Impact of Retinal Photo Imaging in Primary Care Setting: the experience in NTWC (Yuen Long Region)

Dr. NG Yeung Shing

Department of Family Medicine

NTWC

Introductions

- Diabetic Retinopathy: most frequent cause of new cases of blindness among adults aged 20-74 in USA.

- The Prevalence was 15-23% according to Local studies in Hong Kong.

Introductions

- The Diabetic Retinopathy Study (DRS) showed that panretinal photocoagulation surgery would significantly reduce the risk of visual loss from proliferative diabetic retinopathy.

- The Early Treatment Diabetic Retinopathy Study (ETDRS) established the benefit of focal laser photocoagulation surgery in eyes with clinically significant macular oedema.

Introductions

- A certain number of DM patients have not received annual fundal examination although most International clinical guidelines recommended.
- Ideally, all DM patients should have annual ophthalmologist assessment
- Direct ophthalmoscopy by primary care doctors had low sensitivity in detecting DMR:
  - 22-56% in an UK study.
  - 55% in a local study.

Introductions

- Nonmydriatic retinal camera: screening tool
- Easy to use and Inexpensive
- Sensitivity ranges from around 65-90% and specificity from 85-90%.
- Repeated trials have confirmed its superiority over direct ophthalmoscopy.

Aims of Study

- Evaluation the impact of the retinal photo imaging on the diabetic patients' care in a primary care setting

- Evaluation of the accuracy of retinal photos reading by Family Physicians

Study Design

- Retrospective Descriptive Study
- Study period: 27/3/2006 to 31/12/2007
- Subjects: Type 2 DM patients who FU GOPCs in Yuen Long and Tin Shui Wai region
- Exclusion: Already FU Eye Clinic, Refuse retinal photo service

Study Design

- Retinal photo of each eye was taken using the Nikon D100 camera with 45^{o} single field by trained Nurse.

- Retinal images were interpreted by a group of family physicians who have been trained in the interpretation of retinal photographs.


TOPCON
TRC-NW6S
NTHC HOSPITALS

新界西醫院聯網
New Territories West Cluster

醫院管理局
HOSPITAL AUTHORITY

元朗社區醫療中心 –
看眼底攝影報告須知

姓名:

身份證號碼:

眼底攝影日期:

眼底攝影報告將於 2 星期後備妥。如要查詢報告，閣下可於所屬普通科門診 電話預約 / 於下次覆診日期 見醫生，以便醫生於電腦翻查紀錄及向閣下解釋報告內容。

Dear Doctor,

Please check the retinal photo report in remark of DM information / reminder in CMS.

☐ **Poor quality of retinal photo please dilate pupil for retinal ophthalmoscope exam.**

元朗社區醫療中心

視網膜照片

拍照日期: _____

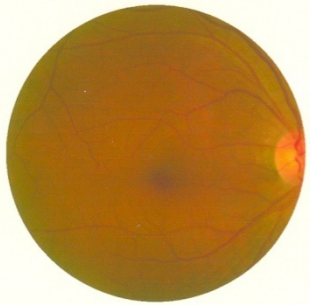
姓名: _____

Yuen Long Community Care Centre, NTWC IMAGEnet™

Patient	[redacted]	Date	24-09-2007

(Right Eye)

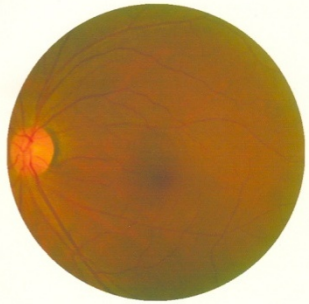
45°



#1

(Left Eye)

Left 45°



Left

#2

Study Design:

