Prevention of blindness from Diabetic retinopathy:
Risk factors control & Chronic Disease Management

At the 26th Association of Malaysian Optometrists AGM
Dr. Goh Pik Pin MD, FRCS, MPH
Dr. Lim Teck Onn FRCP, M. Stat

http://www.myehr.org.my
http://www.corfis2.org.my
Clinical epidemiology of Diabetes & Hypertension and its cardiovascular disease risk factors

The way forward: Chronic Care Model (CCM)

Malaysian experience:
• CORFIS 1.0: the research
• CORFIS 2.0: the next stage
They are very common, poorly controlled in the community, costly to treat and of course deadly.
Medicines used in Malaysia

<table>
<thead>
<tr>
<th>NO.</th>
<th>ATC</th>
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<th>PRIVATE</th>
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<tbody>
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<td>2.5009</td>
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<td>CORTICOSTEROIDS FOR SYSTEMIC USE</td>
<td>1.9061</td>
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<td>PSYCHOLEPTICS</td>
<td>3.0503</td>
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</table>
And the price we pay.. Kidney disease as a complication of DM

Country

Percentage of incident RRT population with Diabetes mellitus as primary renal diagnosis
The price we pay... Eye disease

Among new diabetic patients seen at MOH eye clinic

- Sight threatening eye disease – 19.4%
- 37% Diab. Retinopathy (severe 19% & Proliferative 11%)
- 11% maculopathy
- Need laser - 10.0%
- Need surgery - 1.7%

Source: Diabetic Eye Registry 2007 National Eye Database
Health impact: Eye disease

Prevalence and Risk Factors for Diabetic Retinopathy
The Singapore Malay Eye Study

Tien Y. Wong, MD, PhD, Ning Cheung, MBBS, Wan Ting Tay, BSc, Jie Jin Wang, PhD, Tin Aung, MD, PhD, Seang Mei Saw, PhD, Su Chi Lim, MD, E. Shyong Tai, MD, Paul Mitchell, MD, PhD

Purpose: To describe the prevalence and risk factors of diabetic retinopathy in Asian Malays.
Design: Population-based cross-sectional study.
Participants: Persons with diabetes of Malay ethnicity aged 40 to 80 years in Singapore.
Methods: Diabetes mellitus was defined as random glucose of 11.1 mmol/l or more, use of diabetic medication, or a physician diagnosis of diabetes. Retinal photographs taken from both eyes were graded for diabetic retinopathy using the modified Airlie House classification system.
Main Outcome Measures: Any diabetic retinopathy, retinopathy grades, macular edema, or vision-threatening retinopathy.

Among 757 diabetic subjects surveyed in this community study
- 35% any retinopathy
- 5.7% macular edema
- Sight threatening retinopathy – 9%

Am Academy Ophthal 2008
Diabetic prevalence vs. Proportion had Eye Screening

Source: National Health Survey NHMS 2006
Can we bridge the gap?

Adv. biomedical knowledge, Modern technology (drugs, devices etc) Trained professionals skilled in these

Control of risk factors in the community & Preventing CVD, CKD & Eye diseases
Some countries have shown this can be done

**Heart disease death rates among men aged 30 years and over, 1950–2002**

### Causes for decrease?
- **47%** due to treatments, including secondary prevention
- **44%** due to changes in risk factors, including lipids, BP, smoking, physical activity
Diabetic retinopathy is responsible for 4.8% of the 37 million cases of blindness due to eye diseases.

**Diabetic Retinopathy**

*The data, statistics and narrative in this section are excerpted from the VISION 2020 Action Plan 2006-2010 © World Health Organization*

Diabetic retinopathy is a well-recognised complication of diabetes mellitus. Well-conducted clinical trials have shown that good control of diabetes and hypertension significantly reduces the risk for diabetic retinopathy, and there is evidence from studies spanning more than 30 years that treatment of established retinopathy can reduce the risk for visual loss by more than 90%.

Once vision has been lost due to diabetic retinopathy, it usually cannot be restored, although some forms of retinopathy can be treated by complex vitreoretinal surgery. Screening programmes for detecting diabetic retinopathy at a stage at which treatment can prevent visual loss and health education programmes are the mainstay of prevention of blindness due to diabetic retinopathy. Care for diabetic retinopathy is relatively expensive and requires properly trained eye-care professionals. The decisions made by each country are adapted to their resources, social expectations and available health-care infrastructure. Effective services for prevention and treatment of diabetic retinopathy can be provided only if adequate medical services for patients with diabetes mellitus are in place.

