



Radiology Image Sharing in the Territory - Current and Future

Kwok CW, Chan GWC, Poon JA, Tong ELH, Wong WN, Cheung NT
Health Informatics, Information Technology and
Health Informatics Division, Hospital Authority Head Office

Introduction

Radiology Image Sharing-Why??

- Digital radiology images are essential medical data
- Diagnostic information from one imaging exam is often used by multiple care providers
- Availability of radiology exam records → Improve the quality of interpretation
- Reduce radiation exposure and avoid exam duplication

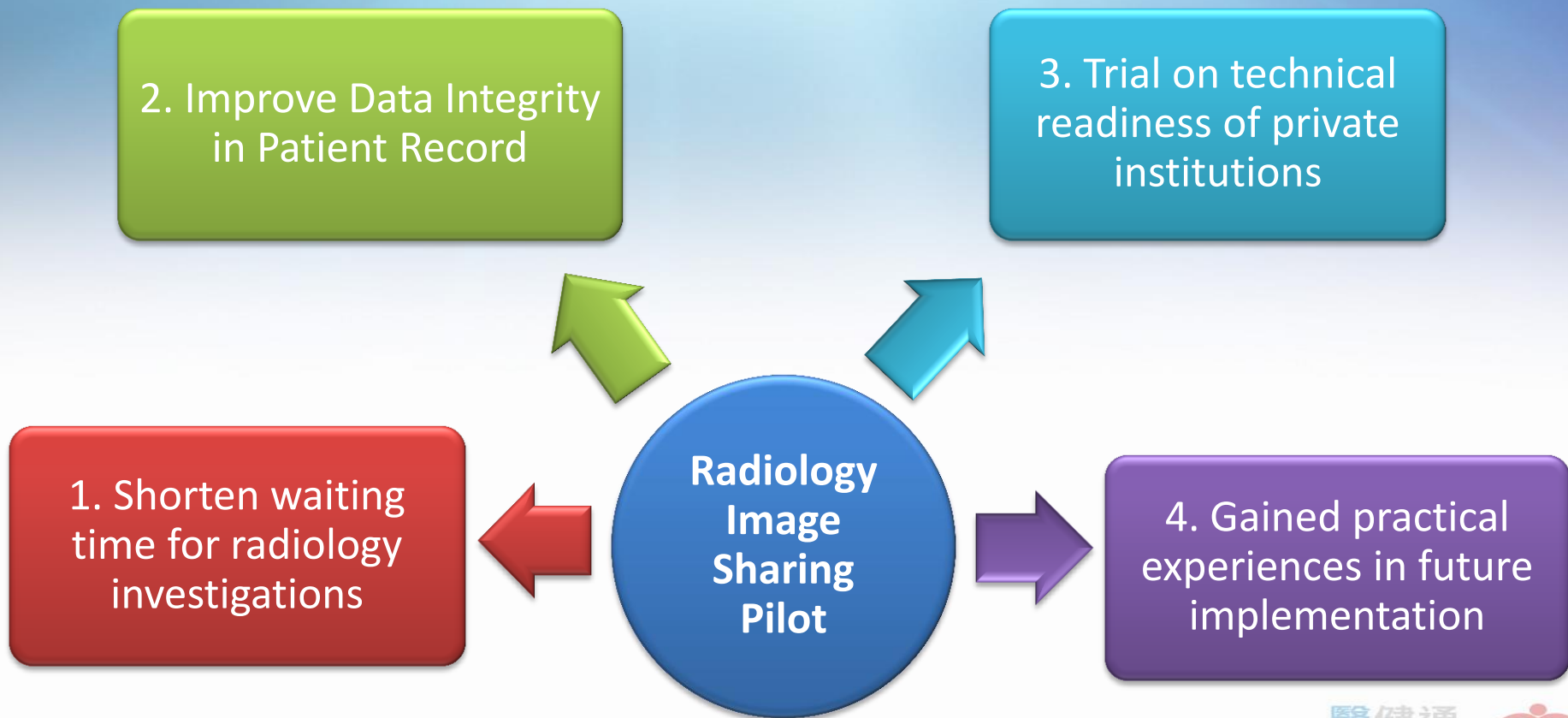


Current Situation in Hong Kong

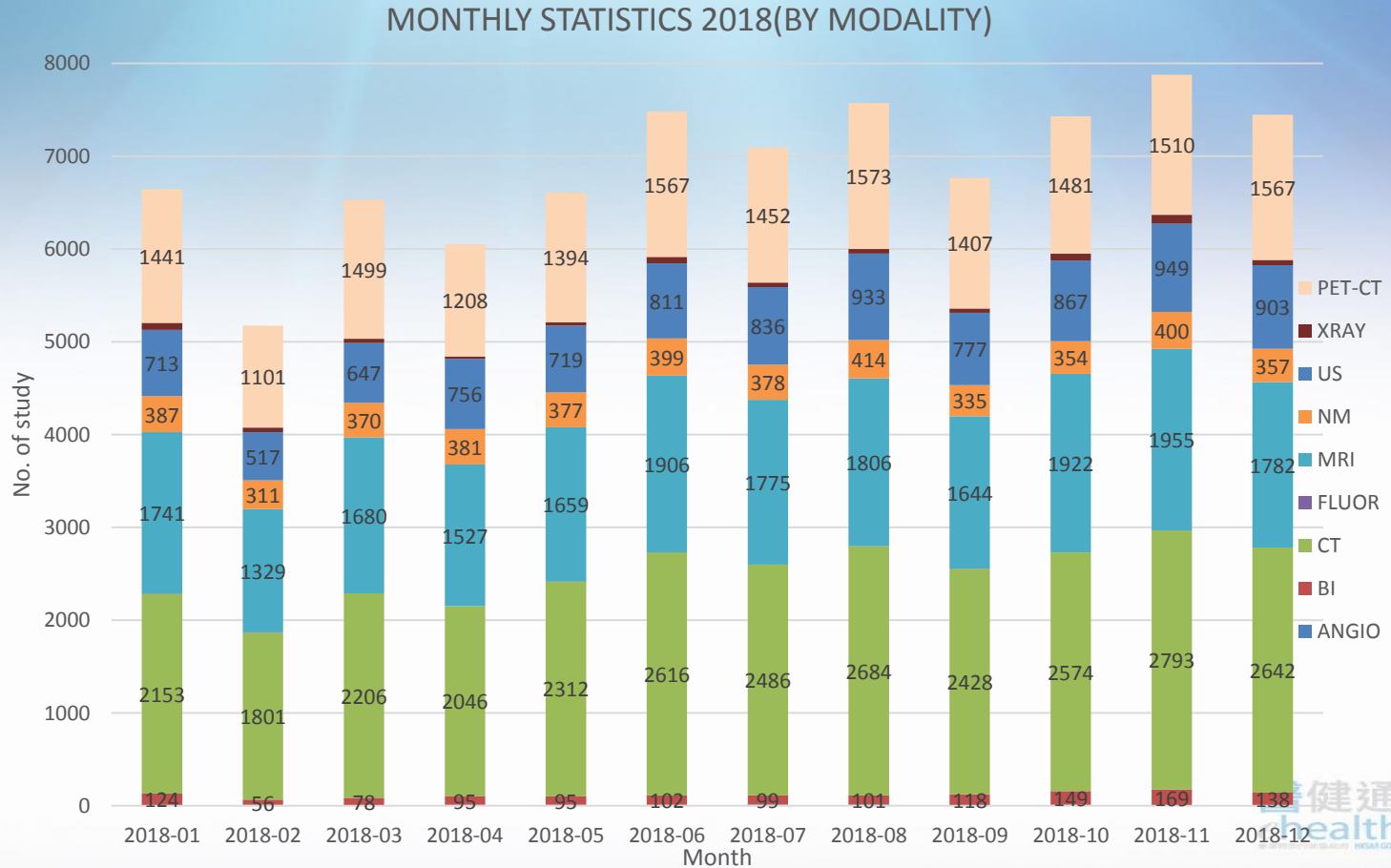
Hospital Authority (HA) experience on Radiology Image Sharing

- Radi Image Sharing Pilot (since 2009)
- Stage 1 Electronic Health Record (eHR) Project
- Established electronic interfaces between public and private hospitals/ radiology centres
- HA referred patients to private institutions for radiological investigations





Latest Statistics (Monthly statistics 2018)



Radi Image Sharing Pilot

Private sectors joined Radi Image Sharing Pilot

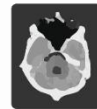
No. of private hospitals	11
No. or radiology groups/centres	20
Total	31

Radiology Image Sharing Pilot statistics (*as at June 2019*)

Total no. of radiology studies received	406,122
Total no. of radiology image received	199,287,951

Benefits of Radi Image Sharing Pilot

- Provide choices for patients
- Enhance radiology service for patients
- Reduce pressure on public radiology service
- Enhance Public Private Partnership

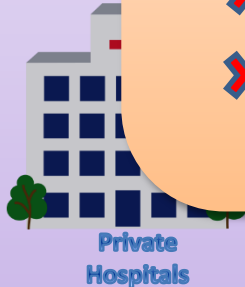


Radiology Image Sharing Pilot



- One-way image sharing
- Images cannot be shared among healthcare professionals
 - ❌ Patient rescanning
 - ❌ Unnecessary patient exposure to radiation

