



Singapore Healthcare Management 2018

Transforming the Patient Services in Medical Imaging

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Introduction

The SingHealth Radiological Sciences ACP Clinical Task Force, formed on 5 Dec 2014, was tasked to transform patient services in medical imaging through:

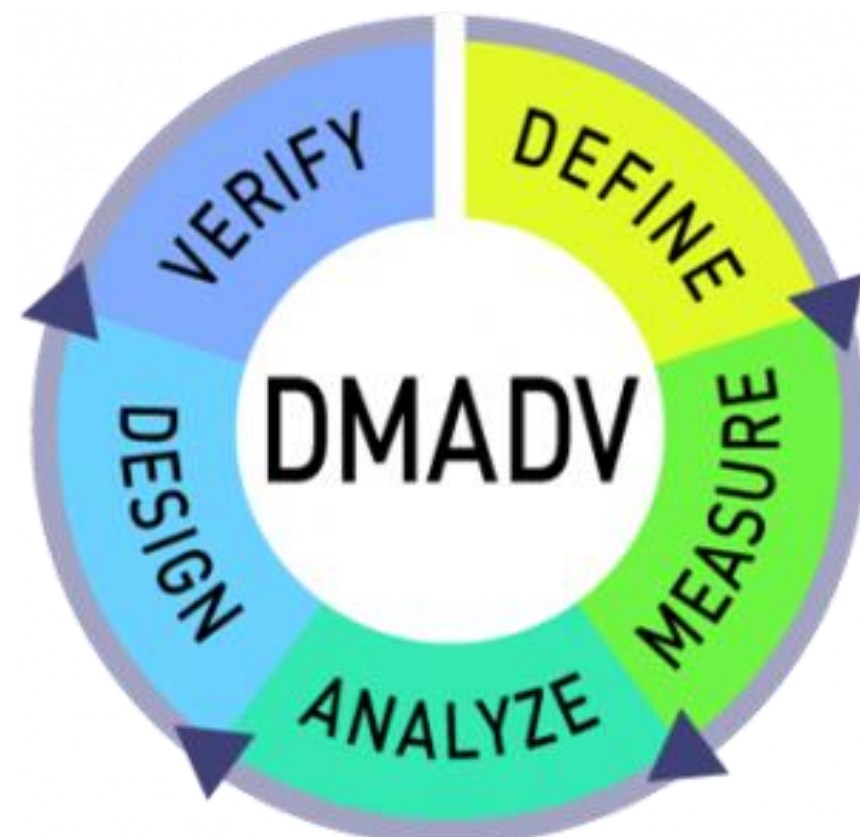
- Enabling** cross-institutional Magnetic Resonance Imaging (MRI) utilisation
- Expanding** cross-institutional X-Ray services to additional Specialist Outpatient Clinics (SOCs) and other performing institutions
- Reviewing** Positron Emission Tomography/Computed Tomography (PET/CT) referral patterns, **optimising** PET/CT utilisation within SingHealth and reducing private sector referrals

Methodology

The **DMADV Design for Six Sigma (DFSS) Framework** was employed for the purposes of developing new services, products or processes. For the purposes of explanation, we will show how **enabling cross-institutional X-Ray services** was facilitated by DMADV.



- DEFINE** project goals, activities as well as end deliverables
- MEASURE** user requirements and specifications
- ANALYSE** options and alternatives to meet requirements
- DESIGN** and develop desired product(s) according to requirements
- VERIFY** that product(s) meet requirements and specifications



- Stakeholder engagements:** Extensive stakeholder engagements were conducted with radiographers, clinicians and relevant staff to determine the key performance areas to improve for cross-institutional X-Ray services.
- Fact finding exercises:** X-Ray operational processes were mapped out and the gaps were identified.

