and age are risk factors for progression of glaucoma.[3] Progression is tracked using IOP, visual fields, disc photos and/or OCT. Optic disc progression can be seen as neuro-retinal rim thinning, enlargement of the cup/ disc ratio and increased area of parapapillary atrophy. Visual field progression is assessed by increasing mean deviation and pattern standard deviation, enlargement of scotoma or increased depth of scotoma. OCT gives numeric values of disc parameters and RNFL thickness; a reduction of ten per cent or more from a previous visit is considered progression. Visual fields and OCT both have built-in progression analysis package called GPA that is capable of giving trend and event analysis.

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Letter to the editor

When something goes wrong

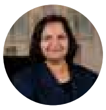
Thank you so much for your courageous coverage of medical error in the most recent issue of the *Community Eye Health Journal*. Inadvertent harm in health care settings can be devastating for patients and caregivers alike. Not too long ago, when I was trained in medicine, disclosure of medical error and apology were discouraged because of the potential for lawsuits. Such an approach disrespected patients and morally harmed caregivers. It was therefore tremendously encouraging to learn that, at least in clinical eye care, disclosure of error and apology are being practiced in hospitals and clinics around the world. A recent account in the Huffington Post by a gynaecologist (**http://bit.ly/Huff-apology**) complements your reporting and highlights the positive impact of disclosing medical error.

When something goes wrong in public health, or global health, offering an apology can be even more difficult. Responsibility is diffuse and causal pathways are more difficult to discern. There may be fear that acknowledging inadvertent harm could threaten public health programmes that deliver substantial benefits. Consequently, as described in a recent article (**http://bit.ly/glob-apol**), apology in public health is less often the norm. We in public health can be inspired and challenged by the progress made by eye health in acknowledging unintended harm.

Your remarkable coverage of this topic in the *Community Eye Health Journal* has done us all a great service. Indeed, this issue can serve as a model for other fields within health care and across global health. Thank you for so positively advancing the conversation, with extraordinary clarity and forthrightness.

David Addiss
Director: Focus Area for Compassion and Ethics (FACE), Task Force for Global Health, Decatur, USA.
Web: **www.taskforce.org** Email: **daddiss@taskforce.org**

Recent advances in retinal imaging and diagnostics



Sucheta Kulkarni
Director: Clinical services and Head-Retina and ROP services, H. V. Desai Eye Hospital, Pune, India.

Col (Retd) Madan Deshpande
Chief Medical Director: H. V. Desai Eye Hospital, Pune, India.

New imaging technologies like artificial intelligence and deep learning systems show a potential to screen populations at risk of retinal diseases at a large scale in a resource constrained setting.

Retinal disorders are emerging as important causes of blindness in middle-income countries. In a recent rapid assessment of avoidable blindness plus diabetic retinopathy (RAAB plus DR) survey in western India, posterior segment disorders (PSD) were responsible for nearly 39 per cent of blindness next only to cataract (45 per cent).[1] Diabetic retinopathy (DR), retinopathy of prematurity (ROP) and age-related macular degeneration (ARMD) are the important retinal diseases of public health significance.

MANOJ SASAWDE

Figure 1 Retinal dialysis imaged with an ultra-wide field camera. INDIA

Challenges in screening for retinal diseases

Challenges to provision of screening in resource poor regions such as Asia include lack of specialists and lack of equipment. Of the limited specialists, most practise in urban areas, whereas a large population resides in remote rural areas. Retinal imaging devices and telemedicine can help address the 'rural-urban gap',[2] as non-ophthalmologists can screen for retinal diseases to save the precious time of specialists.

Types of retinal imaging

Several types of cameras can image the retina or optic nerve. Imaging a retina allows one to:

- screen various diseases
- photo document pathological lesions
- track disease process
- see response to therapy overtime

Fundus photography has transformed from electronic flashes to smart phone-based cameras to more recent portable eye examination kit (PEEK). PEEK is a smart phone-based application for comprehensive eye examination (www.peekvision.org). The advantage of these cameras is that a non-ophthalmologist can take pictures and, with some training, grade them as well.

We discuss various types of imaging systems below:

Mydriatic camera

This is the most used and sophisticated imaging system available in the market. By asking patients to move their eyes in different directions, one can take images of posterior pole as well as the periphery of retina. Pupillary dilatation and bright flash lights make this system less patient friendly. The bulky size of a mydriatic camera makes it unsuitable for use in outreach/high volume screening.

