

## **Project Title**

Singapore Integrated Diabetic Retinopathy Programme (SiDRP)

## **Project Lead and Members**

Project lead: A/Prof Wong Hon Tym (NHGEI), Prof Wong Tien Yin (SNEC)

Project members:

NHGEI: Dr Vernon Yong, Dr Colin Tan, Pauline Gan, Winnie Koh, Ryan Tay, Jane Tan, Pamela Teo, Noor Rizianah Ibrahim

SNEC: Dr Gavin Tan, Dr Kelvin Teo, Lee Kai Yin, Haslina Hamzah, Raudhah Hanim, Ho Xingxiu

## **Organisation(s) Involved**

National Healthcare Group Eye Institute (NHGEI) @ Tan Tock Seng Hospital (TTSH)

SNEC Ocular Reading Centre @ Singapore National Eye Centre (SNEC)

## **Project Period**

Start date: December 2013

Completed date: Ongoing

## **Aims**

To improve the efficiency of DRP reporting and to standardise grading standards nationally

## **Background**

Diabetic retinopathy (DR) is a major cause of vision loss in Singapore and globally. It is estimated that of the 400,000 persons with diabetes in Singapore, about 100,000 will have DR and 30,000 will have sight threatening levels of DR. Screening for DR in people with diabetes is therefore an internationally proven and recognised strategy to prevent DR-related blindness.

The Singapore Integrated Diabetic Retinopathy Programme (SiDRP) is a national DR screening programme based on the concept of centralised assessment of DR images through grading by trained graders on a tele-ophthalmology/tele-care network.

The tele-ophthalmology network for DR screening system links screening providers to centralised Grading Centres (GC) in two different clusters, SingHealth and the National Healthcare Group.

SiDRP interfaces with the respective clusters' electronic medical record systems and enables screening centres (SCs) to send digital retinal images for immediate assessment and reporting. These screenings are assessed by trained and accredited readers/graders using a standardised grading protocol, endorsed by the College of Ophthalmology.

## Methods

### 1. Care & Process Redesign

Care and process redesign was done to centralise DR reading capabilities to two reading centres (National Healthcare Group Eye Institute (NHGEI) and Singapore Eye Research Institute (SERI)), with a set of nationwide standardised referral criteria and guidelines, to minimise differences in care management.

The images taken at the polyclinics are sent to the reading centres for grading and final reports are sent back to the polyclinics within 1 working day. In this regard, most patients who require a referral at eye clinics can be informed of an appointment slot in a timely manner.

### 2. IT Innovation

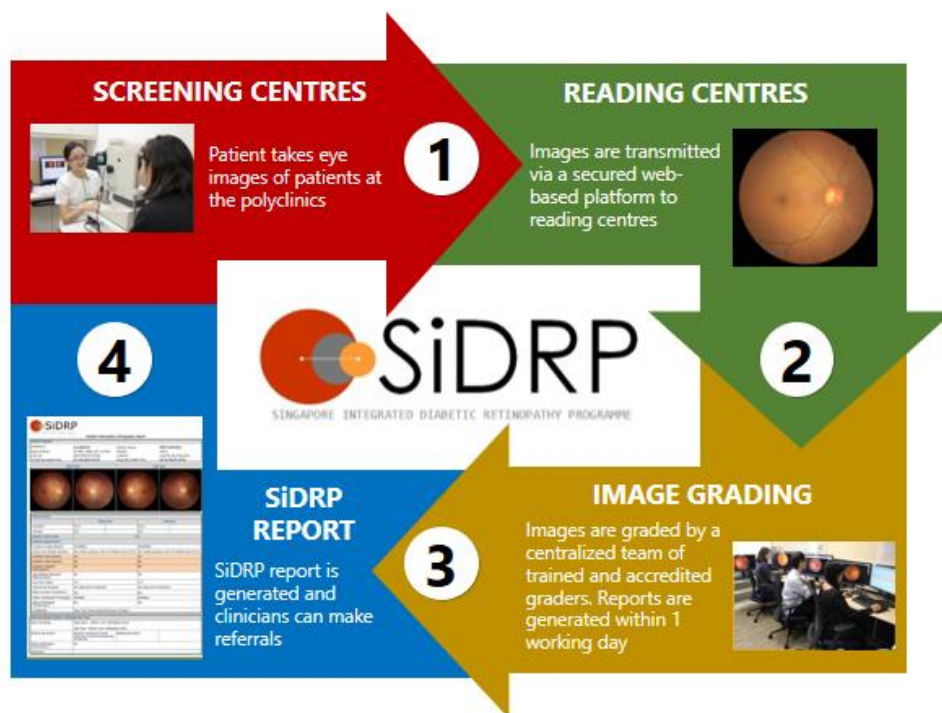
SiDRP involves transferring and grading a huge number of images from all 19 polyclinics in Singapore to the two central reading centres.