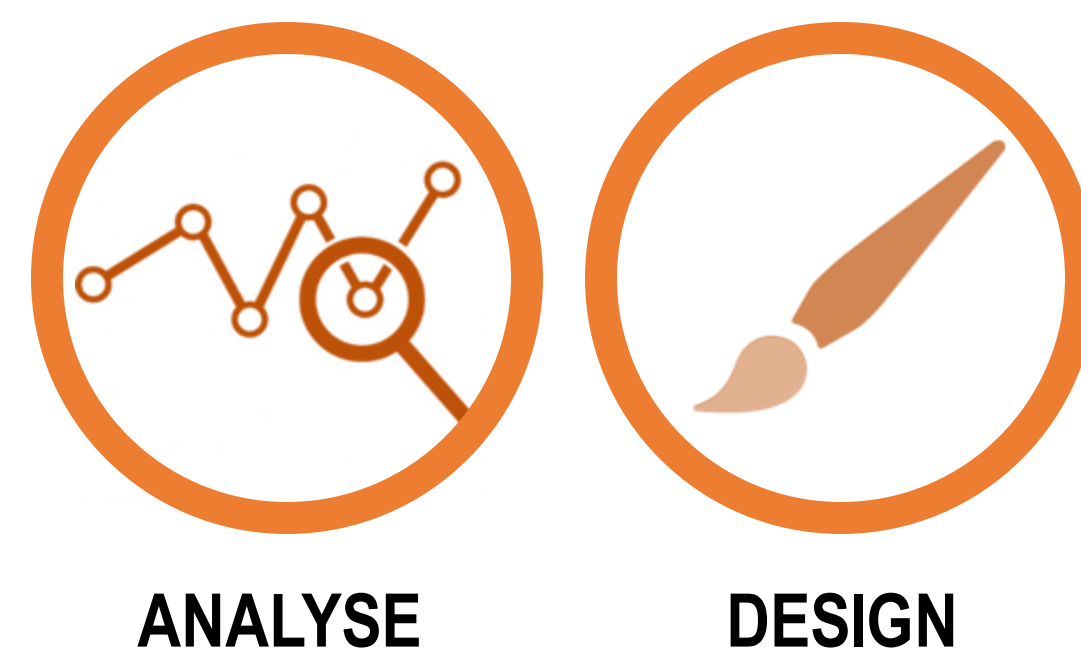
Requirement gathering: The team re-engaged stakeholders to obtain their feedback on the effectiveness and importance of proposed solutions. Senior management was also consulted to seek their guidance.

Product development: A wait time tool was conceptualised to address the shortfalls. Professional services such as IT experts and systems administrators were engaged to design and develop the solution(s).

Validation: Prototypes were presented at management and department meetings to engage stakeholders of varying hierarchy; comments and feedback were consolidated and incorporated into the final product.

User Acceptance Testing: Vigorous testing was done to uncover any bugs or teething issues with the product to ensure that it would be self-sustainable.

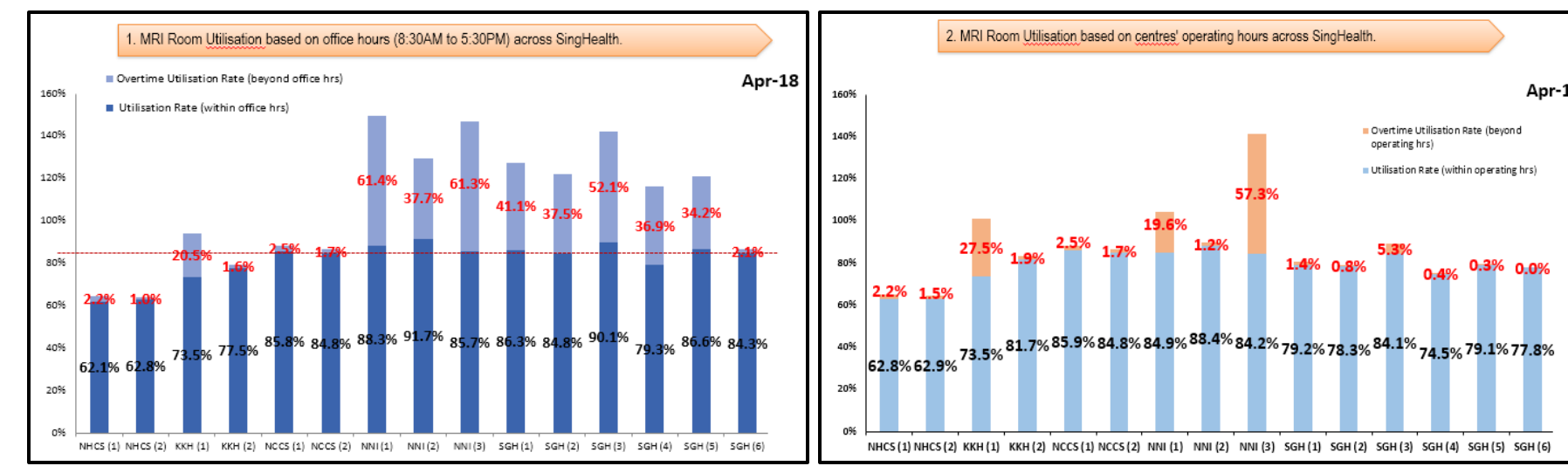
SGC	QIC	DMC	NHC	NCC	KKH	SKH
30 mins	34 mins	21 mins	34 mins	27 mins	17 mins	29 mins