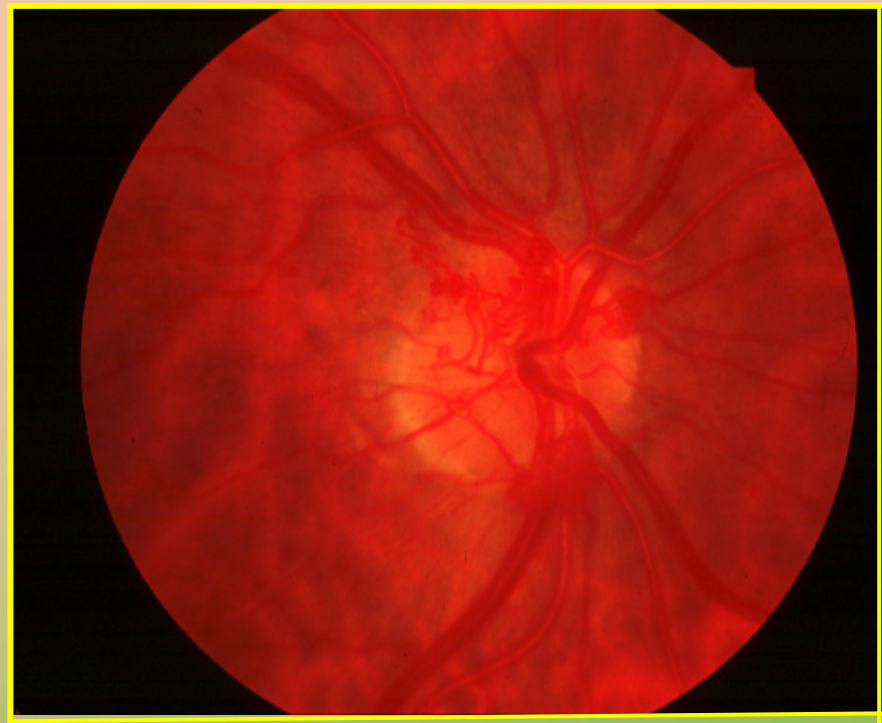
- Referral Criteria:
- Sight threatening DM Retinopathy
- Clinically Significant Macular Edema
- Other suspicious Retinal Pathology

Severe Non-Proliferative Diabetic Retinopathy

- Cotton-wool spots
- Venous irregularities

- Dark blot haemorrhages
- Intraretinal microvascular abnormalities (IRMA)