**Current situation**

Diabetic retinopathy is responsible for 4.8% of the 37 million cases of blindness due to eye diseases throughout the world (i.e. 1.8 million persons).
By the time it gets to this,

Diabetic Macular Edema

Proliferative diabetic retinopathy with tractional retinal detachment

it’s already too late
Dear Optometrist,

Do you Know....

55% of diabetics never have eye checked for diabetic retinopathy

Early detection and treatment of diabetic retinopathy saves sight.

Recommended schedule for diabetic eye examination:

Type 1 DM: First examination at 5 years of diagnosis, and then once yearly if no apparent diabetic retinopathy.

Type 2 DM: First examination at diagnosis, and then once yearly if no apparent diabetic retinopathy.

More frequent examinations IS necessary if visual symptoms and/or diabetic retinopathy are present.

So, please..

Look into the fundus of diabetic patients when you next refract them.

Remind them of their annual eye examination.

This is a community service message from the Ministry of Health and Association of Malaysian Optometrists (www.amoptom.org)

Early detection and treatment of diabetic retinopathy saves sight.
The Chronic Care Model
to improve HT, DM & Dyslipidemia control

## The 6 elements of Chronic Care Model

<table>
<thead>
<tr>
<th>#</th>
<th>Elements</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Health care organization</td>
<td><strong>Goals, values &amp; incentive</strong> to care providers must be aligned with payers &amp; MOH</td>
</tr>
<tr>
<td>2</td>
<td>Community resources &amp; policies</td>
<td>Patients &amp; care providers need <strong>linkages with community resources</strong> like home care, patient education, exercise program, support groups.</td>
</tr>
<tr>
<td>3</td>
<td>Self management support</td>
<td>Enhance patient’s <strong>self-management capacity</strong>; including acceptance of responsibility for self-care, the self-confidence and know-how (<strong>knowledge, skills &amp; tools</strong>) required; build quality relationship &amp; communication</td>
</tr>
<tr>
<td>4</td>
<td>Delivery system</td>
<td><strong>Multi-disciplinary practice team</strong> with clear division of labour; planned management and visits</td>
</tr>
<tr>
<td>5</td>
<td>Decision support</td>
<td>Evidence based clinical practice; working to <strong>protocol</strong>, practice <strong>oversight and access to specialist expertise</strong></td>
</tr>
<tr>
<td>6</td>
<td>Clinical information system</td>
<td><strong>Computerized system</strong> to remind &amp; prompt actions; to support shared care among multiple professionals, to feedback to providers, and to track progress</td>
</tr>
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</table>
A Randomized controlled trial to determine the efficacy of CORFIS program to achieve blood pressure, blood glucose and lipids treatment goals over 6 months

Setting: GPs ; Year: 2007 to 2008
CORFIS 1.0 Results

<table>
<thead>
<tr>
<th></th>
<th>Treatment goal</th>
<th>% on CORFIS achieved goal</th>
<th>% on Control achieved goal</th>
<th>P value</th>
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</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td>HbA$_1^C$ $\leq$ 7%</td>
<td>43%</td>
<td>23%</td>
<td>0.01</td>
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<tr>
<td>Hypertension</td>
<td>BP $&lt;$ 140/90 mmHg; Or $&lt;$ 130/80 mmHg if Diabetes or CKD</td>
<td>57%</td>
<td>34%</td>
<td>0.001</td>
</tr>
<tr>
<td>Hyperlipidemia</td>
<td>$&lt;$ 4.1 mmol/l; or $&lt;$ 3.4 mmol/l if 2 or more CVD factors; or $&lt;$ 2.6 if DM or CAD</td>
<td>50%</td>
<td>32%</td>
<td>0.027</td>
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</table>

- Healthcare for people with chronic diseases in Malaysia is not well organized.
- When we make an effort to organize healthcare to meet their needs, the outcomes are uniformly positive.
The fundamental challenges are how do we....

- Raise awareness of **large number of patients** (1.5 million diabetics, 5 million hypertensives, and 3 millions with **Hyperlipid**) & care providers about **special healthcare needs of chronic diseases**
- Enroll all these patients into CORFIS
- Engage **care providers** (**Nurses/ Educators, GPs, Lab, Pharmacists, Dieticians, Ophthalmologists, Optometrists** etc)
- Provide **low cost & accessible monitoring** (Clinic, Lab, Home, etc) & target organ screening services
- Provide **e-health record long term** linked to SMS reminder services & community resources
# CORFIS 2.0: The answers