Results

After 3 years and 5 months, the Task Force concluded in Apr 2018, having achieved:

MRI Workgroup



Figures 1B & 1C: Dashboard, MRI Room utilisation rates (Institutional level)

A **dashboard** for identifying continuous improvement by harnessing data and processing computation through the utilisation metrics.

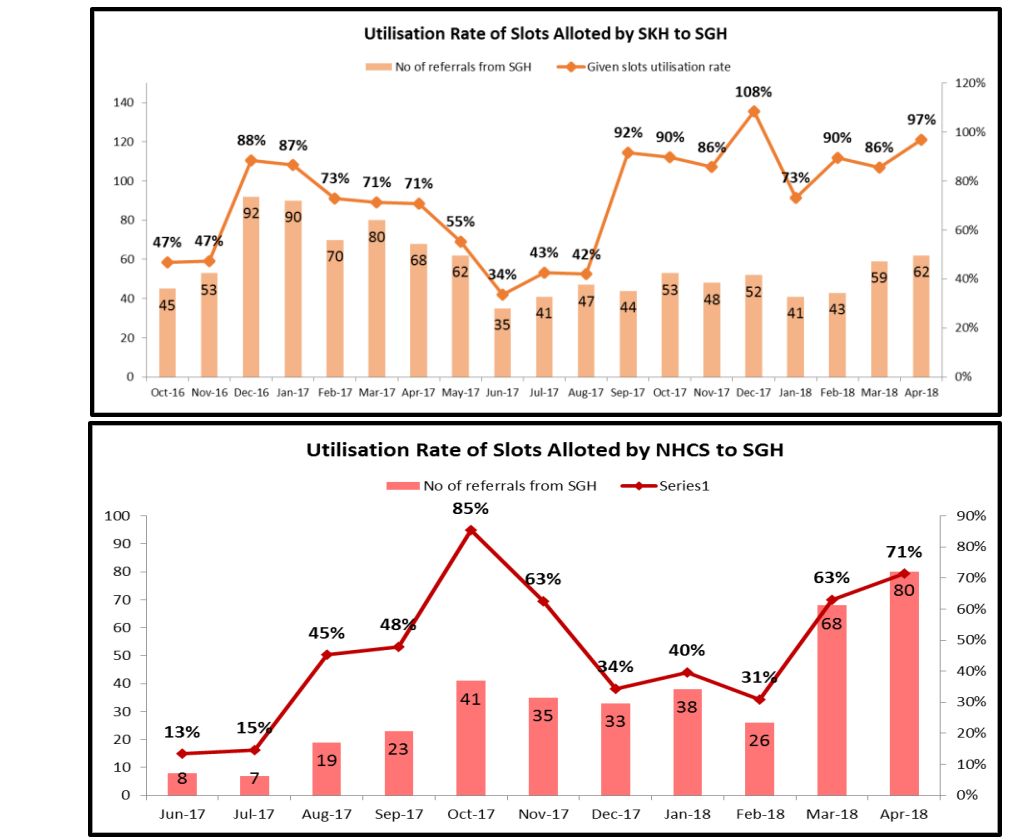
Cross-institutional MRI appointments were established, where Singapore General Hospital (SGH) referred a total of 1,085 cases to Sengkang Health @ Alexandra Hospital (SKH@AH) and 378 cases to National Heart Centre Singapore (NHCS) as of Apr 2018.

$$\text{MRI Utilisation Rate} = \frac{\text{Sum of all machines (Average Procedure Time} \times \text{Total no. of MRI Examinations by Procedure Code)}}{\text{Total Operating Hours for all machines}}$$

$$= \frac{\text{Sum of all machines (Total Procedure Time for Research, Education \& Failed Scans)}}{\text{Total Operating Hours for all machines}}$$

Figure 1A: MRI utilisation formula

A common, integrated metric and tool to measure MRI utilisation for monitoring and improvement tracking was developed.