Proliferative Diabetic Retinopathy: Neovascularization

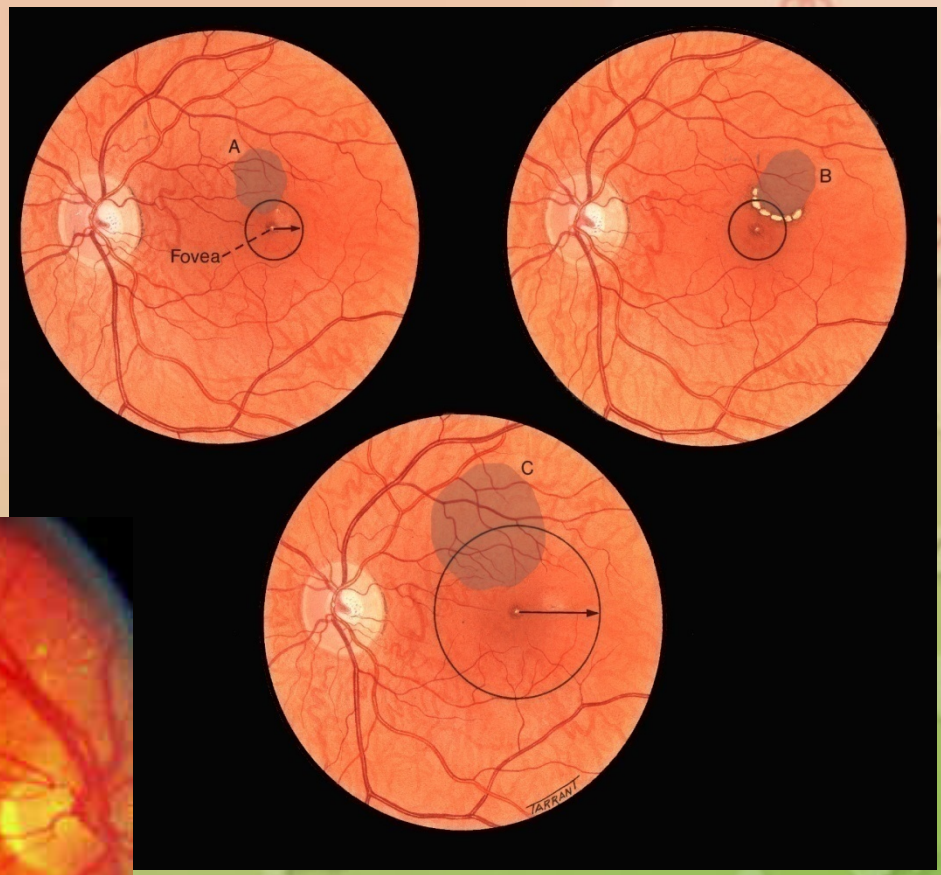


Neovascularization of disc = NVD

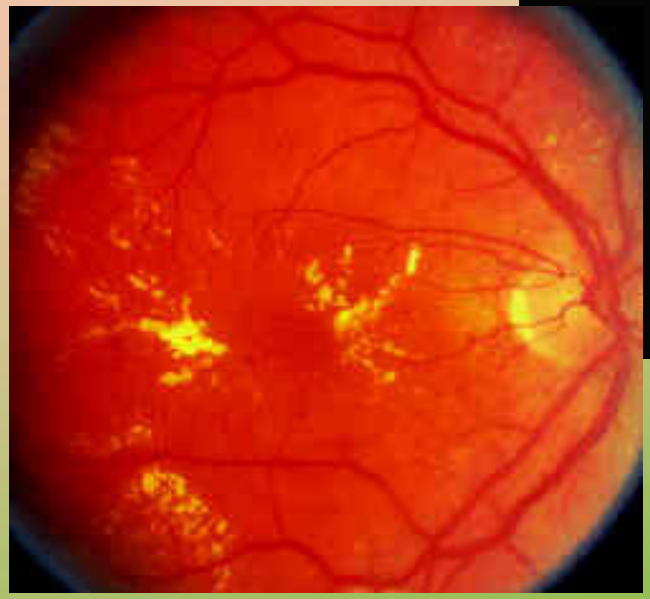
Neovascularization elsewhere = NVE

Clinically Significant Macular Edema

Retinal oedema within 500 μm of centre of fovea



Hard exudates within 500 μm of centre of fovea with adjacent oedema which may be outside 500 μm limit



Retinal oedema one disc area or larger any part of which is within one disc diameter (1500 μm) of centre of fovea

Study Design: Outcomes

- Standard: Diagnosis made by ophthalmologists by dilated examination using slit-lamp bio-microscopy documented in the patients' medical record in both SOPC and GOPC
- Any ophthalmological intervention performed
- Follow up appointment arranged by ophthalmologists

Study Design: Exclusion Criteria

- Patients with ungradable retinal photos

- Patient have no assessment done by ophthalmologist within 6 weeks of retinal photos taken