Non-mydriatic camera

Low cost and less weight makes a non-mydriatic camera ideal for screening. It also appeals to patients as you can image without pupillary dilatation and use low intensity flash light.

Hand-held cameras

The big advantage of a hand-held camera system is its small size. This system does not need to be mounted on a table top unlike the mydriatic and non-mydriatic cameras. It's portable size and low cost make this a good option for high volume screening programmes. One important disadvantage with this camera is that, it is difficult to get good quality images if cataract or other media haze are present. Hand-held cameras cannot be used for special investigations such as FFA.

Smart phone-based camera systems

Special adaptors make it possible to use smart phones as fundus cameras. This is the cheapest way to image a retina. In several studies, a smart phone-based retinal camera has shown similar results to a desktop fundus camera.[3]

Most cameras we mention above provide a field of view between 30 and 45 degrees. This is suitable to identify diseases that affect posterior pole like diabetic retinopathy (DR) or age-related macular degeneration (ARMD). However, there is a possibility of missing lesions in the retinal periphery.

Ultra-wide field (UWF) camera

UWF camera helps to take images of peripheral retinal lesions like vein occlusions, vasculitis, posterior uveitis, breaks and detachments. UWF cameras provide a field of view of 200 degrees which is approximately 82 per cent of retina surface. Fundus fluorescein

H V DESAI EYE HOSPITAL

Figure 2 ROP screening with a portable camera with probe resting on neonate's eye. INDIA

angiography (FFA) with such cameras helps to detect peripheral vascular lesions which are otherwise missed in a standard FFA. Figure 1 shows the ultra-wide field image of a giant retinal tear which may have missed with standard photography. Disadvantages of UWF imaging system are high cost and bulky size.

Ocular angiography

Angiography of the retina and choroid shows vascular diseases and inflammatory pathologies. FFA provides useful information on diabetic retinopathy, retinal vein occlusions and retinal vasculitis. For choroidal pathologies such as ARMD, the ICG angiography is a better tool. Areas where there is hypoperfusion, leakage or staining, show the anatomical location and pathological process. This helps to arrive at a conclusive diagnosis and plan for future management of a case.

Fundus autofluorescence

Fundus autoflourescence (FAF) is non-invasive and a quick method to assess the function of retinal pigment epithelium (RPE). FAF aids in diagnosis of optic nerve head drusen, Best's disease and hereditary macular dystrophies.

Paediatric retinal imaging

The cameras we mention above need a person to sit in front of a camera aperture and fix their gaze on a target. This is impossible in a neonate or an infant. Certain wide field imaging systems like Retcam and Forus Neo help in such cases. Some of these cameras are portable and have a probe which resembles an ultrasound transducer. Paediatric retinal imaging is a contact technique and images up to the ora serrata can be taken under topical anaesthesia. Portability makes these tools an excellent choice for screening retinopathy of prematurity (ROP) and retinoblastoma.

Optical coherence tomography

Optical coherence tomography (OCT) is equal to a histopathological section of a tissue. One can study individual layers of retinal cells and pathological lesions in them. OCT diagnoses many subtle pathologies which may be missed during a clinical examination. Figure 3 shows an OCT image of a neurosensory detachment secondary to central serous retinopathy. OCT is performed on an undilated pupil. Newer OCT machines can capture good quality images even through dense cataracts. Recent addition of OCT angiography allows dyeless visualisation of retinal vessels in macula.

Artificial intelligence in diagnosis of retinal conditions

Artificial intelligence (AI) and deep learning system (DLS) have the potential to improve screening coverage in resource constrained settings. In DLS, neural networks read labels of images with normal and abnormal findings. It then starts to recognise patterns and groups similar images of a particular diagnosis. More the number of image sets, higher the precision and accuracy.

In a study done in Singapore, researchers used AI and DLS to screen and identify DR and other eye diseases. The results of the study showed a very high sensitivity to vision threatening DR but a low sensitivity for diabetic macular oedema. Which makes it, one of the major limitations in a DR screening programme. However the study showed a high sensitivity and specificity for detection of glaucoma and ARMD.[4] Further research may establish the validity of DLS in making a difference at a large scale. AI and DLS show the potential in screening programmes. They can reduce the burden on trained human resources and enable specialists to focus on treatment of these conditions.