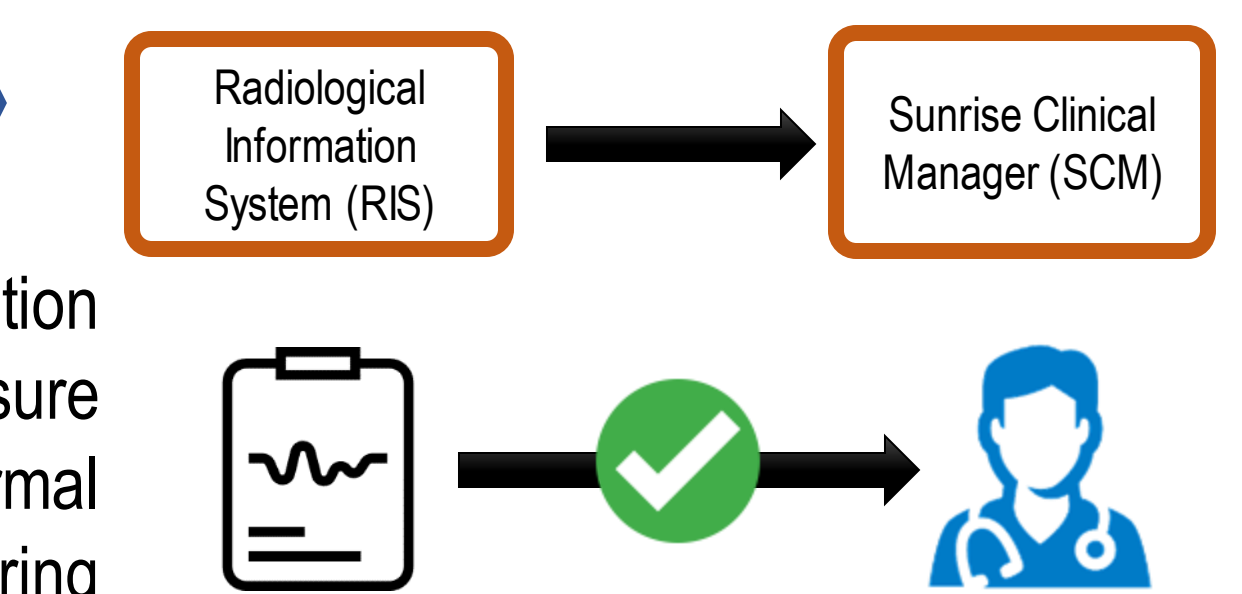
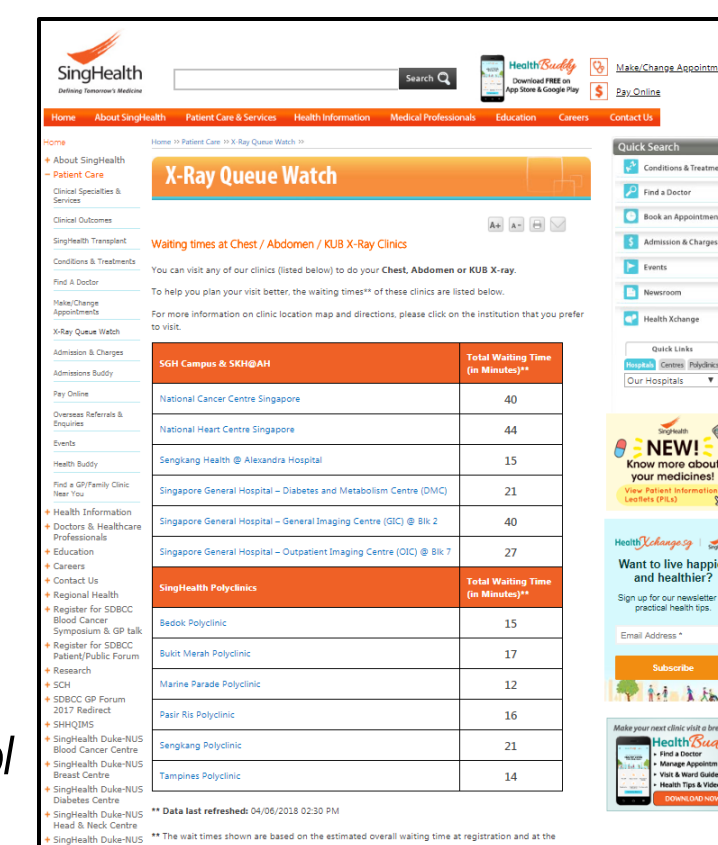
Figures 1D & 1E: Cross-Institutional MRI slot utilisation rates