Study Design: Data Analysis

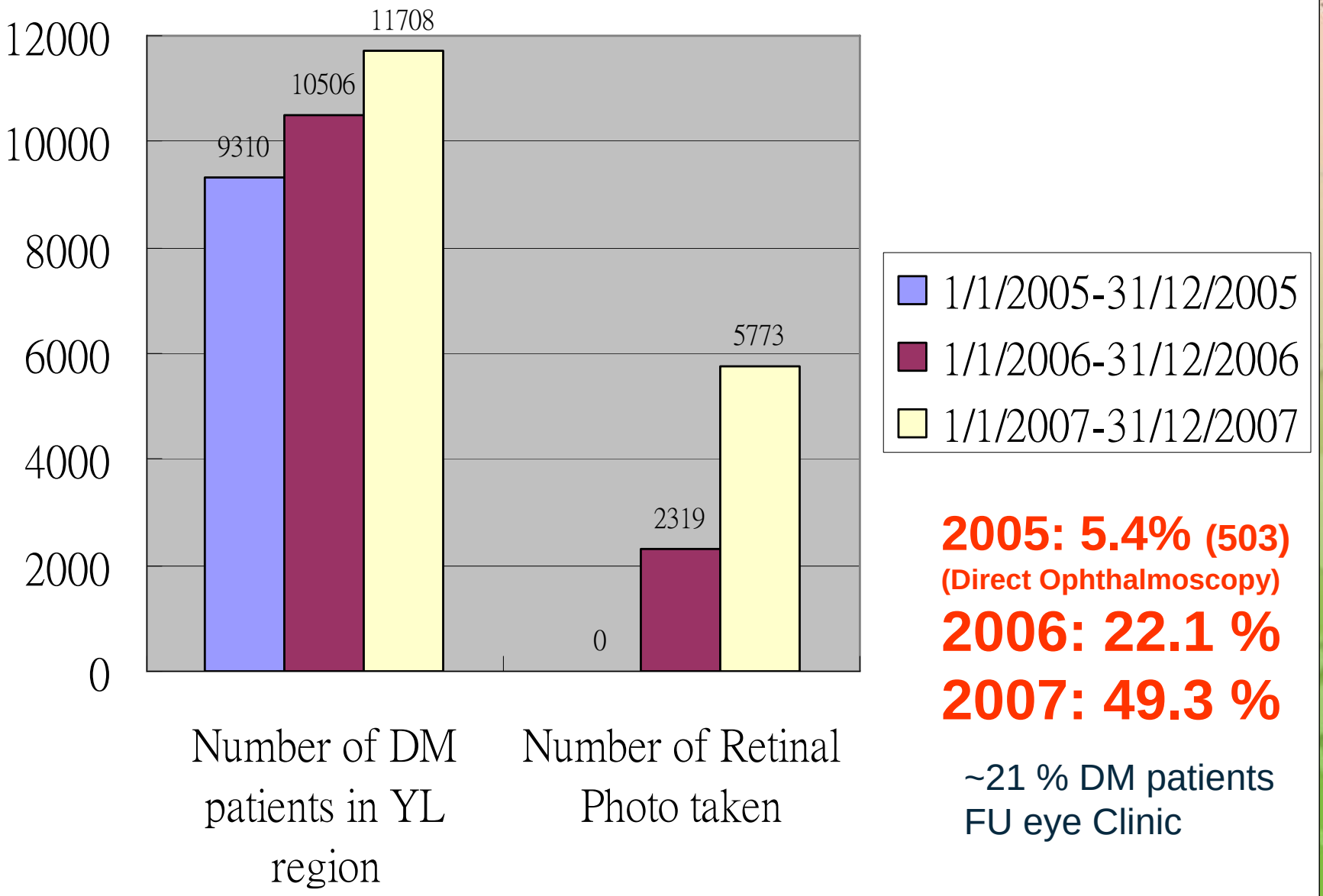
- Evaluation of Agreement between Family Physician's interpretation of retinal photos and Ophthalmologist's slit-lamp examination
  - weighted κ for DMR
  - unweighted κ for macula edema

Results

- 40 retinal photos were ungradable (excluded and referred)

- 8092 retinal photos were interpreted by Family Physicians from March 06 to Dec 07