A single integrated national IT platform was launched in September 2015 to enable seamless transferring of images and final reports between screening centres and reading centre.

The platform is also equipped with an excellent workload management system, an online audit and training system which is the “first-of-its-kind” in the world.

This consolidation of infrastructure allows SiDRP to expand with the benefits of scalability and connectivity.

The process of SiDRP is shown in Figure 1.



**Figure 1: DRP Reporting Process in SiDRP System**

### 3. Job Redesign

The DR images used to be graded by polyclinic doctors or ophthalmologists. Through SiDRP, the optometrists’ role is expanded and they are trained to grade images as Primary Graders. In recent years, ophthalmic technicians have also been trained to grade images as Primary Graders while the optometrists are being upskilled to be Secondary Graders.

The SiDRP Workforce Transformation Model is shown in Figure 2.

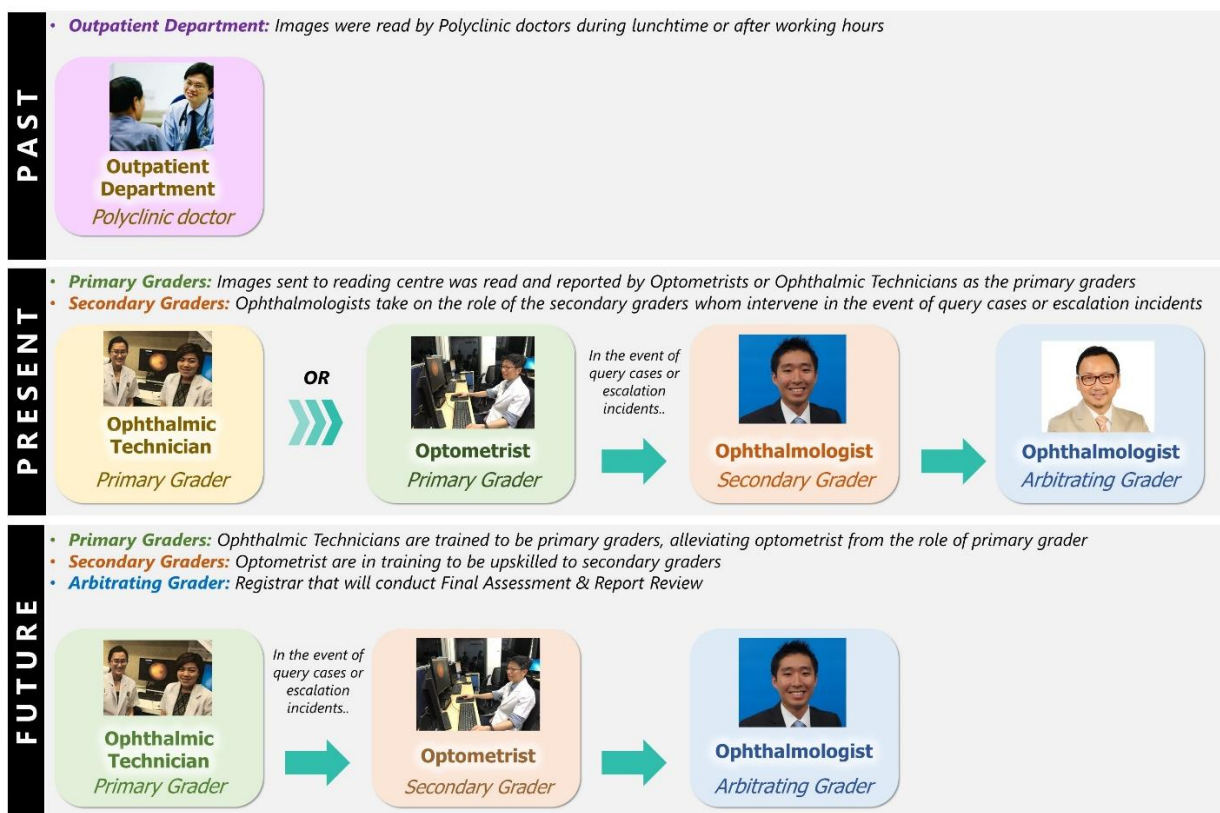


Figure 2: SiDRP Workforce Transformation Model

## Results

### 1. SiDRP Attendances

With the shorter turnaround reporting time, more patients can be screened and receive their results within 24 hours. Through SiDRP, we have seen an increase in attendances from 44,165 patients in FY2016 to 56,636 patients in FY2019 for NHGEI, and from 34,233 patients in FY2016 to 35,963 patients in FY2019 for SNEC.

### 2. Specificity & Sensitivity

Our graders are evaluated on specificity (the accuracy of pick-up of DR) and sensitivity (the accuracy of pick-up of non-DR) and has achieved high results in regular audits. In FY2019, our graders scored 97% and 98.6% in sensitivity and specificity respectively.

### 3. Time Savings

With images flowing seamlessly and electronically to a single national IT platform, both time and costs are saved for our patients. Statistical results showed that

through SiDRP, we have managed to save 1,726,673 days. Patients with detection of eye conditions can also be referred in a timely manner.

#### 4. Workforce Transformation

The roles of the non-clinician graders are continuously expanding along with smart utilisation of resources, where new skills sets are trained for staff development.