Radiology

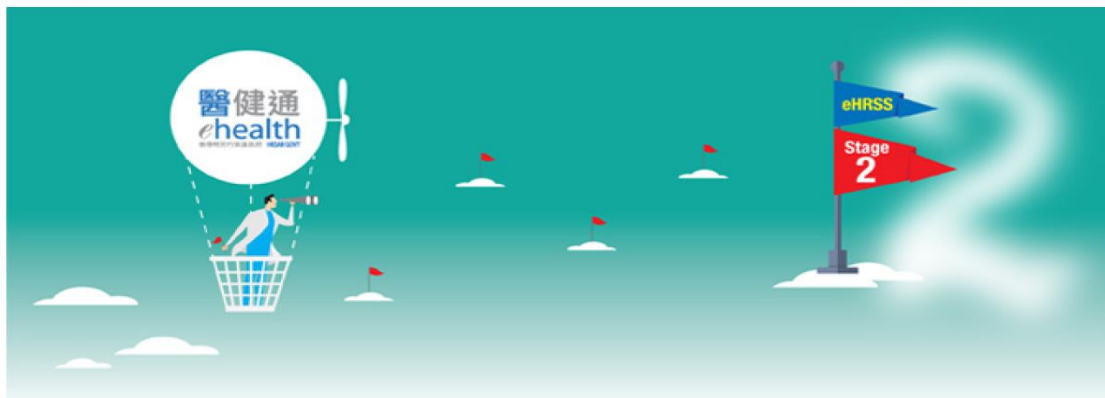


HA Hospitals

Future Development of Radiology Image Sharing in Hong Kong

eHR Stage 2 development (2017-2021)

- **Radiological Images (roll out in 2021)**
- Chinese Medicine
- Patient Portal and Sharing Restriction

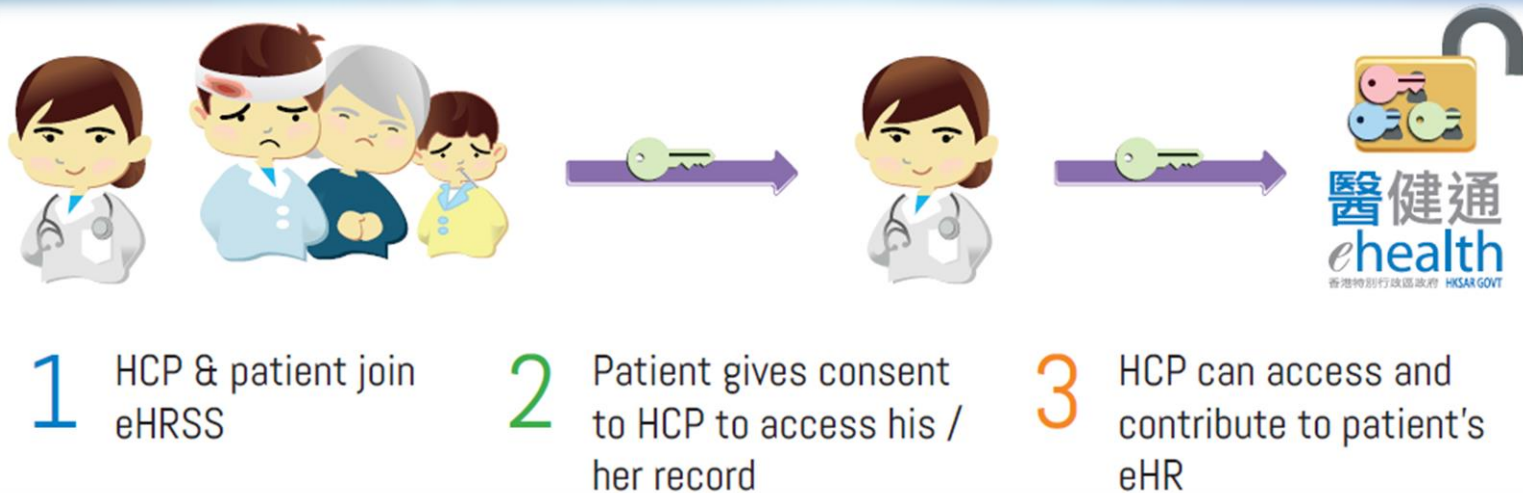


Project Scopes

Stage 2 eHR Radiology Image Sharing

- Allow radiology images sharing among healthcare providers (HCPs)
- Allow images upload via image gateway, image storage in Electronic Health Record Sharing System (eHRSS) repository and image viewing through eHRSS image browser