<table>
<thead>
<tr>
<th>Community resources</th>
<th>Elements of CORFIS 2.0</th>
<th>Public</th>
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<tbody>
<tr>
<td>Health professionals</td>
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<tr>
<td>GPs</td>
<td>Social marketing</td>
<td>People with Diabetes &amp; Other chronic diseases</td>
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<tr>
<td>Nurse educators</td>
<td>Community outreach</td>
<td></td>
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<tr>
<td>Pharmacists</td>
<td>Disease screening &amp; tele-consulting</td>
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<tr>
<td>Dieticians</td>
<td>Link to community services &amp; resources</td>
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<td>Ophthalmologist</td>
<td>MyEHR: e-Health records, tele-consulting, SMS reminders &amp; decision support</td>
<td></td>
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<tr>
<td>Optometrists</td>
<td></td>
<td></td>
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<tr>
<td>Self help groups</td>
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</table>

**People with Diabetes & Other chronic diseases**
1. Social marketing
1. Social marketing

CORFIS 2.0
A COMMUNITY RESEARCH PROGRAM TO HELP YOU STAY ON TOP OF YOUR DIABETES AND OTHER CHRONIC CONDITIONS

THE PROGRAM IS OPEN FOR ENROLMENT
IF YOU HAVE DIABETES MELLITUS, YOU WILL BE ELIGIBLE TO PARTICIPATE IN THE ABOVE STUDY.

People with diabetes and other long term conditions have special healthcare needs. Such conditions are what doctors call chronic diseases; there is no prospect of a cure for these diseases, only control is possible. Common examples of these conditions in Malaysia are diabetes, hypertension and high cholesterol.

Healthcare for people with chronic diseases in Malaysia is not well organized. We know from our past research work (CORFIS: Community based multiple Risk Factors Intervention Strategy to prevent Cardiovascular, Chronic Kidney and Eye diseases) that when we make an effort to organize healthcare specifically to meet the needs of people with chronic diseases, the outcomes are uniformly positive (see www.myehr.org.my for details).

People with chronic diseases need better care, support and access to more resources and services than are commonly available in the community. We are undertaking an ambitious effort to make these resources and services available and accessible to people living with chronic diseases in Malaysia. This CORFIS 2.0 initiative is a follow-up to the work we did in CORFIS.

1. Understand that chronic conditions are for life but that does not mean you need to suffer any ill health. You just need to take all necessary actions to protect your long term health.

2. See a doctor regularly, preferably someone who knows how to manage chronic conditions. Just as not all doctors know how to remove a brain tumour, certainly not all doctors understand and know how to manage chronic diseases.

3. Know your medications and take them regularly as advised by your doctor and pharmacist.

4. Undergo clinical and laboratory testing regularly to assess whether your condition is under control. You will never be cured of the condition, only control is possible. And you cannot rely on symptoms or on how you feel to know whether your condition is in control.

5. Undergo home monitoring regularly, as clinic and laboratory testing are too infrequent. Obtain the necessary devices (such as home BP monitor, blood glucose monitor) and consult a nurse educator.

6. See a professional dietician regularly. There is more to your diet that you need to know than what your doctor, parents or friends could tell you.

7. See a nurse educator and counselor. They will help you understand your condition better, teach you and equip you to take better care of yourself on your own in between seeing your doctor, and in general support you in your life long care.

8. Exercise regularly at least 3 times a week; each exercise session should be for at least 20 minutes. The best strategy is to follow a structured physical training in your local gym or fitness centre.

9. Your chronic condition, if poorly controlled, will lead to long term problems affecting your blood vessels, kidney, eye and foot. Many of these conditions could only be detected early through special testing, so you must undergo such testing at least once a year. This is what doctors call screening for target organ diseases.

10. Your chronic condition is for life; you will need life long care and testing. Many health professionals will be involved in helping you, so it is good idea to maintain a long term health record of your condition including all your past test results.

CORFIS 2.0 will help you adhere to the Ten (10) things you must know and do to stay on top of your chronic condition:
Dear Doctor and Allied Health Professionals

We invite you to participate in CORFIS 2.0, a community program and research supported by the Clinical Research Centre MOH, the National Kidney Foundation and the Malaysian Society of Ophthalmology.

The CORFIS 2.0 program is a follow-up to the research work we did in CORFIS: Community based multiple Risk Factors Intervention Strategy to prevent Cardiovascular, Chronic Kidney and Eye diseases [1-3]. We have long suspected that healthcare for people with chronic diseases in Malaysia leave much to be desired. CORFIS was developed not only to show this, but also demonstrated that when we make an effort to organize healthcare specifically to meet the needs of people with chronic diseases, the outcomes are uniformly positive [1-3; see also www.myhr.org.my for details].

