

A photograph of a young child, possibly a girl, smiling broadly and holding up a string of colorful, glowing lights. The background is dark with bokeh light effects, suggesting an outdoor night setting. The child is wearing a light-colored t-shirt with a graphic on it.

臨床大數據分析及醫療影像量化/視覺化趨勢

IoT+Health Frontier

-Trend of Clinical Big Data Analytics and Quantitative/Visualizing Image

人工智慧/區塊鏈/工業4.0與醫療結合後的未來世界

(How Emerging Technology will Empower Tomorrow's Today to Provide Better Healthcare Solution)

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# 學經歷介紹

- 中原醫工系畢業

- 奇美醫院-醫學工程師-兩年

- 台南市立醫院-醫工組組長-四年

- 成大資工所-視覺系統實驗室

- 友信行-Siemens PACS專員-一年

- 中台科技大學放射技術系專任講師-三年

- 中國醫藥大學放射技術系兼任講師-四年

- 陽明資訊影像系統部執行長-八年

- 瑞特資訊總經理-八年

- 醫療影像資訊標準協會(MISAT)常務理事

- 多種醫學影像融合研究、醫學影像處理、PACS及跨系統規劃、DICOM及IHE規範、醫療影像量化研究、結構化報告研究、醫療大數據研究

- 專利-心導管室微電腦汽球清洗機

- RSNA參訪 (1996/2000/2011)

醫院經驗

外商經驗

教學經驗

創業經驗

# 新興技術對醫療資訊產業的影響

Tomorrow's Radiology Today

# 明日放射科的日常

2018  
RSNA

1996  
RSNA

RADinfo

2000  
RSNA

PACS

2011  
RSNA

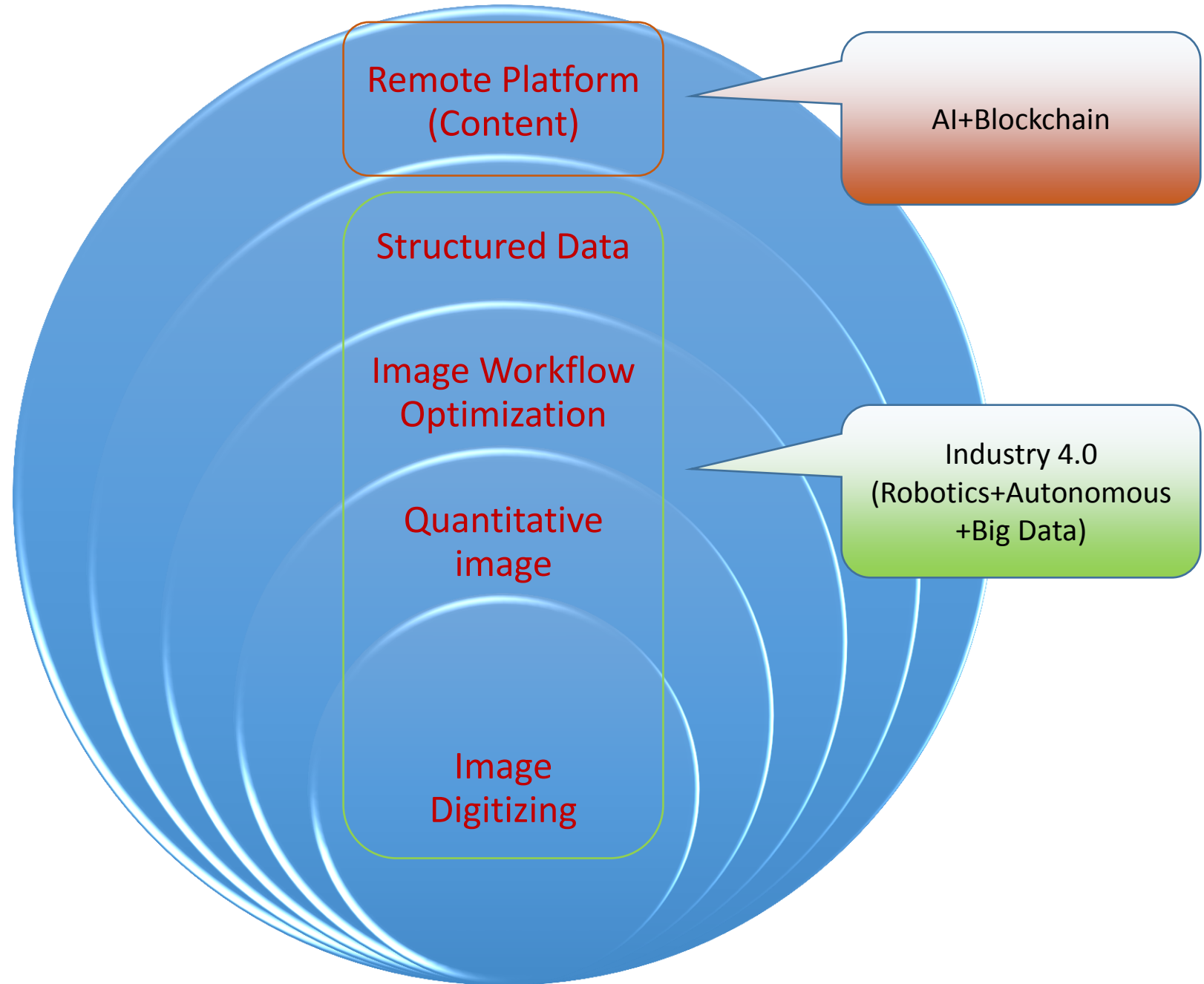
2018  
RSNA

AI



QIBA

Quantitative Imaging Biomarkers Alliance



Remote Platform  
(Content)