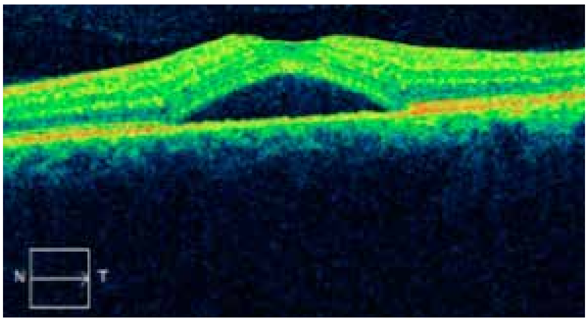


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Figure 3 OCT scan of macula showing a neurosensory detachment. INDIA

Conclusion

Advances in retinal imaging have led to a paradigm change in diagnosis and management of retinal diseases. In future, use of new technologies like AI and DLS in screening programmes is likely to help identify several blinding retinal conditions and treat them at an early stage.

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Managing demand generation with evidence

Ramasamy Meenakshi Sundaram
Senior Manager: Clinical Services, Aravind Eye Hospital, Madurai, India

Thulasiraj Ravilla
Director of Operations: Aravind Eye Care System

B.S. Ganesh Babu
Senior Manager: IT, Aravind Eye Care System

Generating and managing demand for eye care services must be based on evidence. We discuss what this evidence includes and how it can be effectively used to start eye care programmes to reach underserved populations.

ARAVIND EYE CARE SYSTEMS

Evidence is needed to generate and manage demand for eye care services. INDIA

An estimated 1.3 billion people worldwide live with some form of distance or near vision impairment. Uncorrected refractive errors and cataracts are the leading causes of vision impairment. They are also avoidable.[1] The WHO estimates that globally only about a quarter of people with eye problems use eye care services.[2]

Studies conducted in rural India and Nepal show the levels of uptake of eye services and cataract surgery range from seven per cent to 35 per cent. In another study in 52 countries only 18 per cent of people over 60 years got their eyes examined within the last one year; 38 per cent reported never having an eye exam.[3]

Appropriate demand generation strategies can address this unmet need in the community. With large eye care providers based in urban areas, there is a need to reach the rural population. Community outreach programmes are a viable strategy to generate demand in rural populations. These programmes have an indirect or snowball effect on the patients who come to a base hospital.[4] Another strategy is setting up primary eye care centres in rural areas. Primary eye care centres can enable access and refer those who need further interventions to a base hospital.

Outreach

Outreach can be either at a community screening or at vision centre or at primary eye care centre. An eye care provider can generate demand for outreach activities by gaining a good understanding of the region, and ensuring good frequency of visits. While walk-in patients can visit a hospital anytime, their visits depend on:

- their level of awareness
- the priority they accord to eye care and
- the level of trust in the service provider

We need to plan activities and track them with appropriate evidence to ensure that our efforts in delivering eye care are effective.

Estimating the demand potential

While evidence exists for prevalence or backlog, it is a challenge to estimate the demand for, let's say, cataract surgeries or spectacles, from a particular area at a certain period. Yet, one can make reasonable estimates based on existing trends, comparing with other similar regions, and the need in the community. Such estimates can also be made for a country or state.

Setting targets for an eye hospital

Besides, estimating the demand potential, eye hospitals needs to set targets which requires us to understand the current level of eye care in the service area to arrive at the unmet demand potential. Targets combined with the hospital's own capacity can help derive the annual goals for the hospital.

Setting targets for an outreach event

An outreach event covers a circle of eight to ten kilometres radius around the camp and is influenced by the access time to reach the eye camp site. The population covered and the intensity of promotion are the main drivers of the event. Past experiences help to refine the estimates for expected outpatients, surgery or spectacles.

Why are such targets important?

At the national level such targets are critical for advocacy and to build capacity of human resources and facilities. This applies to the hospital level as well. For outreach events such targets guide adequate staffing. Technology like geographic information system (GIS) can help to set realistic targets for served or underserved areas.