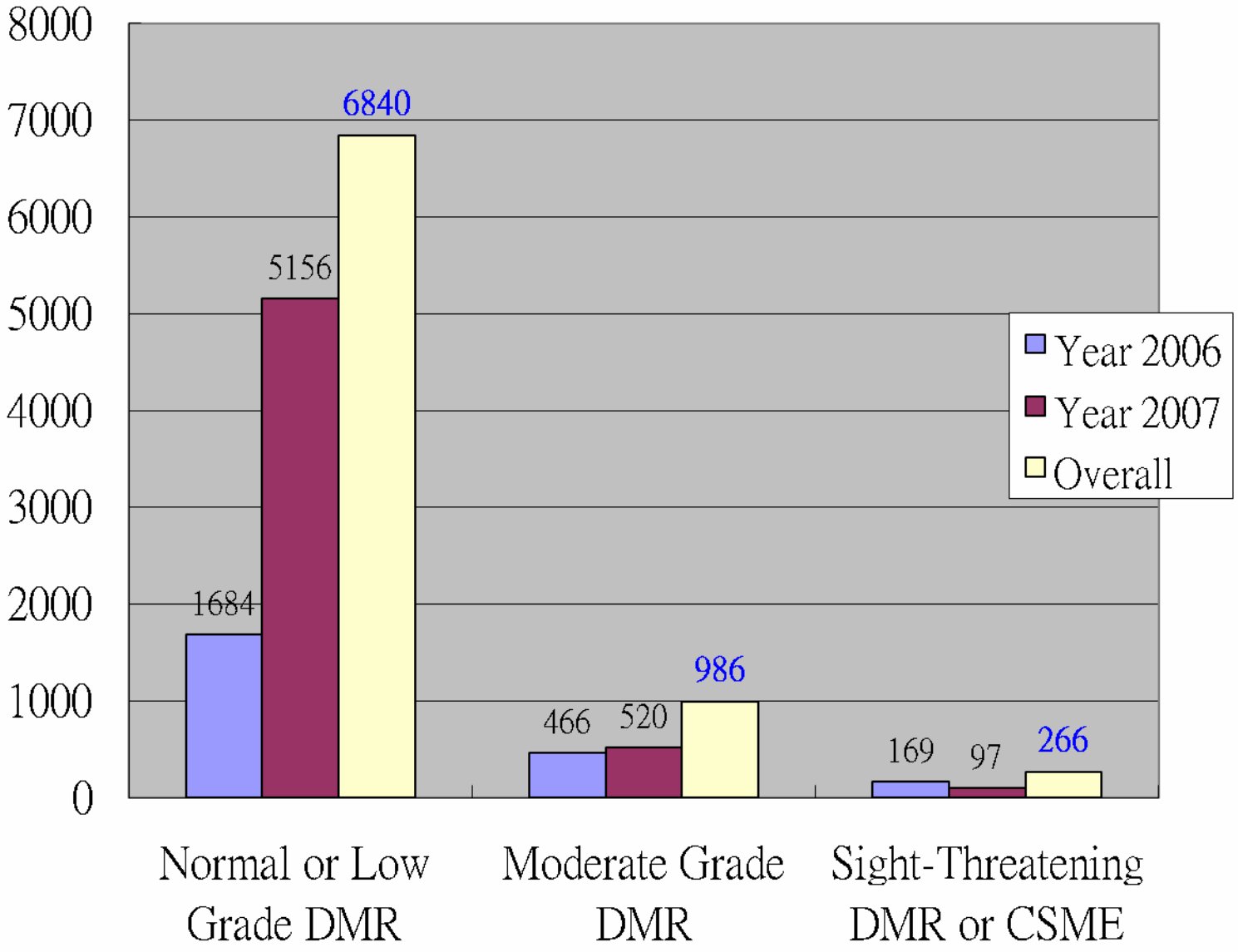
Coverage of Retinal Photos in GOPC YL Region