AI+Blockchain

Structured Data

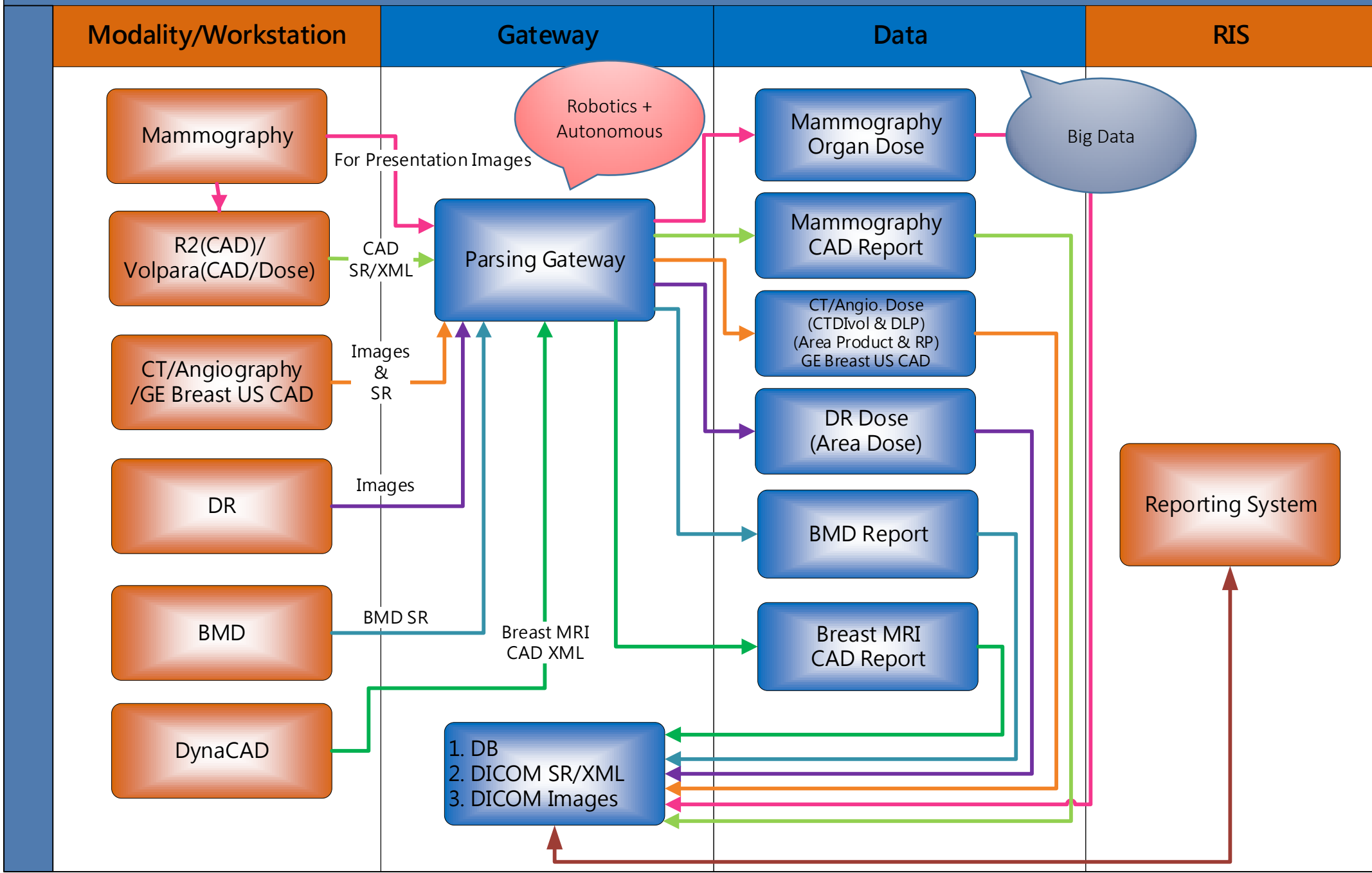
Image Workflow  
Optimization

Quantitative  
image

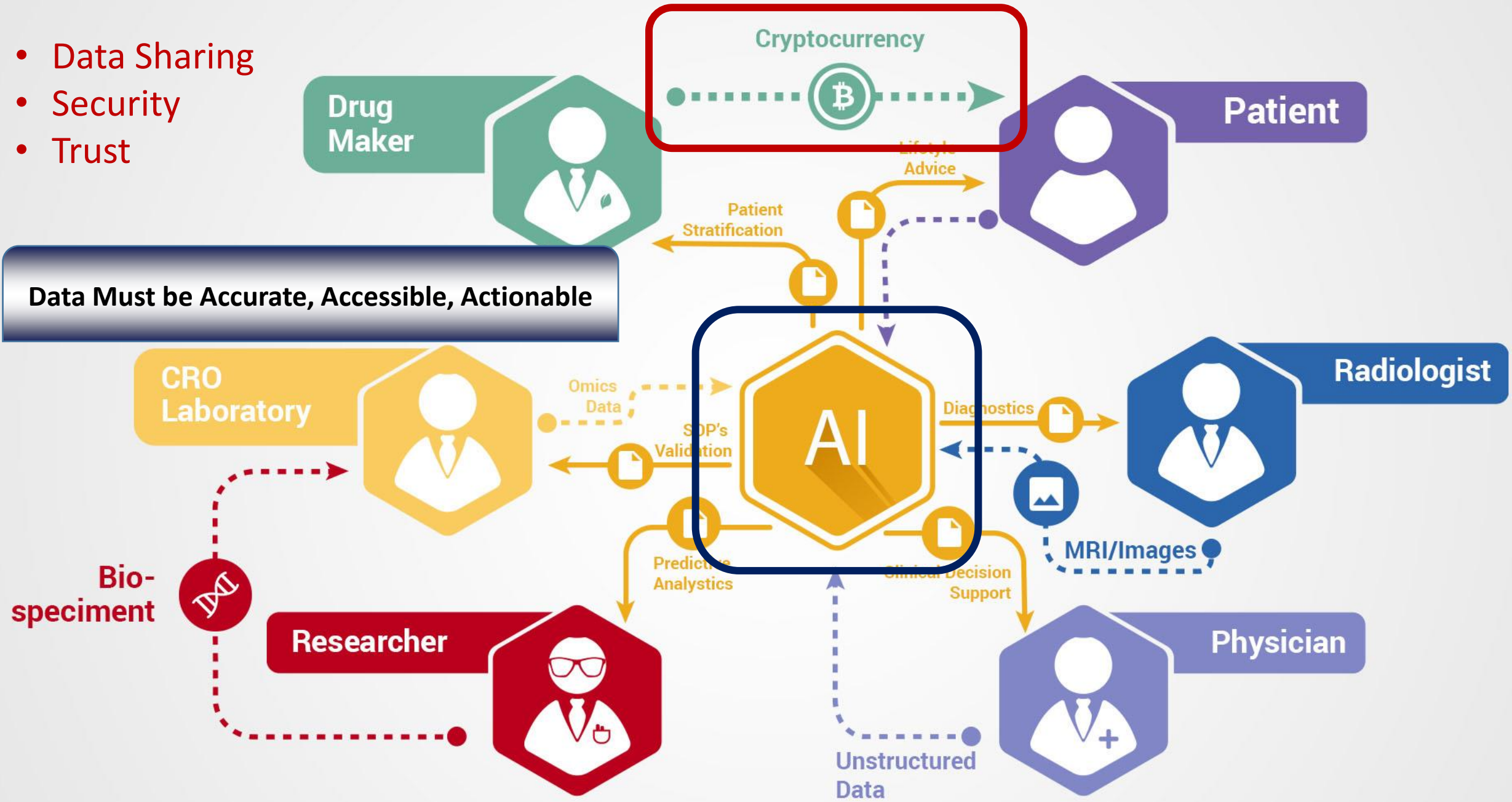
Image  
Digitizing

Industry 4.0  
(Robotics+Autonomous  
+Big Data)