X-Ray Workgroup

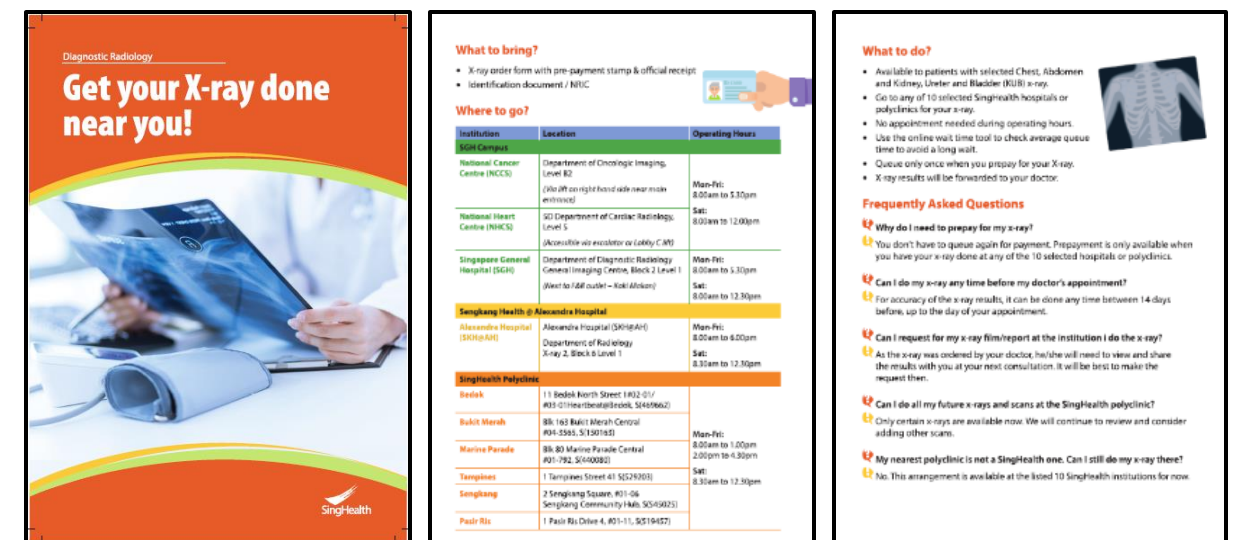
Systems enhancements between Radiological Information System (RIS) and Sunrise Clinical Manager (SCM) to ensure better flow of radiology results to clinicians, where any abnormal results are promptly highlighted to referring clinicians, ensuring that patient safety is not compromised.

An **X-Ray wait time tool** was published on the SingHealth website and on HealthBuddy app, allowing patients to choose the most convenient location with the shortest queue to have their X-Rays taken.

Figure 2A: Wait time tool (SingHealth website)