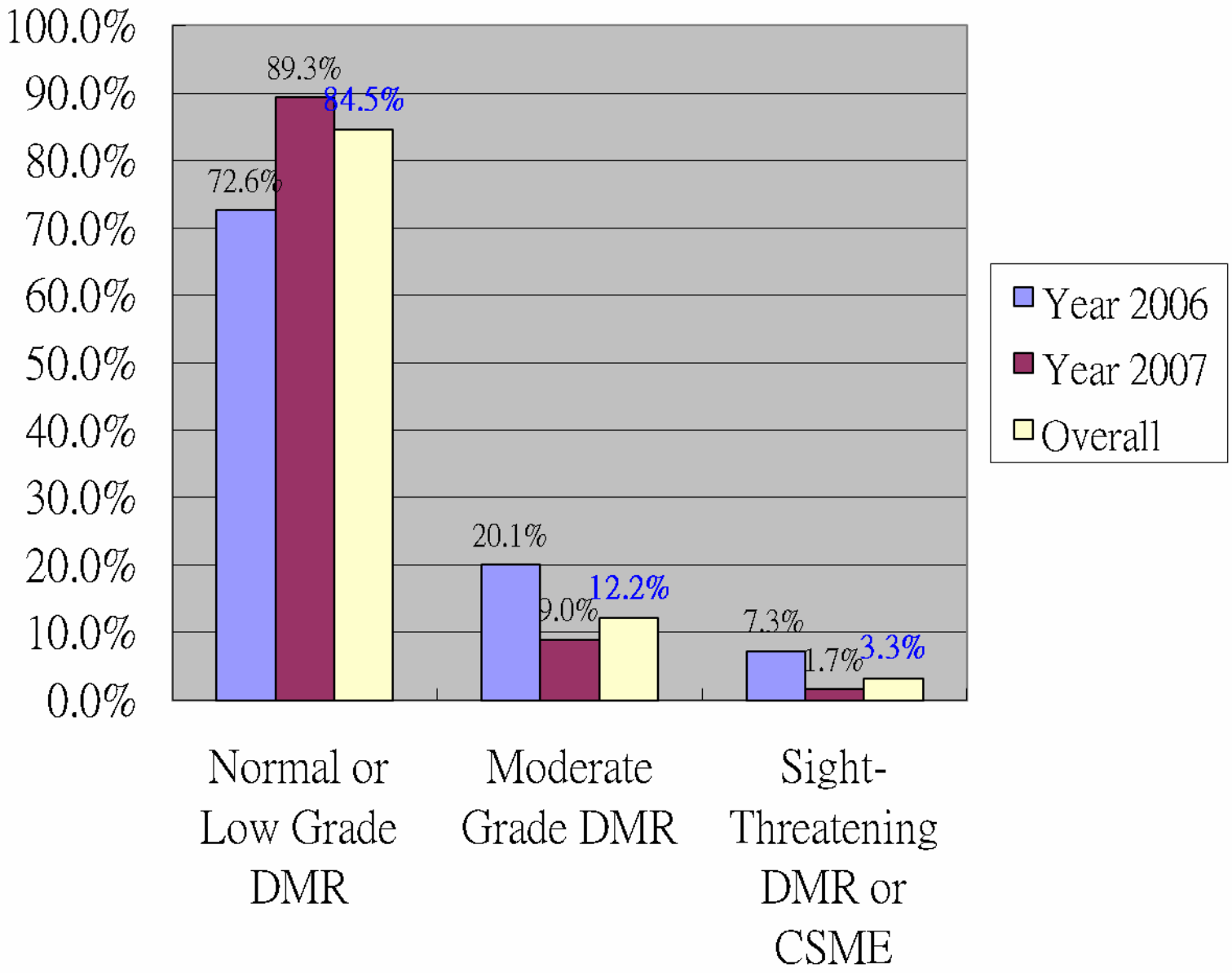
2005: 5.4% (503)
(Direct Ophthalmoscopy)
2006: 22.1 %
2007: 49.3 %

~21 % DM patients
FU eye Clinic

Retinal Photos Interpretation by Family Physicians



Retinal Photos Interpretation by Family Physicians



Results

- 259 Patients need urgent referral with ophthalmologist assessment done.