# 彰化基督教醫院 影像醫學部 影像資料解析系統



- Data Sharing
- Security
- Trust



如何落實AI？



# AI Tech

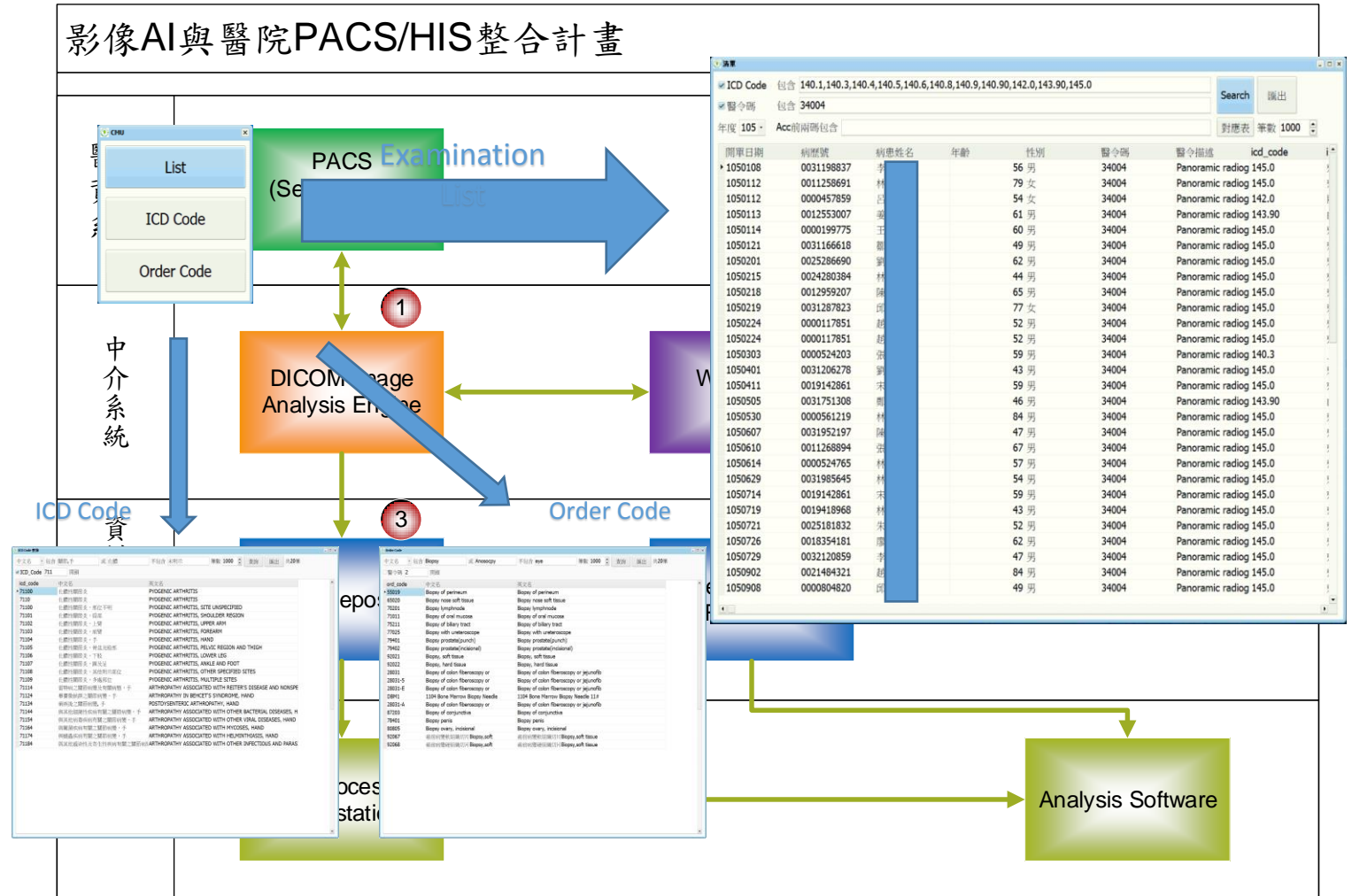
- ML techniques
- Deep learning
- NLP (Natural Language Processing)
- Robotics
- Computer vision
- Speech recognition

Outside the Software Industry

# AI Kernel

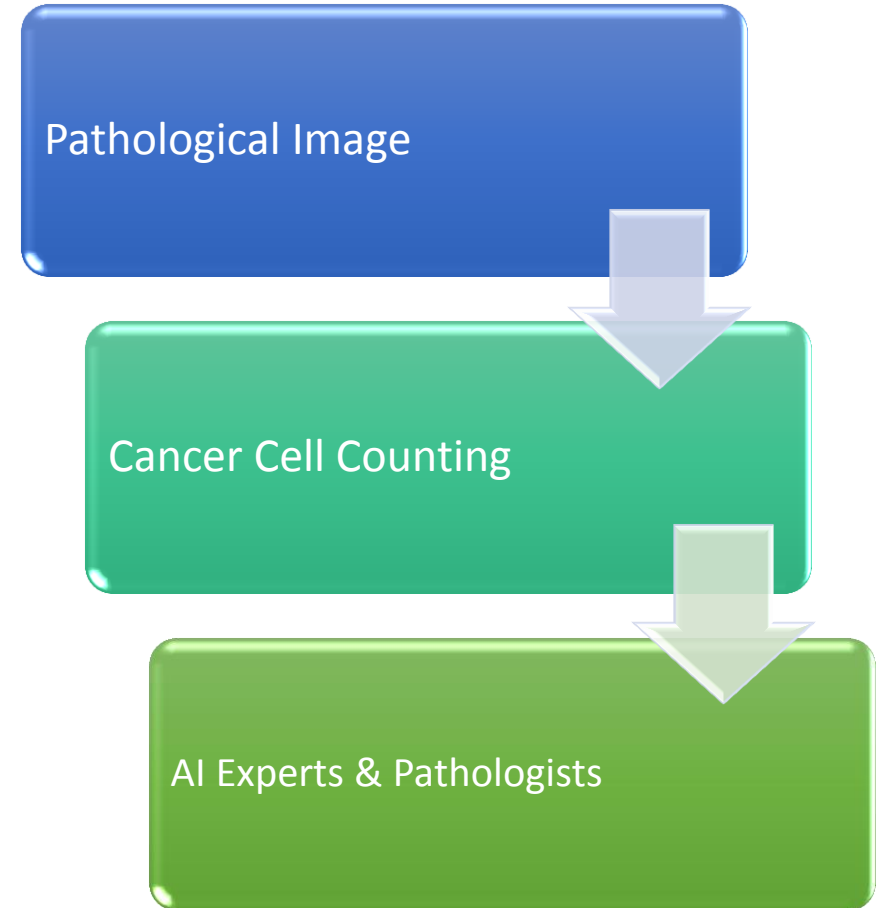
- Data + Compute
- Talent + Ideals + Tools

## 影像AI與醫院PACS/HIS整合計畫



# How to choose an AI Project?

- Start Small
- Automate tasks, not jobs
- Combine AI & subject matter experts



# 醫療資訊產業變化

# IT Infrastructure in the Era of Imaging 3.0

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Christoph Wald, MD, PhD<sup>e,f</sup>

Workflow  
Processes

Reporting &  
Communication  
(LI-RADS, BI-  
RADS, Lung-  
RADS...)

Imaging 3.0 is a blueprint for the future of radiology modeled after the description of Web 3.0 as “more connected, more open, and more intelligent.” Imaging 3.0 involves radiologists’ using their expertise to manage all aspects of imaging care to improve patient safety and outcomes and to deliver high-value care. IT tools are critical elements and drivers of success as radiologists embrace the concepts of Imaging 3.0. Organized radiology, specifically the ACR, is the natural convener and resource for the development of this Imaging 3.0 toolkit. The ACR’s new Imaging 3.0 Informatics Committee is actively working to develop the informatics tools radiologists need to improve efficiency, deliver more value, and provide quantitative ways to demonstrate their value in new health care delivery and payment systems. This article takes each step of the process of delivering high-value Imaging 3.0 care and outlines the tools available as well as additional resources available to support practicing radiologists. From the moment when imaging is considered through the delivery of a meaningful and actionable report that is communicated to the referring clinician and, when appropriate, to the patient, Imaging 3.0 IT tools will enable radiologists to position themselves as vital constituents in cost-effective, high-value health care.

**Key Words:** Imaging 3.0, accountable care organizations, patient experience, value-based imaging

*J Am Coll Radiol 2014;11:1197-1204. Copyright © 2014 American College of Radiology*

Dose  
&  
Safety

Communication  
With Mobile  
Devices

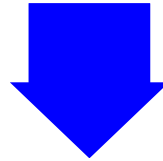
Protocol Standardized is Everything

# DICOM Standard

# The development of DICOM

**ACR-NEMA Standard No. 300- 1985 / 1988**

(American College of Radiology and National Electrical Manufacturers Association)



**SPI 1987**  
**(Standard Product Interconnect)**



**DICOM 3.0 1993**  
**(Digital Imaging and COmmunication in Medicine)**



# The Parts of the DICOM Standard

- Part 1 - Introduction and Overview
- Part 2 - Conformance
- Part 3 - Information Object Definitions
- Part 4 - Service Class Specifications
- Part 5 - Data Structures & Encoding
- Part 6 - Data Dictionary
- Part 7 - Message Exchange
- Part 8 - Network Communication Support for Message Exchange
- ~~Part 9 - Point-to-Point Communication Support for Message Exchange~~

# The Parts of the DICOM Standard

- Part 10 - Media Storage and File Format for Media Interchange
- Part 11 - Media Storage Application Profiles
- Part 12 - Media Formats and Physical Media for Media Interchange
- ~~Part 13 - Print Management Point-to-Point~~

- Part 14 - Grayscale Standard Display Function
- Part 15 - Security and System Management Profiles
- Part 16 - Content Mapping Resource
- Part 17 - Explanatory Information
- Part 18 - Web Services

- Part 19 - Application Hosting
- Part 20 - Imaging Reports using HL7 Clinical Document Architecture
- Part 21 - Transformations between DICOM and other Representations

# DICOM Q&A

- DICOM 3.0 still Evolutionary or Stop?