Prerequisites for data sharing for eHRSS



Major components of eHR Radi Image Sharing

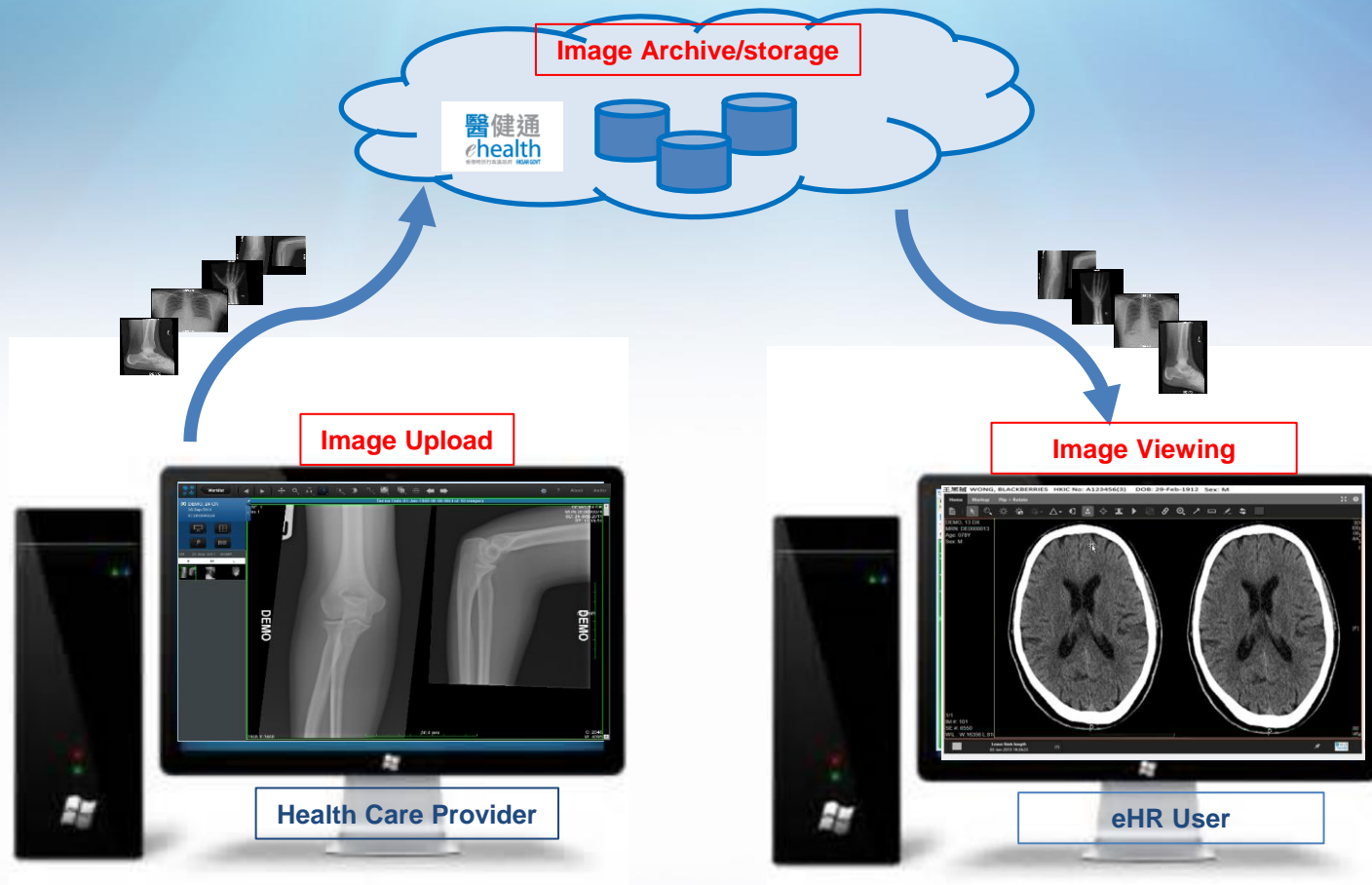
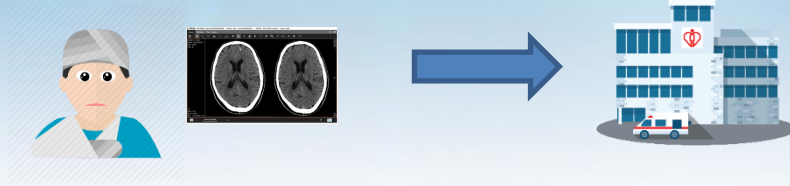