- SEVEN Patients were excluded from the study of accuracy of retinal photo reading by Family Physicians

Diagnosis: Agreement

		Diagnosis by Ophthalmologists				
		No/Mild NPDMR	Moderate NPDMR	Severe NPDMR	PDMR	**Total**
Diagnosis by Family Physicians	No/Mild NPDMR	**11**	0	0	0	11
	Moderate NPDMR	0	**6**	0	0	6
	Severe NPDMR	0	16	**170**	2	188
	PDMR	1	0	9	**44**	54
	Total	12	22	179	46	259

Diagnosis: Agreement

		Diagnosis by Ophthalmologists		
		No Macular Edema	CSME	**Total**
Diagnosis by Family Physicians	No Macular Edema	**217**	0	217
	CSME	18	**24**	42
	Total	235	24	259

Results: Diagnosis

- The inter-rater reliability for the raters:
- Kappa = 0.764 for DMR
  - ($p < 0.001$), 95% CI (0.682, 0.846)
- Kappa = 0.691 for CSME
  - ($p < 0.001$), 95% CI (0.560, 0.821)
- Both signified substantial agreement.

  - κ =0.41-0.60, “moderate agreement “ between groups
  - κ= 0.61–0.80, “substantial agreement” between groups,
  - κ= 0.81–1.00, "almost perfect agreement."
    - » Guidelines of κ interpretation by Landis and Koch.

Other Diagnoses

Diagnosis	Dx by Family Physician	Dx by Ophthalmologist	Accuracy of Diagnosis by Family Physician		
			Correct	Incorrect	%
Cataract	13	13	13	0	100.0%
Glaucoma	1	1	1	0	100.0%
Other Suspicious lesions	9	6	6	3	66.7%

Wet type age-related macular degeneration (x 4),
Retinal detarchment (x2)

Intervention after urgent referral (N = 85)

Ophthalmological Intervention		No	%
Cataract Extraction		13	5.0 %
Laser Therapy		63	**24.3 %**
	Laser pan retinal photo-coagulation for chorioretinal lesions and Focal Laser to chorioretinal lesions	44	
	Grid Laser to chorioretinal lesions	25	
Other ophthalmological Interventions (vitrectomy, iridotomy)		9	3.5%
Overall		85	**32.8 %**

Outcomes

- 242 (**93.4 %**) of these patients need regular eye followed up arranged by ophthalmologists.

Conclusions

- This primary care–based retinal imaging service had increase the rate of screening of diabetic eye diseases.

- The interpretations of the retinal photos by Family Physicians are satisfactory in accuracy of detecting potential sight-threatening retinopathy and macula edema.

- Diabetic patients are benefited from early detection, timely referral and treatment of sight-threatening diabetic eye diseases.

Acknowledgement:
Ophthalmologist, TM Eye Centre

The End

Thank You!

Characteristics of DM patients need Laser therapy (N=63)

	Mean	SD
Age (Range 41-80)	60.9	10.8
Sex Ratio M:F	1.1	
Duration of DM (year) (Range 0-30)	**8.5**	**6.0**
HbA1c	**9.4**	**2.2**
LDL-Cholesterol	3.6	0.9
Visual Acuity	0.432	0.242
	Patient No	%
Smoker	7	11%
HT	46	73%
Nephropathy	**33**	**52.4%**
Neuropathy	**25**	**39.7%**
Macrovascular complications (IHD, CVA, PVD)	2	3.2%

Characteristics of DM patients need Urgent Referral (N=259)

	Mean	SD
Age (Range 35-90)	62.6	11.55
Sex Ratio M:F	1.04	
Duration of DM (year) (Range 0-33)	**7.76**	**6.10**
HbA1c	**8.76**	**1.92**
LDL-Cholesterol	3.27	0.93
Visual Acuity	0.542	0.266
	Patient No	%
Smoker	35	13.5%
HT	53	20.5%
Nephropathy	**118**	**45.6%**
Neuropathy	**93**	**35.9%**
Macrovascular complications (IHD, CVA, PVD)	13	5.0%

Retinal Imaging: Cost

- 1. Topcon Digital Imaging System
  HK$ 310,000
- 2. (Paper = ~HK$0.9 + Ink = ~HK$0.3)
  Total = ~HK$ 1.2/each