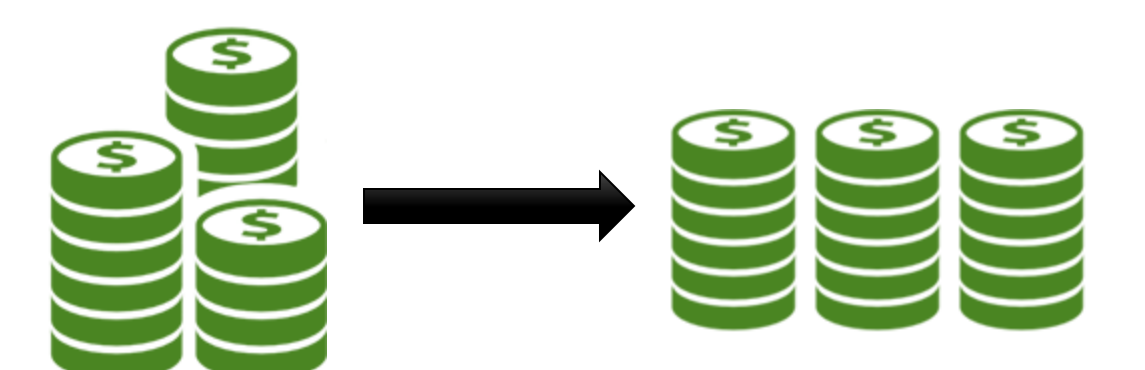


Patient leaflets were printed and disseminated at SOC's to inform patients on what to do, what to bring and where to go for their X-Rays.



Figures 2B, 2C & 2D: Patient leaflet for prepaid X-Ray cases

A **price revision framework** for harmonisation of prices for X-Ray services across the cluster, together with the establishment of **pre-payment**, eased the patient journey when patients turn up at any of the 10 SingHealth hospitals or polyclinics convenient for them for their X-Rays.



PET/CT Workgroup

A **proposal paper to enable subsidies** was jointly written and submitted with National University Health System (NUHS). In-principle approval was obtained from the Ministry of Health (MOH) to subsidise Fluorodeoxyglucose (FDG) PET/CT scans for 13 oncologic indications.