Image Upload

- **Radi Image Sharing Pilot:** Only the referred case is sent to HA



- **eHR Radi Image Sharing:** All cases will be sent to eHRSS (include HA referred case)

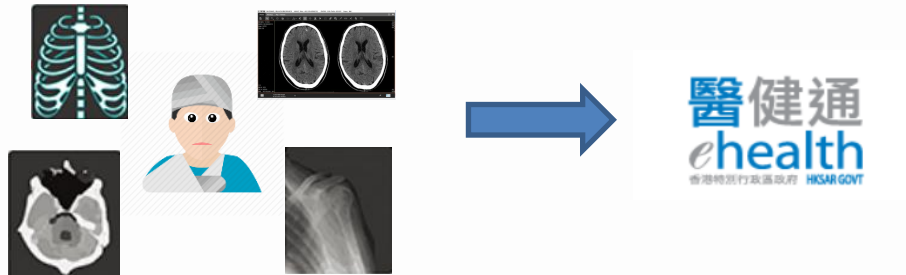


Image Upload

- Sharable radiology modalities for images

✓10 modalities

CT	MRI
Ultrasound	PET-CT
Nuclear Medicine	X Ray
Angiographic Examination	Fluoroscopy
Interventional Radiology (IR)	Breast Imaging (BI)

- Image quality

- ✓Image upload from HCP and viewing in browser: Lossless images
- ✓Standard for sharing (DICOM for images)

Image Storage

- **Centralized Model**
 - All HCPs image stored in eHRSS
- Image stored centrally for a simple and quick access response
- Assure image availability/readiness
- Facilitate interface

- **Radi Image Sharing Pilot:** Only HA users can view Radi exam from private sectors
- **For eHR Radi image sharing:** Public and private clinical users can view others' radiology exam data in eHRSS

WONG BLACKBERRIES
MODECA DR MODECA_DR ES | User: [redacted]

HKC NC : LH9732(1) (6)
DOB: 29-Feb-1972 Age: 106 years Sex: M Details >

健康通 health

Home Local

- My Data Connection Request
- My Health Note & Summary
- Clinical Notes & Summary
- Referral
- Beth Record
- Encounter / Appointment
- Problem & Procedure
- Problem / Diagnosis
- Procedure Investigation Report
- Medication
- Prescribing History
- Dispensing History
- Laboratory Record
- Chemical Pathology
- Hematology
- Immunology
- Molecular Virology
- Anatomical Pathology
- Toxicology
- Molecular Pathology
- General & Other
- Radiology Record
- Genetic Pathology
- Controlled Technology
- Allergies / Vaccines RI
- Non-vaccinate RI
- Magnetics Diagnostic Imaging
- Investigation Record

Problems / Diagnosis Details >

Date	Description
29-Apr-2015	I ?
24-Feb-2013	? Diabetes Mellitus
24-Feb-2013	Type II diabetes mellitus with complication B
24-Feb-2013	? Type II diabetes mellitus with complication B
24-Feb-2013	Type II diabetes mellitus with unspecified heart disease
23-Feb-2013	Vesical pain
25-Feb-2011	Delirium
28-Feb-2011	Sepsis shock
27-Jun-2000	Pterygium

Laboratory Record Details >

Date	Profile Description	Institution
24-Dec-2012	IDT BET	VUCL_A
15-Oct-2012	APTT PT	VAC4
21-Aug-2012	AD	VAC4
20-Aug-2012	Hematology Result	VAC4
09-Aug-2012	Hematology Laboratory Report (PDF)	GEH
09-Aug-2012	Molecular Pathology Report (PDF)	GEH
15-Sep-2011	Skin Cytogen Cytology H	VUCL_A
15-Sep-2011	ESCE, RL TOTO, TOTO	VAC4
12-Sep-2011	C, D, FO, FB	>>>More

Encounter / Appointment Details >

Start Date	Specialty	Institution
21-Dec-2018 11:00	VAHS2	VAHS2
03-Dec-2018 09:45	VAHS2	VAHS2
30-Nov-2018 15:50	VAHS2	VAHS2
30-Nov-2018 16:50	VAHS2	VAHS2
19-Nov-2018 17:15	VAHS2	VAHS2
09-Nov-2018 09:30	VAHS2	VAHS2
07-Nov-2018 18:10	VAHS2_B	VAHS2_B
11-Nov-2018 14:50	VAHS2_B	VAHS2_B
12-Oct-2018 14:05	VAHS2_B	>>>More

Allergy & Adverse Drug Reaction Details >

Click to display patient's adverse drug or ADR reactions.