Ensuring effectiveness of the programme

Several factors influence the effectiveness of our efforts or deployment of resources. Having evidence helps to develop the right interventions to enhance the effectiveness. Such factors are:

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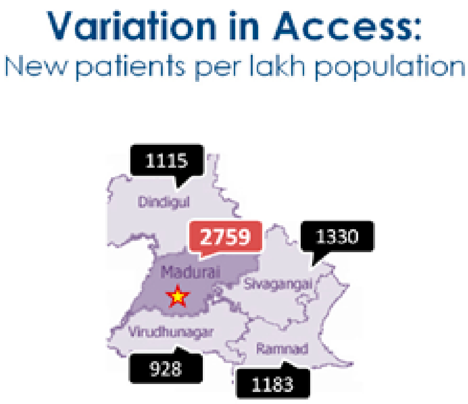

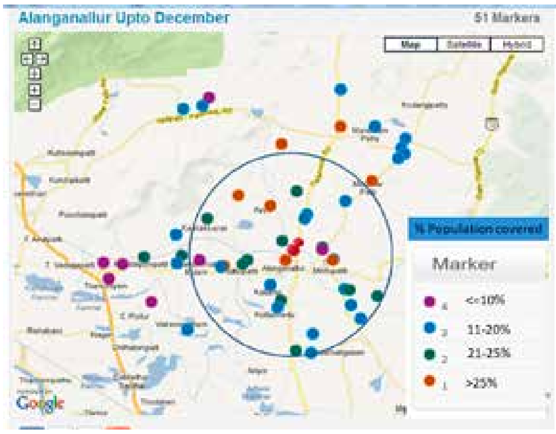

A geographical analysis can tell where patients come from . INDIA

ARAVIND EYE CARE SYSTEMS

Compliance refers to whether or not patients follow their physicians instructions. It is important to understand how many patients comply with the prescribed surgery, spectacles or treatment. All the diagnostic or outreach efforts on those who don't comply, is essentially wasted. Plus without the treatment, there is no impact on the problem. So it is important to track the prescriptions and their compliance. Understanding the barriers to non-compliance helps to plan appropriate strategies to improve compliance.

Cataract surgery acceptance rate is the number of cataract patients accepting a surgery among the total number of patients prescribed. Setting a target for the surgery acceptance rate helps to measure the gap and plan for increased productivity and cost effectiveness. You may find that transport, counselling and costs are also facilitators for improving effectiveness.

Cataract conversion rate is the number of cataract surgeries done per hundred outpatients served. We use this when calculating cataract surgery acceptance rate is not possible due to lack of data. The rate varies across the regions as per the prevalence of cataract and the type of services available. Comparing the rate with similar organisations ensures that we do not miss the patients needing cataract surgery. The rate can suggest refinements to clinical protocol and counselling process.

Diagnostic profile of outpatients gives an insight into the patients' condition. We must take appropriate action if patients are not visiting the hospital for certain conditions. For instance, if very few patients with diabetes are getting their eyes examined, focused awareness campaigns at the community level can address this and reduce the risk of diabetic retinopathy.

A **geographic analysis** of where patients come from can help to identify areas of low coverage. This, in turn, helps to frame appropriate strategies to reach patients from all locations.

It is a common phenomenon in many regions to see seasonal variations in **patient load**. This can be due to several reasons, including changes in the weather. Such variations lead to underutilising resources during lean periods and stretching in peak periods. Both scenarios are undesirable. So, knowing the variations would help managers to smooth the seasonality.

Sustaining the demand

Sustaining and growing the demand is largely driven by word of mouth and trust in the hospital. Therefore the evidence for quality of services, patient satisfaction and retention requires constant improvement.

Post-operative visual outcome:
Satisfied patients usually become the ambassadors of the hospital. It is important to minimise operative complications and ensure that the patient gets the best possible vision. The WHO recommends that over 90 per cent of the cataract surgical patients should gain a best corrected vision of 6/18 or better. It is heartening that very good outcome of better or equal to 6/12 is a step in the right direction for quality vision.

Patient experience:
This is another major influence on demand. It includes both clinical and non-clinical services. Apart from clinical outcomes, patients should be happy with other services you offer like short waiting time, support services, food and quality of communication. A simple way to know what patients want is by placing a suggestion box or through feedback surveys.

Tracking patients with chronic conditions:
Patients with conditions like glaucoma or diabetes need to be monitored regularly to preserve their vision. A patient register to track such patients and sending reminders via SMS or WhatsApp may be useful. You can track the effectiveness of such interventions through compliance to periodic follow-up.