2011

2013

2014a, 2014b, 2014c

2015a, 2015b, 2015c

2016a, 2016b, 2016c, 2016d, 2016e

2017a, 2017b, 2017c, 2017d, 2017e

2018a, 2018b, 2018c, 2018d, 2018e

2019a, 2019b, 2019c (Sep.)...

- Part name is fixed or not?

Part 18 from “Web Access to DICOM Persistent Objects (WADO)” to “Web Services”(2013)

Part 20 from “Transformation of DICOM to and from HL7 Standards” to “Imaging Reports using HL7 Clinical Document Architecture”(2015)

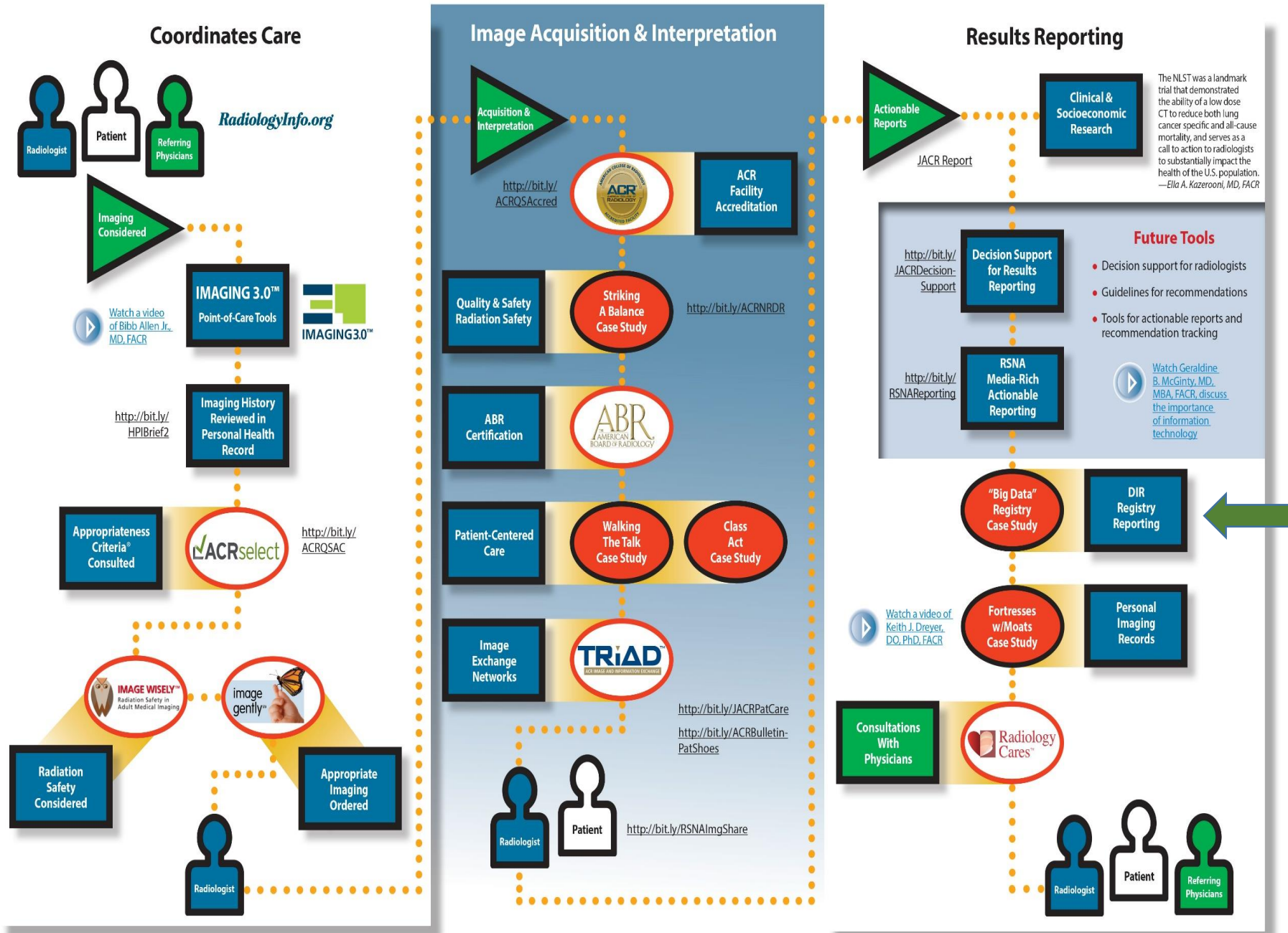
Add Part 21 “Transformations between DICOM and other Representations”(2017e)

- DICOM file is image-package only?

Radiomic Features(2017d)

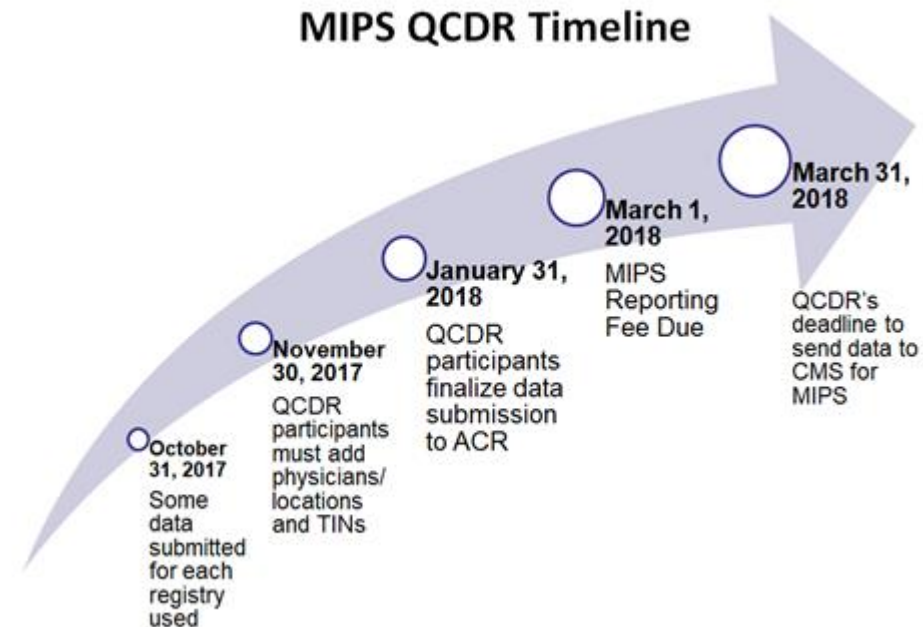
DICOM SEG(2007)+Parametric Maps(2014)+DICOM SR(TID 1500)+Tractography(2015)

# ACR Registry



# ACR NRDR

- The ACR NRDR (National Radiology Data Registry) has been approved as a Qualified Clinical Data Registry (QCDR) for the CMS (Centers for Medicare & Medicaid Services) Merit-Based Incentive Payment System (MIPS) for 2017



# ACR NRDR

- Lung Cancer Screening Registry
- Interventional Radiology Registry
- CT Colonography Registry
- Dose Index Registry
- General Radiology Improvement Database
- IV Contrast Extravasation
- National Mammography Database

# It's All about Dose-EU

## ALL ABOUT THE DOSE

The Basic Safety Standards Directive (Council Directive 2013/59/EURATOM of 5 December 2013) lays down basic safety standards for protection against the dangers arising from exposure to ionising radiation.