Drugs	Adverse Information
aspirin	Certain, Angioedema, Oti
gabapentin	Certain, Dyspnoea [DSCR], ...
ascorbic acid + betanotene + biotin + calcium (as carbonate) + cho...	Certain, Angioedema, Dyp...
VISCOYAN	Suspected, Manifestation u...
CDR1-150	Certain, Exagitation
AUGMENTIN	Certain, Rash

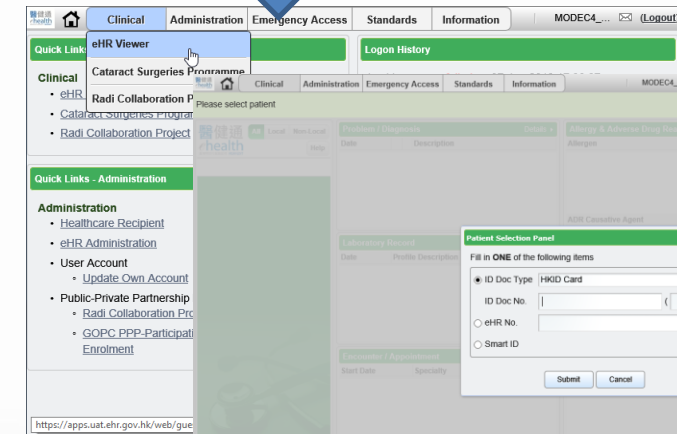
ADR Causative Agent Details >

Agent	Adverse Information
mefenamic acid	Mild Vomiting
tramadol	Mild, Ankle swelling / ankle...
DICLOFENAC SODIUM	Severe
VOLTAREN	Mild
ALDOMET [METHYLDOPA]	Mild
ALDOMET [METHYLDOPA]	Mild
INDAPAMIDE	Mild >>>More

Prescribing History Details >

Date	Modification
05-Nov-2018	etymidolum hydrochloride + lodoxane hydrochloride
05-Nov-2018	calcium magnesium inositolhexaphosphate + cole extract + dimethylglycineborate bala...
05-Nov-2018	oxytroprenamine maleate + desmethorphan hydrobromide
	desmethorphan hydrobromide
	(as fumarate)
	propantholin hydrochloride + ephedrine hydrochloride + promethazine hydrochloride
	oxycodone phosphate + ephedrine hydrochloride + promethazine hydrochloride
	brompheniramine + deschlorpheniramine maleate
	tetracaine sulfate
	codiprene phosphate + pseudophedrine hydrochloride + tripropidine hydrochloride
	eurotine hydrochloride
10-Aug-2018	pilocarpine (as hydrochloride)
	insulin soluble human
	nifedipinehydroxide aspartate
	betaxolol

To View Radiology Images in eHR Viewer



WONG, BLACKBERRIES
HKIC No. : UH977321(6)
DOB : 29-Feb-1912 Age : 106 years Sex : M

Problem / Diagnosis

Date	Description
28-Apr-2015	Fever
24-Feb-2013	Diabetes Mellitus
24-Feb-2013	Type II diabetes mellitus with complication
24-Feb-2013	Type II diabetes mellitus with complication B
24-Feb-2013	Type II diabetes mellitus with ischaemic heart disease
23-Feb-2013	Verical pain
28-Feb-2011	Delirium
28-Feb-2011	Septic shock
27-Jun-2000	Pterygium

Laboratory Record

Date	Profile Description	Institution
24-Dec-2012	AD, RFT	VUC4_A
15-Dec-2012	APTT, PT	VHC4
21-Aug-2012	AD	VHC4
20-Aug-2012	Haematology Result	VHC4
09-Aug-2012	Haematology Laboratory Report (PDF)	QEH
09-Aug-2012	Molecular Pathology Report (PDF)	QEH
09-Aug-2012	Skin/Gynae Cytology/34	VHC4
15-Dec-2011	DESC, PII, TOXG, TOXH	VHC4
12-Sep-2011	C, DD, FIB	VUC4_A

Encounter / Appointment

Date	Specialty	Institution
21-Dec-2018 11:30		VHB2
03-Dec-2018 09:45		VHB2
30-Nov-2018 16:50		VHB2
30-Nov-2018 16:50		VHB2
16-Nov-2018 17:15		VHB2
08-Nov-2018 09:30		VHB2
07-Nov-2018 18:10		VHB2_B
01-Nov-2018 14:55		VHB2_B
12-Oct-2018 14:05		VHB2_B

Allergy & Adverse Drug Reaction

Click to display patient's deleted allergy or ADR record(s).