With standardised training and accreditation of staff, the team has trained:

- 8 optometrists to be Primary Graders
- 3 optometrists to be Secondary Graders
- 3 ophthalmic technicians to be Primary Graders

### Lessons Learnt

#### 1) Regular feedback between stakeholders

There is a robust feedback channel among Grading Centres, IHiS and polyclinics with regards to IT issues, system requests and enhancements. With a common platform for regular communications, there is cross-sharing of information to help improve the SiDRP system.

#### 2) Evolving eye conditions and flexibility of SiDRP system

Eye conditions are evolving with changing patient demographics observed in the population. With the cases encountered by polyclinics as well as updated scientific literature, there is a regular need to review the referral criteria and grading protocols. The team has revised the harmonised set of referral guidelines and training syllabus in Jun 2020. In conjunction with the changing guidelines, the team has also enhanced the system with the flexibility in updating guidelines in the SiDRP system without the need of a professional vendor. This provides the team more empowerment in shaping the guidelines and processes to meet the evolving needs.

#### 3) Scalability

The SiDRP platform has a potential for extension because of its robust IT infrastructure. The SiDRP platform is a system catered for Diabetic Retinopathy screening in the polyclinics. Given its structured platform and systematic process, SiDRP system can be

easily applied to other nodes including (a) General Practitioners (GPs), (b) other disciplinary departments i.e., Endocrine, (c) other conditions i.e., Plaquenil Screening.

#### 4) Efficiency

There are also plans to further improve the efficiency of the SiDRP framework by enhancing it with an artificial intelligence (AI) analytics platform - Singapore Eye LESioN Analyser (SELENA). This enhancement will be introduced to detect abnormal fundus images, particularly diabetic retinopathy. This combination of human and artificial intelligence aims to improve both outcomes and productivity and is slated to go-live in FY2021.