Common examples of chronic diseases in Malaysia are diabetes mellitus (prevalence among adults:14%), hypertension (prevalence 44%), high cholesterol (prevalence 24%). People with diabetes and chronic diseases have special healthcare needs; they need better care, support and access to more resources and services than are commonly available in our community. We have therefore initiated CORFIS 2.0, an ambitious effort to make many of these needed resources and services available and accessible to you as healthcare professional and to your patients in Malaysia. By signing up to join CORFIS 2.0, you will be able to access these resources and services. See overleaf for what CORFIS 2.0 could offer you.

Participation in CORFIS 2.0 is strictly voluntary of course. It is also NOT free of charge as many of these resources and services are provided by the private sector although they are priced significantly lower just for CORFIS 2.0 or otherwise heavily subsidized by the sponsors of CORFIS 2.0 to make them affordable (similar services may be available from the public sector at perhaps lower cost, please check with the MOH).

Case Study:
A Malaysian man brought his father to see an ophthalmologist because of visual impairment. The old man has sight threatening diabetic retinopathy. The ophthalmologist checked the son for neglecting his father's medical care. The angry son soon confronted his family doctor who has long taken care of his father's diabetes and his whole family's health for more than 20 years. The doctor has never once examined the old man's eye. The son sued, and the family doctor quickly settled out of court. Fortunately for him, the case was never referred to MMC, otherwise he could well be struck off the register for gross professional negligence.


An optometrist in Singapore misdiagnosed the diagnosis of diabetic retinopathy in one of his regular customers. Although he only offered refraction and optical dispensing, he was still held liable as he is a registered optometrist and therefore legally required to screen for diabetic retinopathy.

You may be of the opinion that the above resources and services are optional extras; that you as a doctor is under no obligation to provide to your patients. You should know that many of these services are actually recommended by current clinical practice guidelines. And when patients do sue their doctors for negligently failing to provide these services, they have won each time. Refer to the two case studies for details.

This letter has been reviewed and approved by the MOH's Medical Research and Ethics Committee (MREC).

Thanks
Regards

Zaki Morad FRCP
Consultant Nephrologist*
Professor of Medicine IMU
President National Kidney Foundation

Goh Pk Pin FRCS
Consultant Ophthalmologist
Director, Clinical Research
Corin MOH

SaBankah Fatih Horm
Jalaluddin M. Med
(Anaesth.)
President Association of
Clinical Registry
Malaysia

Lim Tack Oon, FRCP
Consultant Nephrologist
Adjunct Professor IMU

References
## Social marketing

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<td>2</td>
<td>Exhibition</td>
<td>Shopping malls, employment sites</td>
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<td>3</td>
<td>Public forum</td>
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<tr>
<td>8</td>
<td>Telco</td>
<td>Telekom, MAXIS, DIGI</td>
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</table>
2. Community Outreach

Trained and prepared teams of nurses will reach out DIRECTLY to patients in the community in both traditional healthcare & non-traditional settings (shopping malls, workplace etc).
3. Disease screening

Non mydriatic fundus camera (No need to dilate the pupil)

Urine microalbuminuria a dipstick test

WHO CVD Risk prediction

Predicting Heart Attack and Stroke risk
CVD risk prediction

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<td>Smoker</td>
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<td>4</td>
<td>Diabetes</td>
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<td>5</td>
<td>Hyperetension (Syst. BP)</td>
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<td>Hyperlipidemia (Cholesterol)</td>
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<td>7</td>
<td>Family Hist.</td>
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<td>8</td>
<td>Urine-Microalbumin</td>
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</tbody>
</table>

Figure 2. WHO/ISH risk prediction chart for WPR B. 10-year risk of a fatal or non-fatal cardiovascular event by gender, age, systolic blood pressure, total blood cholesterol, smoking status and presence or absence of diabetes mellitus.

Risk Level
- <10%
- 10% to <20%
- 20% to <30%
- 30% to <40%
- ≥40%

WPR B People with Diabetes Mellitus

- Age (years)
- Male/Non-smoker, Male/Smoker, Female/Non-smoker, Female/Smoker
- SBP (mm Hg)
- Cholesterol (mmol/l)
4. Link to community resources
## 5. MyEHR