Allergen	Allergy Information
prawn	Certain, Angioedema, Othe...
aspirin	Certain, Dyspnoea (SOB)...
paracetamol	Certain, Angioedema
ascorbic acid + betacarotene + biotin + calcium (as carbonate) + chro...	Certain, Angioedema, Dyp...
VIBRAMYCIN	Suspected, Manifestation u...
DOXY-100	Certain, Esophagitis
AUGMENTIN	Certain, Rash
ADR Causative Agent	ADR Information
metenamic acid	Mild, Vomiting
tramadol	Mild, Ankle swelling / ankle...
DICLOFENAC SODIUM	Severe
VOLTAREN	Mild
ALDOMET (METHYLDOPA)	Mild
ALDOMET (METHYLDOPA)	Mild
INDAPAMIDE	Mild

Prescribing History

Date	Medication
08-Nov-2018	cetylpyridinium chloride + lidocaine hydrochloride
07-Nov-2018	calcium magnesium inosinetriphosphate + cola extract + dimethylaminoethanol bita...
07-Nov-2018	chlorphenamine maleate + dextromethorphan hydrobromide
07-Nov-2018	dextromethorphan hydrobromide
07-Nov-2018	ketotifen (as fumarate)
07-Nov-2018	prochlorperazine hydrochloride
07-Nov-2018	codeine phosphate + ephedrine hydrochloride + promethazine hydrochloride
07-Nov-2018	betamethasone + dexchlorphenamine maleate
07-Nov-2018	terbutaline sulfate
07-Nov-2018	codeine phosphate + pseudoephedrine hydrochloride + triprolidine hydrochloride
07-Nov-2018	bromhexine hydrochloride
07-Nov-2018	pioglitazone (as hydrochloride)
07-Nov-2018	insulin soluble human
07-Nov-2018	methylprednisolone acetonate
07-Nov-2018	tadalafil

Radiology Record in eHR Viewer

WONG, BLACKBERRIES
HKIC No. : UH977321(6) DOB : 29-Feb-1912 Age : 106 years Sex : M [Details ▶](#)

[View / Add Allergy & ADR](#) [Select Patient](#) [Close Record](#)

Radiology Record

[Date View](#) [Document View](#) [All Images](#) Modality: All Period: All Default View

Exam Date	Modality	Examination	Performed At
10-Mar-2013	CT	Brain plain	QMH
26-Feb-2013	MRI	Knee plain	QMH
23-Nov-2012	CT	Brain plain	QMH
23-Nov-2012	MRI	Chest	DH
23-Nov-2012	MRI	Chest	STH
23-Nov-2012	XRAY	Chest	TWAH
10-Jun-2012	MRI	Knee plain	QEH
05-May-2012	IR	CT guided drainage, peritoneum, Pre-CT guided procedure diagnostic set	QEH
30-Apr-2012	XRAY	Radiology Report (PDF & Text)	QEH
10-Apr-2012	XRAY	Chest	QEH
10-Mar-2012	XRAY	Chest	QEH
10-Mar-2012	CT	Coronary plain, Coronary+con	QEH
20-Dec-2011	CT	Abdomen +con., Abdomen plain, Pelvis plain, Pelvis+con.	QEH
20-Dec-2011	CT	Brain plain	QEH
11-Nov-2011	XRAY	Chest	QEH
11-Aug-2011	XRAY	Radiology Report (PDF & Text)	QEH
21-Jan-2009	CT	64 Slice CT Thorax+Whole abdomen (Plain + Contrast)	QEH
23-Dec-2008	CT	Brain plain	QEH
20-Nov-2007	CT	Abdomen +con., Abdomen plain, Pelvis plain, Pelvis+con.	QEH
24-Mar-2007	CT	HRCT	QEH
02-Nov-2006	XRAY	Chest	QEH
21-Sep-2004	CT	HRCT	QEH
08-Oct-2002	ANGIO	C C Graft/Shunt, C Chamber Angio, Cardiac Cat(-Rgst) (+Rad)	QEH
30-Apr-2002	CT	Brain plain	