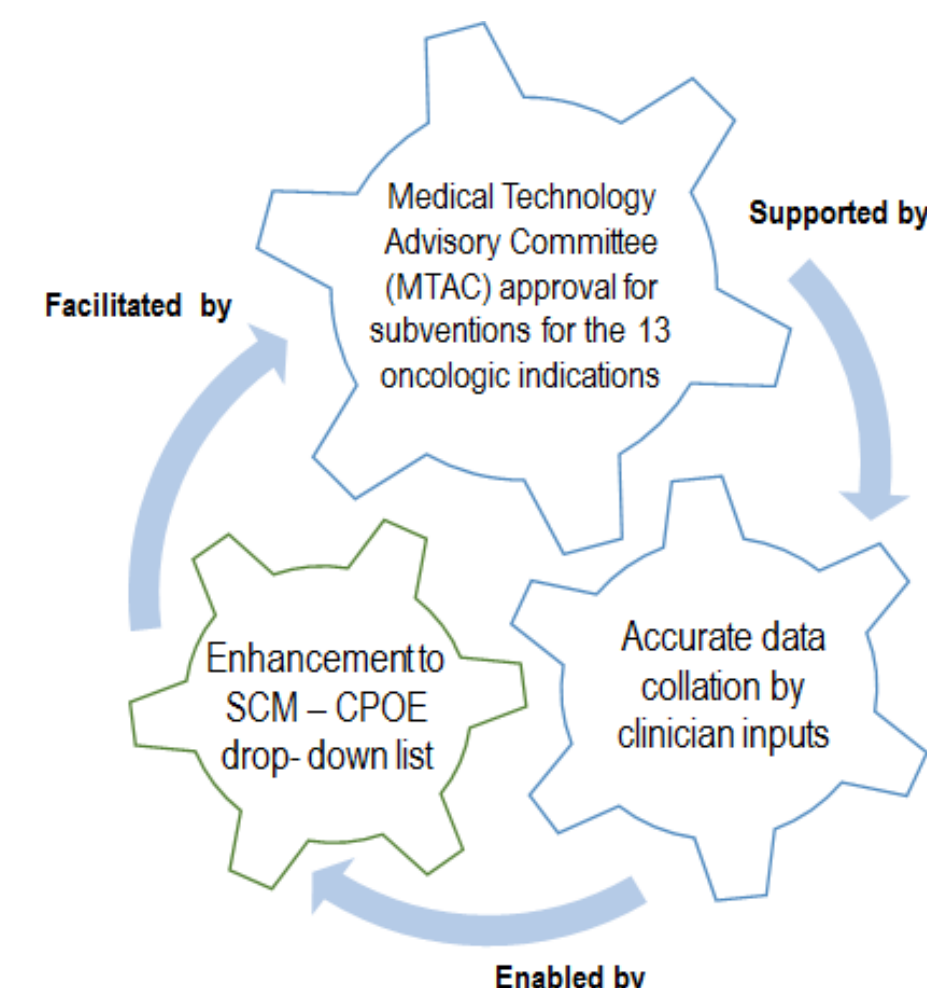


Figure 3A: PET/CT subventions strategy

Systems enhancement to the SCM's Computerised Physician Order Entry (CPOE) module with addition of a drop-down list for clinicians to select the oncologic indications with the appropriate mappings to functions for each selection, thereby ensuring accurate data capturing.

Workflow enhancement by implementing same day urgent slots through analysis of utilisation, pricing models as well as data analytics on referral patterns, thereby streamlining operational work processes.

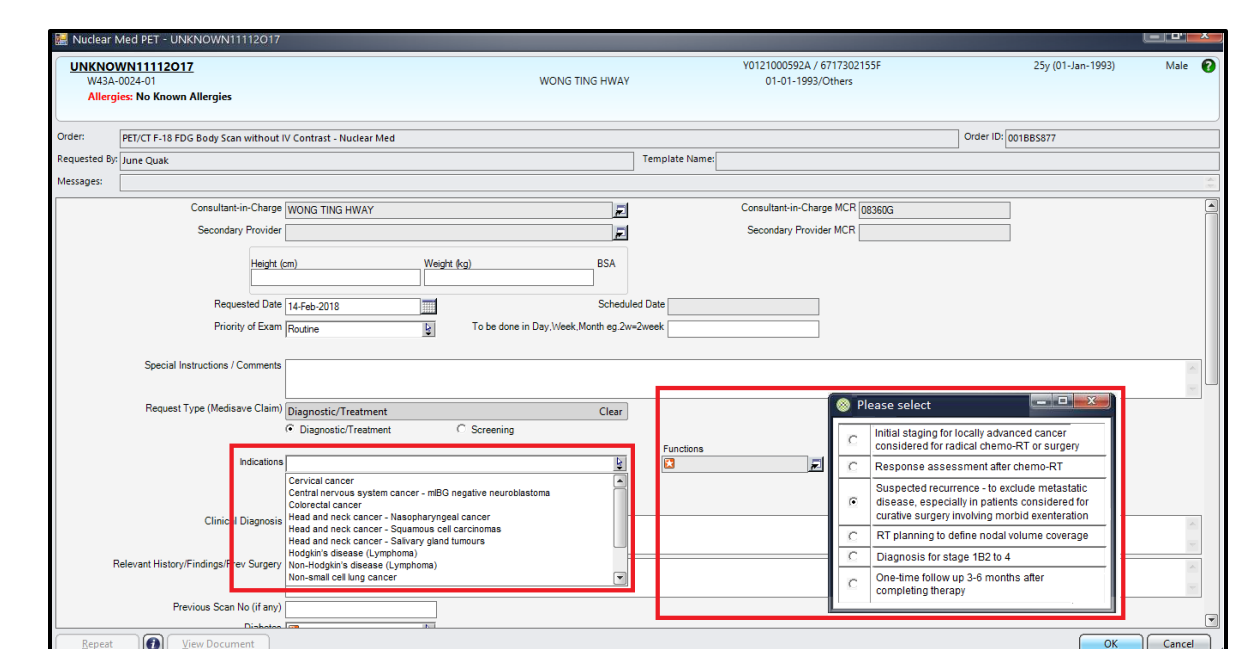


Figure 3B: CPOE drop-down mock-up

Conclusion

Through the **DMADV Design for Six Sigma Framework**, various initiatives were implemented to address the objectives outlined for each of the three workgroups. Since the successful closure of the Task Force, the Radiological Sciences ACP has **assumed ownership of the initiatives implemented and will continue to oversee their progress**, in particular for level-loading of MRI services across the cluster to be sustained using demand forecasting and resource planning strategies, for expansion of cross-institutional X-Ray services to encompass more families of X-Rays and more performing sites, and for increasing capacity of PET/CT service provision in expectation of rising demand as a result of enabling subventions through extended scanning hours and increasing supply of FDG tracers.