EU countries must ensure compliance  
in national legislation by  
6 February 2018

Source: [ec.europa.eu/energy/sites/ener/files/documents/CELEX-32013L0059-EN-TX1.pdf](http://ec.europa.eu/energy/sites/ener/files/documents/CELEX-32013L0059-EN-TX1.pdf)



### RAISING AWARENESS

International Patient Safety Day

17 September

International Day of Radiology

8 November

### AS LOW AS REASONABLY ACHIEVABLE (ALARA) PRINCIPLES

- 1 Time** minimising the time of exposure directly reduces radiation dose
- 2 Distance** increasing the distance between you and the radiation source will reduce exposure by the square of the distance
- 3 Shielding** using absorber materials is an effective way to reduce radiation exposures



# Research Contract for Dose Management

## 產研合作專題研究計畫合約書

立合約書人：

衛生福利部雙和醫院 影像醫學部

(以下簡稱甲方)

台灣醫療影像資訊標準協會

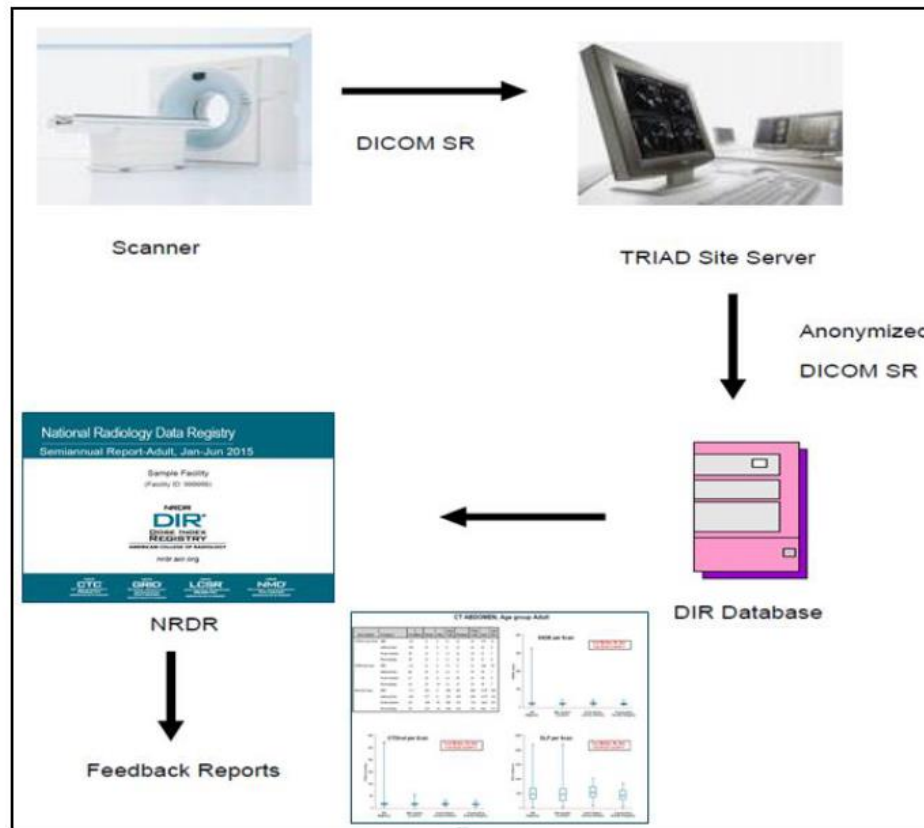
(以下簡稱乙方)