WONG, BLACKBERRIES
HKIC No.: UH977321(6) DOB: 29-Feb-1912 Age: 106 years Sex: M

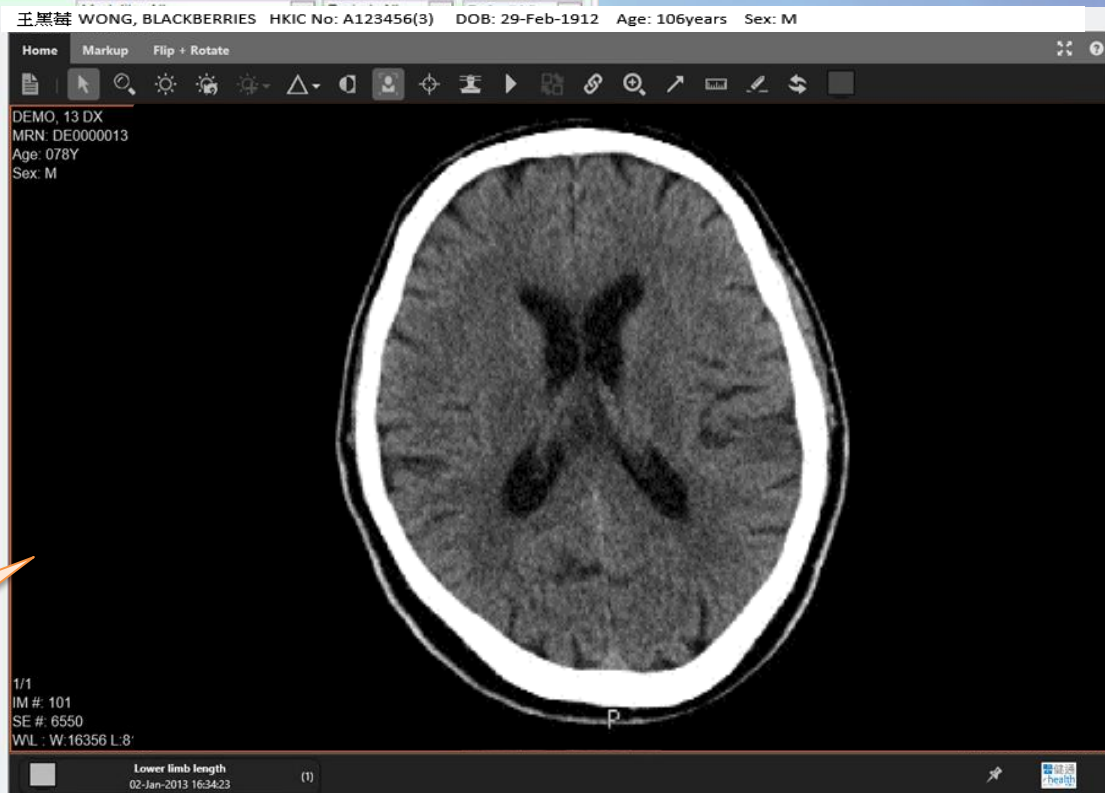
Radiology Record

Date View Document View All Images

Exam Date	Modality	Examination
10-Mar-2013	CT	Brain plain
26-Feb-2013	MRI	Knee plain
23-Nov-2012	CT	Brain plain
23-Nov-2012	MR	Chest
23-Nov-2012	MR	Chest
23-Nov-2012	MR	Chest
10-Jun-2012	CT	Knee
05-May-2012	CT	Cervical spine diagnostic scan
11-Aug-2011	XRAY	Radiology F
21-Jan-2009	CT	64 Slice CT
23-Dec-2008	CT	Brain plain
20-Nov-2007	CT	Abdomen + Pelvis

[Image icon] will appear if Image a/v in Image Archive

Pop-Up Image Viewer and selected image



In dual monitor setting...



- User can drag image viewer to secondary monitor (if available)

Key Challenges

1. Image archive consideration due to large storage size in eHRSS
2. Compliance with eHR standard (e.g. eHR number, Accession Number format)
3. Migration of radiology institutions from Radi Image Sharing pilot
4. Software and hardware compatibility
5. Advancement in new technology in radiology image



Way Forward

- Centralize storage of recent 3 years lossless images
- Strictly follow report & Image data requirements (DICOM conformance, accession no. format)
- Data Compliance testing to ensure eHR standard
- Continuous engagement with stakeholders and healthcare providers



eHR Radiology Image Sharing (Multiple way of sharing radiology Images)



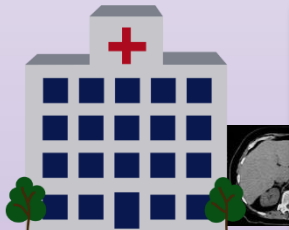
Private
Radiology centre



Government
Clinics



DH



Private
Hospital

- Avoid repeated scanning
- Timely access to images
- Facilitate clinical decision



HA hospital

References

- Sodickson A, Opraseuth J, Ledbetter S. Outside imaging in emergency department transfer patients: CD import reduces rates of subsequent imaging utilization. Radiology 2011; 260:408–413.
- The Royal College of Radiologists (2016).“It's good to share: medical image and report exchange between UK health service providers”
- Sandberg JC, Ge Y, Nguyen HT, et al. Insight into the sharing of medical images: physician, other health care providers, and staff experience in a variety of medical settings. Appl Clin Inform 2012;3:475-87.

Thank you