Benchmarking:
Any evidence by itself in isolation does not give much insights. Looking at historical data or a comparison with other providers can give rich insight. For example, an indicator of quality of surgery is when a hospital reports that 80 per cent of cataract patients gained best corrected visual acuity (BCVA) 6/18 or better. When you compare this with WHO standards of 90 per cent you can find the gap and opportunities for improvement.

Monitoring system:
For excelling in operations, monitoring should be an integral part of a hospital teams work. Periodic systematic review of what went well or what didn't, can pave the way for continuous improvement of existing systems and processes.

Conclusion

Managing demand has two facets and each has a different orientation. Looking at the current demand for services that is, those who come and have their need met by your services. All providers, regardless of whether you are programme manager or running a hospital, should also be concerned with those in the catchment area you are not reaching, the unmet need. Coverage is the percentage of those who have their need met out of all those who have a need. This needs to be based on good evidence generated through ongoing monitoring and population based studies.

Beyond VISION 2020: universal eye health coverage and the elimination of trachoma

Peter Holland
Chief Executive: International Agency for the Prevention of Blindness, London, UK.

Serge Resnikoff
Immediate Past Chair: International Coalition for Trachoma Control, Lisbon, Portugal.

The WHO World Report on Vision provides a strategic path to achieve sustainable eye health systems and universal eye health coverage.

On 18 February 1999, the World Health Organization (WHO) and the International Agency for the Prevention of Blindness (IAPB) launched **VISION 2020: The Right to Sight**. This global initiative was created to eliminate causes of avoidable blindness by the year 2020.

SIMON TOWNSLEY

Women in Napak, Uganda, after trichiasis surgery at a camp set up by the local health department in collaboration with Sightsavers as part of The Queen Elizabeth Diamond Jubilee Trust Trachoma Initiative, with support from UK Aid.

VISION 2020 aims to build comprehensive and sustainable eye health systems by integrating existing health services and ensuring high quality universal eye care. VISION 2020 has three key objectives: 1) the control of diseases that affect eye health; 2) the development of human resources; and 3) the provision of appropriate technology and infrastructure.

Trachoma, the world's leading infectious cause of blindness, is one of the priority diseases targeted by VISION 2020. There has been significant advancement towards elimination since the launch of VISION 2020. In June 2019, **WHO announced a 91% global reduction** in the number of people at risk of trachoma, from 1.5 billion in 2002 to 142.2 million today. During the same period, the number of people requiring surgery for trachomatous trichiasis (TT), the late blinding stage of trachoma, reduced from 7.6 million to 2.5 million – a 68% reduction. Nine countries across all endemic WHO regions have also been validated for achieving elimination.

Progress towards VISION 2020's mission and objectives include:

1. Raising support for comprehensive and sustainable eye health systems

VISION 2020 has led several initiatives that have raised the profile of avoidable blindness. Four World Health Assembly (WHA) resolutions have been adopted since 2003, including WHA resolution 66.4 **Universal Eye Health: A global action plan 2014 – 2019**, which have reinforced WHA Resolution 51:11 calling for the global elimination of trachoma. WHA resolutions aim to support UN member states to achieve global vision targets, including universal access to comprehensive eye care services.

2. Robust evidence to support disease elimination efforts

International commitments and increased investment led to the largest ever infectious disease survey – the **Global Trachoma Mapping Project** (GTMP). From 2012–2016, GTMP screened over 2.6 million people for trachoma across 29 countries and identified areas where interventions needed to be scaled up. Since 2016, **Tropical Data** has supported health ministries through the full survey process - from planning and protocol development to application of the survey outputs. Data collected by GTMP and Tropical Data have mobilised resources to scale up all components of the WHO-endorsed SAFE strategy (surgery, antibiotics, facial cleanliness, environmental improvements) and have contributed to **over 566 million doses of antibiotics being distributed and nearly 1.5 million TT operations being conducted** since 2011.