茲因甲方與乙方共同執行產學合作專題研究計畫(以下簡稱本計畫)，雙方協議如下以資共同遵守：

一、本計畫主題為：輻射劑量登錄系統-DICOM SR 劑量值擷取研究

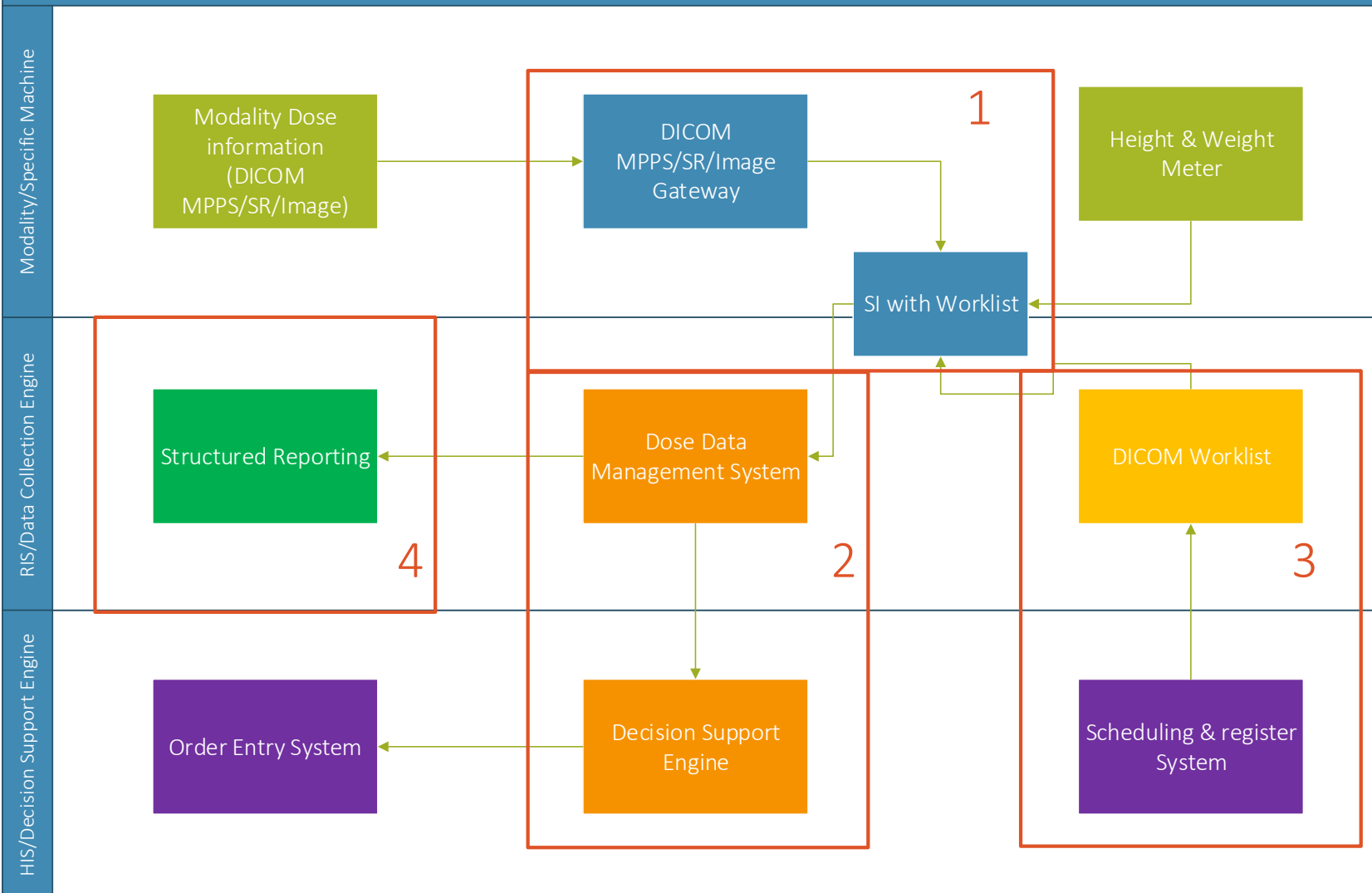
# DIR Data Flow Chart

## DIR User Guide



TRIAD™ Data Flow Chart

# 醫學影像部輻射劑量跨系統整合機制



# Dose Data Management System

- 建立(DR, Mammo, Angiography, CT)機構診斷參考水平(LDRL)
- 建立成人輻射劑量警示回饋
- 建立小兒輻射劑量警示回饋

# DICOM Image/SR for Dose Management

# Mammography Organ Dose

# Mammography Organ Dose

- Organ Dose Report Export

110	0028	1055	LO	Window Center & Width Explanation	NORMAL / HARDER / SOFTER
111	0028	1056	CS	VOI LUT Function	SIGMOID
112	0028	2110	CS	Lossy Image Compression	00
113	0040	0275	SQ	Request Attributes Sequence	+ Sequence +
114	0040	0007	LO	Scheduled Procedure Step Description	Mammography
115	0040	0009	SH	Scheduled Procedure Step ID	XMAGR
116	0040	1001	SH	Requested Procedure ID	8203
117	0040	0302	US	Entrance Dose	0
118	0040	0306	DS	Distance Source to Entrance	620
119	0040	0310	ST	Comments on Radiation Dose	15 %
120	0040	0316	DS	Organ Dose	0.01259
121	0040	0318	CS	Organ Exposed	BREAST
122	0040	0555	SQ	Acquisition Context Sequence	
123	0045	0010	LO	Private Creator	GEMS_SFMO_02



	A	B	C	D	E	F	G	H	I
1	Hologic Imaging Biomakers								
2	病歷號：97[REDACTED]5 姓名：GAU[REDACTED]MEI 檢查號：L012554890101 檢查日：20131216 091904								
3									
4	Position	RCC	RMLO	LCC	LMLO				
5	Organ Dose(dGy)	0.01491	0.01515	0.01513	0.01259				
6									

1. Indication for examination:  Screening mammogram  Diagnostic mammogram

2. Glandular Dose (mGy): RCC  RMLD  LCC  LMLO

3. Breast Thickness (mm): RCC  RMLD  LCC  LMLO

4. Description of overall breast composition categories:

5. Description of findings:

= S/P partial mastectomy appearance in the right upper outer quadrant.  
= Nonetheless, dramatically development of ill-defined high density mass in the mid portion and right upper outer quadrant superimposed on the post surgical scar with skin thickening and retraction.  
= Tissue diagnosis was required.

6. Comparison to previous examination (Most recent):

7. Assessment

- Category 0: Incomplete - Need Additional Imaging Evaluation and/or Prior Mammograms for Comparison.
- Category 1: Negative
- Category 2: Benign
- Category 3: Probably Benign
- Category 4: Suspicious
  - Category 4A: Low suspicion for malignancy
  - Category 4B: Moderate suspicion for malignancy
  - Category 4C: High suspicion for malignancy
- Category 5: Highly Suggestive of Malignancy
- Category 6: Known Biopsy-Proven Malignancy

8. Management

- Recall for additional imaging and/or comparison with prior examination(s)
- Routine mammography screening
- Short-interval (6-month) follow-up or continued surveillance mammography
- Follow-up or continued surveillance mammography
- Tissue diagnosis
- Surgical excision when clinically appropriate

Reporting



1. Indication for examination:  Screening mammogram  Diagnostic mammogram

	2-D	Tommo						
2. Glandular Dose (mGy):	RCC	<input type="text" value="1.18"/>	RML0	<input type="text" value="1.33"/>	LCC	<input type="text" value="1.33"/>	LMLO	<input type="text" value="1.15"/>
3. Breast Thickness (mm):	RCC	<input type="text" value="47"/>	RML0	<input type="text" value="44"/>	LCC	<input type="text" value="46"/>	LMLO	<input type="text" value="47"/>

4. Description of overall breast composition categories:

5. Description of findings:

No mass or suspicious abnormal cluster of calcifications are visible.

6. Comparison to previous examination (Most recent):

7. Assessment

- Category 0: Incomplete - Need Additional Imaging Evaluation and/or Prior Mammograms for Comparison.
- Category 1: Negative
- Category 2: Benign
- Category 3: Probably Benign
- Category 4: Suspicious
  - Category 4A: Low suspicion for malignancy
  - Category 4B: Moderate suspicion for malignancy
  - Category 4C: High suspicion for malignancy
- Category 5: Highly Suggestive of Malignancy
- Category 6: Known Biopsy-Proven Malignancy

8. Management

- Recall for additional imaging and/or comparison with prior examination(s)
- Routine mammography screening
- Short-interval (6-month) follow-up or continued surveillance mammography
- Follow-up or continued surveillance mammography
- Tissue diagnosis
- Surgical excision when clinically appropriate

-----  
c. n. n.

1. Indication for examination:

= Screening mammogram

2. Glandular Dose (mGy):

	RCC	RMLO	LCC	LMLO
	1.18	1.33	1.33	1.15

3. Breast Thickness (mm):

	47	44	46	47
--	----	----	----	----

4. Description of overall breast composition categories:

= c. The breasts are heterogeneously dense, which may obscure small masses.

5. Description of findings:

= No mass or suspicious abnormal cluster of calcifications are visible.

6. Comparison to previous examination (Most recent):

= N/A

7. Assessment

= Category 1: Negative

8. Management

= Routine mammography screening

Note: The false-negative rate of mammography is approximately 10%. Management of a palpable abnormality must be based upon clinical grounds.

-----  
開單: [REDACTED]