<table>
<thead>
<tr>
<th>CONTENTS</th>
<th>USES</th>
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<tbody>
<tr>
<td>1. Personal &amp; Medical history data</td>
<td>1. Patient view own health record anytime/anywhere</td>
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<tr>
<td>2. Professional consults</td>
<td>2. Download referral letter</td>
</tr>
<tr>
<td>3. Medicine prescription</td>
<td>3. Health professional access data anytime/anywhere</td>
</tr>
<tr>
<td>4. Disease screening: Fundus image, Microalbuminuria</td>
<td>4. SMS communication of test results &amp; medical advices</td>
</tr>
<tr>
<td>5. Lab test data (Hba1c, Lipid etc)</td>
<td>5. SMS reminder services</td>
</tr>
<tr>
<td>6. Home monitoring data</td>
<td>6. SMS health promotion messages</td>
</tr>
<tr>
<td>7. Directory services</td>
<td>7. Online patient education services</td>
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<tr>
<td>8. Community resources</td>
<td>8. Online professional services</td>
</tr>
<tr>
<td>9. Web based patient education services</td>
<td>9. Online community resources</td>
</tr>
<tr>
<td>10. Drug information service</td>
<td>10. Online supplies procurement</td>
</tr>
<tr>
<td>11. Medical supplies (home monitors, medicines, etc)</td>
<td></td>
</tr>
</tbody>
</table>
**MyEHR dashboard**

### Patient Personal Information
- **Name:** TING SIN HUNG, 50022-14-5201 (Male)
- **Age:** 55 years 3 months 4 days (22/08/1958)
- **Contact No:** (Home) 03-79801825 (Mobile) 012 301 8276 (Office) 03-58820238
- **Medical History:** Diagnosis (Year known: 1996), Surgical procedure (Year: 2009), Allergy

### Dates
- Enrolled: (dd/mm/yyyy) 01/11/2009
- Last annual screening: (dd/mm/yyyy) 03/02/2010
- # days since last screening: 2 months 26 days
- Record terminated (as requested): -

### Health Data
#### Parameters
- **Diabetes (HbA1c):** Control status
- **Diabetes (HbGH):** Control status
- **BP (Clinic BP):** 120/90
- **BP (Home BP):** 120/90
- **Lipid:** < 5.2 mmol/L
- **Body weight:** 45kg - 55kg
- **WHR:** 0.85% - 0.90%

#### Control limits
- **HbA1c:** 3.5-5.5%
- **HbGH:** 3.5-5.5%
- **BP (Clinic):** 120/90
- **BP (Home):** 120/90
- **Lipid:** < 5.2 mmol/L
- **Body weight:** 45kg - 55kg
- **WHR:** 0.85% - 0.90%

### Health Consults & Professionals' Contact
<table>
<thead>
<tr>
<th>Type</th>
<th>When (Date / Time)</th>
<th>Who</th>
<th>Where</th>
<th>Details</th>
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</thead>
<tbody>
<tr>
<td>GP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specialist</td>
<td>23/01/2010 15:30pm</td>
<td>Dr Kelvin Lee</td>
<td>Hospital Kuala Lumpur</td>
<td>Details</td>
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<tr>
<td>Nurse</td>
<td>23/01/2010 15:30pm</td>
<td>SN Roeli</td>
<td>Hospital Kuala Lumpur</td>
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<tr>
<td>Dietician</td>
<td></td>
<td></td>
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<tr>
<td>Etc</td>
<td></td>
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</tbody>
</table>

### Tests
- **Lab:** Fundus
- **Medication:** Metformin, Insulin

### CV Risk Score
- 70 yrs old: 38.5%
- 60 yrs old: 19.2%
- 50 yrs old: 8%
- 40 yrs old: 5%
**MyEHR**

**Tele-consulting diabetic retinopathy screening service**

**Screening station**
Nurses capture patients’ demographic and fundus images using fundus camera

**Tele-Health IT**
Fundus images are transferred and stored at www.myehr.org

**Doctors’ office or doctors’ home**
Viewing and grading retinal images by eye specialists

**Feedback to Patients via handphones**
Patients receive messages on eye status and advice for further actions
Translational clinical research is research that requires to translate scientific knowledge into tangible human benefit.

Translation from basic science to human studies

Advanced biomedical knowledge, Modern technology (drugs, devices etc)

Trained professionals skilled in these

Translation of new knowledge into clinical practice

Control of risk factors in the community & Preventing CVD, CKD & Eye diseases

Translational research bridges the gap
Your roles as Eye Care Professionals

1. Refer patients with DM to Corfis 2
   - Brochures at your optometrists outlet/ Private eye clinics

2. Help us to grade fundus images
   - Support us as a form of social responsibility
   - Training on DR grading will be provided
   - Receive certificate of appreciation from CORFIS Investigators and Clinical Research Centre, MOH
Thank You

www.crc.gov.my