### **Conclusion**

The SiDRP framework and system have been proven to be beneficial in many areas. With the harmonised grading criteria and guidelines in place and reviewed to meet the evolving demands, SiDRP provides an improved and streamlined work processes. The turnaround reporting time is reduced, and more patients can be screened within 24 hours. Those who required referrals will be seen timely and promptly, while the screening costs remain affordable for the patients.

With the establishment of workforce transformation, the new role expansion not only enhances our graders' skill sets but also gives the staff a higher job satisfaction with a more rounded job scope. For example, the optometrists are able to exercise more autonomy and apply their clinical judgement and knowledge in deciding the patient's disease diagnosis and their management plan. Undergoing the training and accreditation has also broadened the understanding and knowledge of the eye disease spectrum, hence improving the quality of an ophthalmic technician's core diagnostics duties such as fundus imaging.

This SiDRP's transformation of our staff's work also aligns with the primary eye care's model transformation initiatives to prepare for a more sustainable and improved quality eye care for the future.

### **Additional Information**

Recipient of the National Clinical Excellence Team Award 2019

### **Project Category**

Care & Process Redesign, Automation, IT & Robotics, Workforce Transformation

### **Keywords**

Care & Process Redesign, Automation & IT & Robotics, Workforce Transformation, Job Redesign, Role Expansion, Healthcare Training & Education, Primary Eye Care, Time Savings, Ophthalmology, Tan Tock Seng Hospital, National Healthcare Group Eye Institute, Singapore National Eye Centre, Diabetic Retinopathy, Education Accreditation, Artificial Intelligence, Specificity, Sensitivity

### **Name and Email of Project Contact Person(s)**

Name: Winnie Koh; Pamela Teo; Noor Rizianah Ibrahim

Email: [Winnie\\_koh@ttsh.com.sg](mailto:Winnie_koh@ttsh.com.sg); [Pamela\\_LM\\_TEO@ttsh.com.sg](mailto:Pamela_LM_TEO@ttsh.com.sg);  
[Noor\\_Rizianah\\_Ibrahim@ttsh.com.sg](mailto:Noor_Rizianah_Ibrahim@ttsh.com.sg);

# Singapore Integrated Diabetic Retinopathy Programme (SiDRP)



A collaboration between NHG Eye Institute (NHGEI) & Singapore National Eye Centre (SNEC)  
 NHGEI: A/Prof Wong Hon Tym, Dr Colin Tan, Winnie Koh, Ryan Tay, Jane Tan, Pamela Teo  
 SNEC: Prof Wong Tien Yin, Dr Gavin Tan, Haslina Hamzah, Soundaram Jaganathan

## Background & Objectives

Singapore Integrated Diabetic Retinopathy Programme (SiDRP) is a national Diabetic Retinopathy (DR) screening programme based on the concept of centralised assessment of DR images through grading by trained graders on a tele-ophthalmology / tele-care network.

Before SiDRP was launched,

- Reading of images for DR were done by polyclinic doctors during lunchtime or after working hours
- Communication of results back to patients would take 2-4 weeks
- There was no harmonized grading criteria and guidelines at the national level

To improve the efficiency of DRP reporting and standardise grading standards, the Project Management Office involving NHGEI, SNEC and IHS was set up in December 2013. The objectives include:

- Improve the level of screening standards and turnaround time
- Provide uniform assessment and referral guidelines for DRP reporting at the national level
- Provide standardised training and audit governance for DRP reporting



## Action Plan

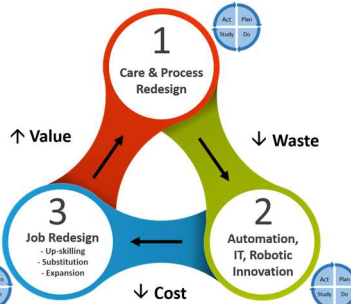
### Care & Process Redesign

Care and process redesign was done to centralise DR reading capabilities to two reading centres (National Healthcare Group Eye Institute (NHGEI) and Singapore Eye Research Institute (SERI)), with a set of nationwide standardise referral criteria and guidelines. The images taken at the polyclinics are sent to the reading centres for grading and final reports are sent back to polyclinics within 24 hours.