判讀: [REDACTED]  
放診專醫字第0166 號

輸入: [REDACTED] 3700/1/000/1/0  
X光片完成時間: 103/09/29 09:50:00

# CT Dose Report

# DICOM SR Output

## Snap-Shoot Image

Scan	kV	mAs / ref.	CTDIvol* mGy	DLP mGycm	TI s	cSL mm
1	80	50 mAs	0.06 L	2	2.7	0.6
2	120	390	59.48 S	1073	1.0	0.6

```

X-Ray Radiation Dose Report
Procedure reported - Computed Tomography X-Ray
Has Intent - Diagnostic Intent
Observer Type - Device
Device Observer UID/Device Observer Name - CTAWP73263
Device Observer Manufacturer - SIEMENS
Device Observer Model Name - SOMATOM Definition Flash
Device Observer Serial Number - 73263
Device Observer Physical Location during observation - Ser.:73263
Start of X-Ray Irradiation/End of X-Ray Irradiation/Scope of Accumulation - Study
Study Instance UID/CT Accumulated Dose Data
Total Number of Irradiation Events - 2 events
CT Dose Length Product Total - 1074.74 mGycm

CT Acquisition
Acquisition Protocol - Topogram
Target Region - Head
CT Acquisition Type - Constant Angle Acquisition
Procedure Context - CT without contrast
Irradiation Event UID/CT Acquisition Parameters
Exposure Time - 2.72 s
Scanning Length - 250 mm
Nominal Single Collimation Width - 0.6 mm
Nominal Total Collimation Width - 3.6 mm
Number of X-Ray Sources - 1 X-Ray sources
CT X-Ray Source Parameters
Identification of the X-Ray Source - A
KVP - 80 kV
Maximum X-Ray Tube Current - 50 mA
X-Ray Tube Current - 50 mA

CT Dose
Mean CTDIvol - 0.06 mGy
CTDIw Phantom Type - IEC Body Dosimetry Phantom
DLP - 1.5 mGycm
Comment - Internal technical scan parameters: Organ Characteristic - Head, Body Size - Adult, Body Region - Body, X-ray Modulation Type - OFF
Device Role in Procedure - Irradiating Device
Device Manufacturer - SIEMENS
Device Model Name - SOMATOM Definition Flash
Device Serial Number - 73263

CT Acquisition
Acquisition Protocol - Head
Target Region - Head
CT Acquisition Type - Spiral Acquisition
Procedure Context - CT without contrast
Irradiation Event UID/CT Acquisition Parameters
Exposure Time - 9.53 s
Scanning Length - 201 mm
Nominal Single Collimation Width - 0.6 mm
Nominal Total Collimation Width - 38.4 mm
Pitch Factor - 0.55 ratio
Number of X-Ray Sources - 1 X-Ray sources
CT X-Ray Source Parameters
Identification of the X-Ray Source - A
KVP - 120 kV
Maximum X-Ray Tube Current - 276 mA
X-Ray Tube Current - 214 mA
Exposure Time per Rotation - 1 s

CT Dose
Mean CTDIvol - 59.48 mGy
CTDIw Phantom Type - IEC Head Dosimetry Phantom
DLP - 1073.24 mGycm
Comment - Internal technical scan parameters: Organ Characteristic - Head, Body Size - Adult, Body Region - Head, X-ray Modulation Type - X_CARE_EC
Device Role in Procedure - Irradiating Device
Device Manufacturer - SIEMENS
Device Model Name - SOMATOM Definition Flash
Device Serial Number - 73263
Source of Dose Information - Automated Data Collection
  
```

# Effective Dose

- Effective dose (**E**) in CT given by the following

$$\mathbf{E = DLP \times k}$$

where, *k* is the tissue weighting factor based on region of body scanned

# Estimating Effective Dose: K values

- **Effective dose = DLP x  $k$  ( $k$  is weighting factor)**
- **Representative adult values for  $k$  are:**
  - » **Head/Neck** .0031
  - » **Head** .0021
  - » **Neck** .0059
  - » **Chest** .014
  - » **Abdomen** .015
  - » **Trunk** .015

DX Area/Entrance Dose

Tag	Attribute Name	Def VR	VM	Values
(0018,1050)	Spatial Resolution	DS	1	0.140
(0018,1110)	Distance Source to Detector	DS	1	1800
(0018,1111)	Distance Source to Patient	DS	1	1755
(0018,1147)	Field of View Shape	CS	1	RECTANGLE
(0018,1149)	Field of View Dimension(s)	IS	2	425426
(0018,1150)	Exposure Time	IS	1	18
(0018,1151)	X-ray Tube Current	IS	1	200
(0018,1152)	Exposure	IS	1	4
(0018,1153)	Exposure in 縉As	IS	1	3600
(0018,115e)	Image and Fluoroscopy Area Dose Product	DS	1	1.18
(0018,1160)	Filter Type	SH	1	0.1MM CU
(0018,1164)	Imager Pixel Spacing	DS	2	0.140000.14000
(0018,1166)	Grid	CS	1	FOCUSED
(0018,1190)	Focal Spot(s)	DS	1	1.200
(0018,1200)	Date of Last Calibration	DA	1	20170109
(0018,1201)	Time of Last Calibration	TM	1	163614
(0018,1400)	Acquisition Device Processing Description	LO	1	CHEST\CHEST PA\Custom_20170125
(0018,1405)	Relative X-ray Exposure	IS	1	88
(0018,1411)	Undefined	DS	1	264
(0018,1412)	Undefined	DS	1	293.000
(0018,1413)	Undefined	DS	1	-454
(0018,1508)	Positioner Type	CS	1	NONE
(0018,1510)	Positioner Primary Angle	DS	1	0.0
(0018,1511)	Positioner Secondary Angle	DS	1	0.0
(0018,5100)	Patient Position	CS	0	
(0018,5101)	View Position	CS	0	
(0018,7004)	Detector Type	CS	1	SCINTILLATOR
(0018,7005)	Detector Configuration	CS	1	AREA
(0018,7006)	Detector Description	LT	1	Uamm
(0018,700e)	Detector ID	SH	1	KR14MI9002026ADW

Tag	Attribute Name	Def VR	VM	Values
(0033,1011)	: private mapped to (0033,FE11)	LT	1	12 5 0 30 30 0 60 60 0 80 80 0
(0033,1020)	: private mapped to (0033,FE20)	SH	1	263.94
(0033,1021)	: private mapped to (0033,FE21)	LT	1	1, 7, 1800, 0, 0, 0, 3040, 0, 3040, 3024, 16, 3024, 16, 0, 0, 0
(0033,1022)	: private mapped to (0033,FE22)	LT	1	<ExtraInfo> <Receptor>3</Receptor> <ReceptorRotation>0</ReceptorRotation> <OriginalReceptorRotation>0</Original...
(0033,1023)	: private mapped to (0033,FE23)	LT	1	<ShutterOverlay> <Left>0</Left> <Top>0</Top> <Width>3040</Width> <Height>3036</Height> <IsCircle>false</IsC...
(0033,1031)	: private mapped to (0033,FE31)	LO	1	DETECTOR S/N:KR14MI9002026ADW CYYH80003
(0040,0244)	Performed Procedure Step Start Date	DA	1	20170714
(0040,0245)	Performed Procedure Step Start Time	TM	1	095740
(0040,0253)	Performed Procedure Step ID	SH	1	9719876
(0040,0254)	Performed Procedure Step Description	LO	1	CHEST (PA)
(0040,0275)	Request Attributes Sequence	SQ	1	
>BEGIN ITEM 1				
>(0040,1001)	Requested Procedure ID	SH	1	K395754650201
>END ITEM 1				
(0040,0302)	Entrance Dose	US	1	0
(0040,0555)	Acquisition Context Sequence	SQ	1	
(0040,2017)	Filler Order Number / Imaging Service Request	LO	1	49335655
(0040,8302)	Entrance Dose in mGy	DS	1	0.09
(0088,0200)	Icon Image Sequence	SQ	1	
>BEGIN ITEM 1				
>(0028,0002)	Samples per Pixel	US	1	1
>(0028,0004)	Photometric Interpretation	CS	1	MONOCHROME2
>(0028,0010)	Rows	US	1	128
>(0028,0011)	Columns	US	1	128
>(0028,0100)	Bits Allocated	US	1	8
>(0028,0101)	Bits Stored	US	1	8
>(0028,0102)	High Bit	US	1	7
>(0028,0103)	Pixel Representation	US	1	0
>(7fe0,0010)	Pixel Data	OW	1	C:\Program Files (x86)\DVT&DICOM Editor\Results\W08L0002.pix
>END ITEM 1				
(0903,0010)	: private mapped to (0903,00FD)	LO	1	GEIIS PACS