3. Improved human resources, infrastructure and technology for eye health

In recent years, programmes have included strategies to **effectively use limited human resources** in resource-poor settings.[1] In Kenya, Tanzania and Chad, national programmes are upskilling ophthalmic nurses and ophthalmic clinical officers to carry out and manage TT operations. In Ethiopia, **which accounts for 44% of the global burden of trachoma**, the national programme is training general health workers to provide eye care services, including TT surgery, in order to improve coverage rates. Furthermore, new innovations, such as the TT tracker, is **helping national programmes to track surgical performance** for individual surgeons, so supervisors know when enhanced supervision or additional training is needed.[2]

Conclusion

With VISION 2020 coming to an end next year, the eye health sector can celebrate advancements towards building sustainable eye health systems. The WHO World Report on Vision, published in October 2019, provides a strategic path to progress towards objectives set by VISION 2020. However, to achieve targets, trachoma interventions must be included in national eye health care plans and health systems must be equipped to deliver comprehensive eye health care for entire populations, including people with disabilities and other hard to reach populations.

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Elmien Wolvaardt
Editor: *Community Eye Health Journal*, International Centre for Eye Health, London School of Hygiene & Tropical Medicine, UK.

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Ophthalmologists from Kenya and India studying at the London School of Hygiene & Tropical Medicine.

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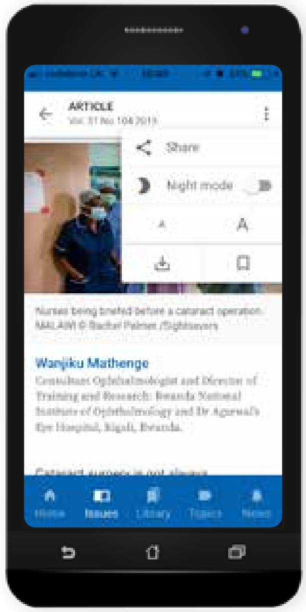

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Find our app in **Google Play** (Android) or the **App Store** (iOS): search for **'Community Eye Health Journal'** or **'CEHJ'**.

You can also view the app in any browser, on any device, by visiting **https://m.cehjournal.org**

Test your knowledge and understanding

This page is designed to help you to test your own understanding of the concepts covered in this issue, and to reflect on what you have learnt.

NIRANJAN GAIRE, CHHANDA (KALE-BABU) NARAYANI EYE HOSPITAL

You can detect many eye conditions using a simple torch. NEPAL

We hope that you will also discuss the questions with your colleagues and other members of the eye care team, perhaps in a journal club. To complete the activities online – and get instant feedback – please visit **www.cehjournal.org**

Answer TRUE or FALSE for every part of all questions.

Question 1

The following eye examinations can be performed by a trained eye health worker (who is not a doctor) who has suitable equipment:

- ☐ **a.** Measurement of visual acuity
- ☐ **b.** Indirect ophthalmoscopy
- ☐ **c.** Refraction for presbyopia
- ☐ **d.** Measurement of intraocular pressure using a Schiötz tonometer
- ☐ **e.** Examination of the visual fields

Question 2

The following can be performed using a torch:

- ☐ **a.** Examination of the pupil light reflex
- ☐ **b.** Examination of the conjunctiva
- ☐ **c.** Diagnosis of trichiasis
- ☐ **d.** Examination of the optic disc
- ☐ **e.** Examination of the cornea for a foreign body

Question 3

The Arclight:

- ☐ **a.** Requires batteries
- ☐ **b.** Costs about £30
- ☐ **c.** Can be used to examine the optic disc
- ☐ **d.** Can only be used by doctors
- ☐ **e.** Can be used to examine the ears

Question 4

Which of the following statements are TRUE ?

- ☐ **a.** A baby with a white pupil should be referred immediately
- ☐ **b.** Reading glasses can be given to a 50-year-old patient with 6/60 vision in both eyes
- ☐ **c.** A 50-year-old patient who has an in-turned eye on cover test and complains of double vision probably has a squint from childhood
- ☐ **d.** A patient who complains of sudden unilateral painless loss of vision should have their pupil reactions tested and fundi examined following dilation of the pupils
- ☐ **e.** Community health workers must refer all eye patients to a specialist

ANSWERS

1. a, c, d and e are TRUE. Indirect ophthalmoscopy is usually done by ophthalmologists.
2. d, is FALSE. a, b, c and e are TRUE.
3. c and e are TRUE. a, b and d are FALSE. It is solar powered and costs about £10 (US $13). It can be used by any trained health worker.
4. a. TRUE. It may be cataract or retinoblastoma, both of which require urgent specialist attention. b. FALSE. The cause of poor distance vision needs to be found before considering giving reading glasses. c. FALSE. Double vision implies a recent muscle or nerve problem, e.g., sixth nerve palsy. d. TRUE. Sudden vision loss in a non-painful eye may be due to diseases of the retina or optic nerve. e. FALSE. A community health worker can be trained to carry out a basic eye examination and diagnose and treat common eye conditions such as conjunctivitis.