### Job Redesign

DR images used to be graded by polyclinic doctors or ophthalmologists. Through SiDRP, optometrists' role is expanded and are trained to grade images as primary graders.

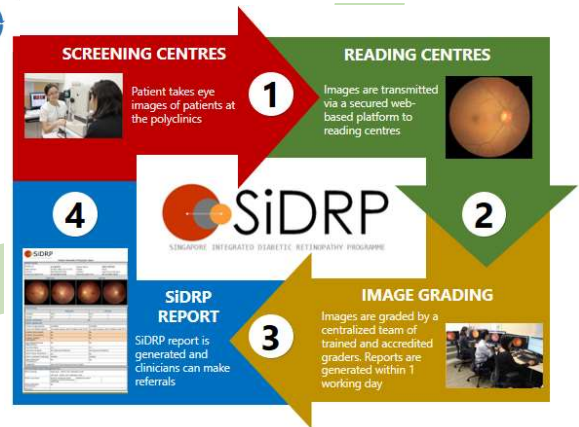
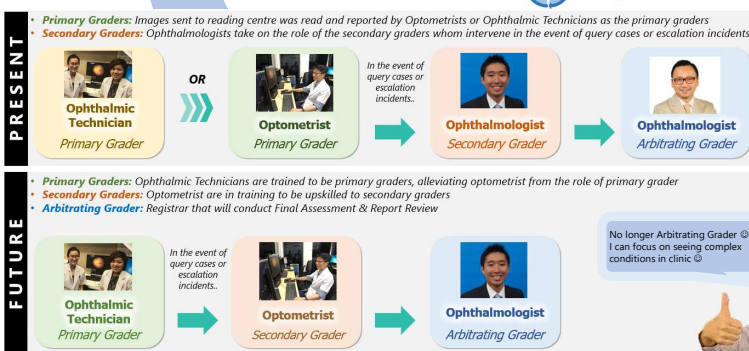
Moving forward – ophthalmic technicians will also be trained to grade images as primary graders while optometrists are upskilled to be secondary graders.



### IT Innovation

SiDRP involves transferring and grading a huge number of images from all 19 polyclinics in Singapore to the two central reading centres.

A single integrated National IT platform was launched in September 2015 to enable seamless transferring of images and final reports between screening centre and reading centre.



## Results & Staff Responses

### 1 SiDRP Attendances

Increasing SiDRP attendances – With shorter turnaround time, more patients can be screened and receive their results within 24 hrs

### 2 Specificity & Sensitivity

**Specificity** (Accuracy of pick-up of DR) **97.7%**

**Sensitivity** (Accuracy of pick-up of non-DR) **95.0%**

Graders are evaluated on specificity and sensitivity

### 3 Time Savings

With images flowing electronically to a single National IT platform, both time and cost are saved for our patients.

With early detection of eye conditions, patients can be referred in a timely manner.

### 4 Workforce Transformation

With standardised training and accreditation of staff, the team has trained:

- 8 optometrists to be primary graders
- 3 optometrists to be secondary graders
- 3 ophthalmic technicians to be primary graders



"Optometrists are able to exercise more autonomy and apply our clinical judgment and knowledge in deciding the patient's disease diagnosis and their management plan."

**TAN SHIH CHIA**  
Senior Optometrist



"This training has not only enabled me to have a better understanding and knowledge of the disease spectrum, it too helps to improve the quality of my core diagnostics duties such as fundus imaging."

**SAMANTHA DING**  
Ophthalmic Technician

## Future Plans

Enhancing SiDRP, there is an artificial intelligence analytics platform that will be introduced to detect abnormal fundus images, particularly diabetic retinopathy. This combines human intelligence with artificial intelligence to improve outcomes and productivity, and is slated to go live in FY2021.