Picture quiz


ICEH

Question 1
What do you notice about each of the following?
- **a.** Eyelids
- **b.** Conjunctiva
- **c.** Cornea
- **d.** Pupil

Note: the dense white oval mark at 12 o'clock on the pupil margin is a reflex from the flash of the camera.

Question 2
What is the diagnosis?

Question 3
What disease is likely to cause this?

Question 4
What is the name of the public health strategy to eliminate blindness from this disease?

ANSWERS

1. What can you see?
a) Eyelids: turning in of the upper eyelashes
b) Conjunctiva: it is red
c) Cornea: there is a small grey-white opacity at 4 o'clock near the pupil edge; the rest of the visible cornea is clear
d) Pupil: it looks normal.
2. What is the diagnosis? Trichiasis.
3. What disease is likely to cause this? Trachoma.
4. What is the name of the public health strategy to eliminate blindness from this disease? The SAFE strategy (S for surgery to treat trichiasis, A for antibiotics to clear infection, F for facial cleanliness and hand hygiene to help reduce transmission and E for environmental improvement (for access to water and sanitation).

Inaugural World Ophthalmic Nursing Forum

The World Ophthalmic Nursing Forum will offer nurses the opportunity to meet and network with a wide range of colleagues from across globe. It is free for nurses who register to attend the IAPB Global Assembly in Singapore from 12-14 October 2020. Find out more: email **communications@iapb.org** or visit **IAPB.org/GA2020**

Egypt carries out first trachoma intervention since 2001

Egypt distributes antibiotics to over 300,000 people to prevent and treat trachoma. Egypt has conducted its first mass drug administration (MDA) since 2001, giving it to over 300,000 people to prevent and treat trachoma, Read more at **www.cehjournal.org/NAME-OF-ARTICLE**

Cataract surgeons needed

BOOST BETTER OPERATIVE OUTCOMES SOFTWARE TOOL

Are you a practicing ophthalmologist cataract surgeon interested in improving cataract surgical outcomes? The BOOST app will help you to capture key cataract outcome data and and produce simple, engaging reports that can help you improve outcomes. To help us test the app, email **BOOST@hollows.org** or read more at **www.cehjournal.org/NAME-OF-ARTICLE**. The deadline is **30 December**.

Paediatric cataract surgery video now online

Highly respected paediatric ophthalmologist Albrecht Hennig has made a valuable teaching video about cataract surgery in children, based on techniquest he perfected while working in Nepal and performing cataract surgery on thousands of children. Watch it on YouTube: **https://youtu.be/exYK409KgL8**

Courses

MSc Public Health for Eye Care, London School of Hygiene & Tropical Medicine, London, UK

Fully funded scholarships are available for Commonwealth country nationals. For more information visit **www.lshtm.ac.uk/study/masters/mscphec.html** or email **romulo.fabunan@lsthm.ac.uk**

Small Incision Cataract Surgery Training at Lions Medical Training Centre in Nairobi, Kenya

Courses begin every six weeks and cost US $1,000 for training and approximately US $1,000 for accommodation. Email **training@lionsloresho.org** or call/message +254 728 970 601 or +254 733 619 191.

Free online courses

The ICEH Open Education for eye care programme offers a series of online courses in key topics in public health eye care. All the courses are free to access. More free courses coming! Certification also available. For more information visit **http://iceh.lshtm.ac.uk/oer/**

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Next issue


ALLEN FOSTER

The next issue is on the theme **Viral infections and the eye** and it will be available on our app and online only

Key community eye health messages

SEEMA BANERJEE/IAPB #EYECAREEVERYWHERE

The visual acuity should be measured in each eye for all patients complaining of eye problems

DR. SHIVAM MAINI, OPERATION EYESIGHT

How to examine the eyelids, conjunctiva, cornea and pupils with a torch should be taught to all health workers

RAJESH PANDEY, DROP INDIA INITIATIVES

Smart phone-based cameras for retinal examinations are inexpensive, easy to use and show similar results as a fundus cameras