# Fluoroscopy Dose

## X-Ray Radiation Dose Report

Procedure reported = Projection X-Ray

Has Intent = Combined Diagnostic and Therapeutic Procedure

Observer Type = Device

Device Observer UIDDevice Observer Name = Clarity FD20C

Device Observer Manufacturer = Philips Medical Systems

Device Observer Model Name = Allura Xper

Device Observer Serial Number = 1

Scope of Accumulation = Performed Procedure Step

Performed Procedure Step SOP Instance UIDAccumulated X-Ray Dose Data

Acquisition Plane = Single Plane

Reference Point Definition = 15cm below BeamIsocenter

Dose Area Product Total = 0.00019030000000 Gy.m2

Dose (RP) Total = 0.00538005190491 Gy

Fluoro Dose Area Product Total = 3E-07 Gy.m2

Fluoro Dose (RP) Total = 9.2052969885E-06 Gy

Total Fluoro Time = 2 s

Acquisition Dose Area Product Total = 0.00019 Gy.m2

Acquisition Dose (RP) Total = 0.00537084660792 Gy

Total Acquisition Time = 85.74 s

Total Number of Radiographic Frames = 220 no units

Height of System = 1065 mm

Focal Spot to ISO Center = 810 mm

Irradiation Event X-Ray Data

Acquisition Plane = Single Plane

DateTime StartedIrradiation Event Type = Fluoroscopy

# Bi-Plane Dose

## X-Ray Radiation Dose Report

Procedure reported = Projection X-Ray

Has Intent = Combined Diagnostic and Therapeutic Procedure

Observer Type = Device

Device Observer UIDDevice Observer Name = AXIS05222

Device Observer Manufacturer = Siemens

Device Observer Model Name = AXIOM-Artis

Device Observer Serial Number = 153310

Scope of Accumulation = Study

Study Instance UIDAccumulated X-Ray Dose Data

Acquisition Plane = Plane A

Calibration

Dose Measurement Device = Dosimeter

Calibration DateCalibration Factor = 1 no units

Calibration Uncertainty = 5 Percent

Calibration Responsible Party = siemens

Dose Area Product Total = 0.00427409 Gy<sup>2</sup>

Dose (RP) Total = 0.7268 Gy

Fluoro Dose Area Product Total = 0.0012005 Gy<sup>2</sup>

Fluoro Dose (RP) Total = 0.20549 Gy

Total Fluoro Time = 141 s

Acquisition Dose Area Product Total = 0.00307359 Gy<sup>2</sup>

Acquisition Dose (RP) Total = 0.52131 Gy

Total Acquisition Time = 48 s

Reference Point Definition = 15cm from Isocenter toward Source

Accumulated X-Ray Dose Data

Acquisition Plane = Plane B

Calibration

Dose Measurement Device = Dosimeter

Calibration DateCalibration Factor = 1 no units

Calibration Uncertainty = 5 Percent

Calibration Responsible Party = Siemens

Dose Area Product Total = 0.00506859 Gy<sup>2</sup>

Dose (RP) Total = 0.84664 Gy

Fluoro Dose Area Product Total = 0.00042013 Gy<sup>2</sup>

Fluoro Dose (RP) Total = 0.07247 Gy

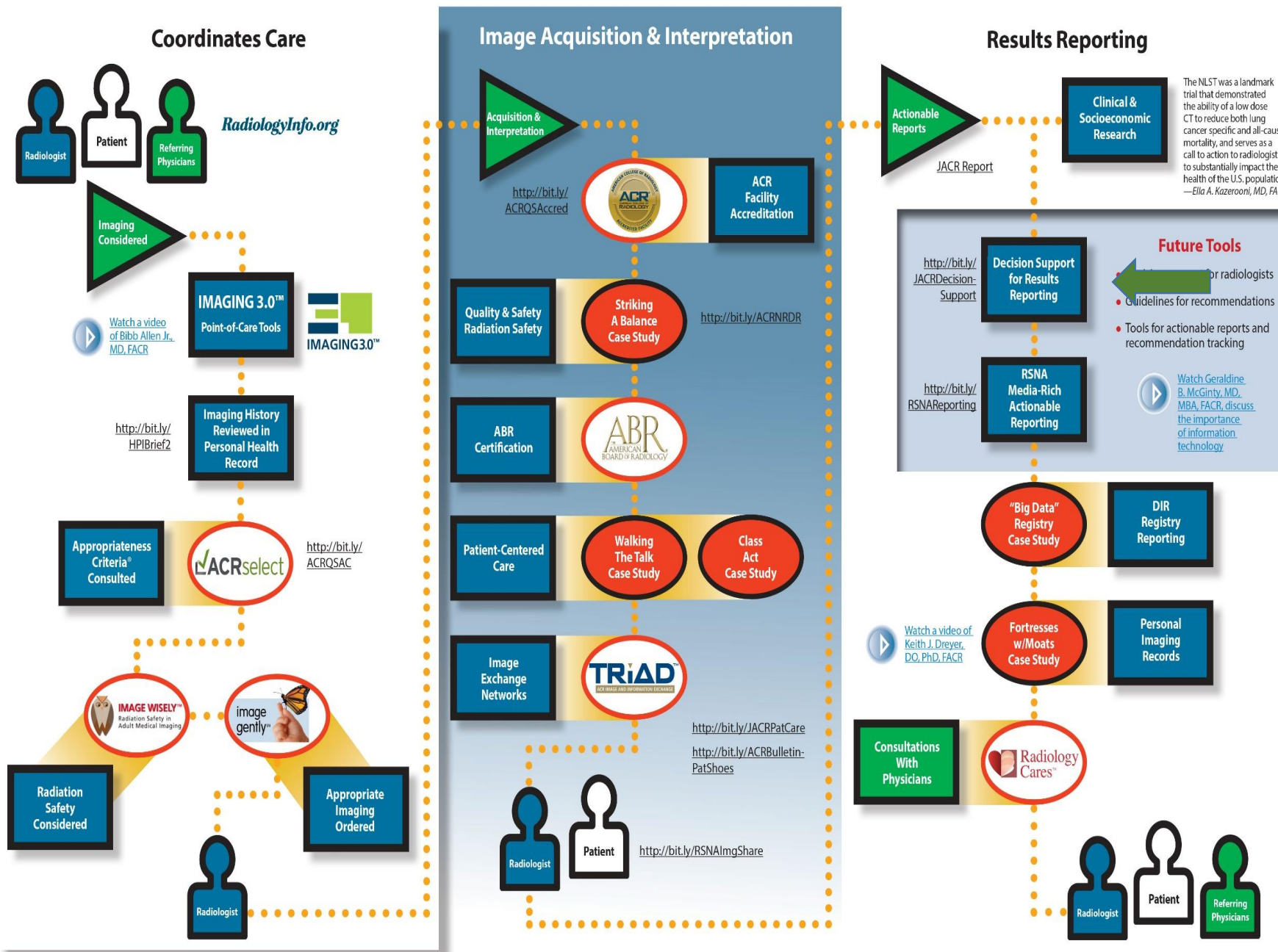
Total Fluoro Time = 31 s

Acquisition Dose Area Product Total = 0.00464846 Gy<sup>2</sup>

Acquisition Dose (RP) Total = 0.77417 Gy

Total Acquisition Time = 41 s

Reference Point Definition = 15cm from Isocenter toward Source



# DICOM SR for CAD

Mammography CAD results  
“BI-RADS<sup>®</sup> - like”  
recommendations

# Mammography CAD SR

- DICOM SR Report Export

No.	Group	El...	VR	Description	Value
834	0008	0100	SH	Code Value	R2cn018
835	0008	0102	SH	Coding Scheme Designator	99R2TECH
836	0008	0103	SH	Coding Scheme Version	1.0
837	0008	0104	LO	Code Meaning	Vfg:Volume of fibroglandular t...
838	0040	A300	SQ	Measured Value Sequence	+ Sequence +
839	0040	08EA	SQ	Measurement Units Code Sequence	+ Sequence +
840	0008	0100	SH	Code Value	cm3
841	0008	0102	SH	Coding Scheme Designator	UCUM
842	0008	0103	SH	Coding Scheme Version	1.4
843	0008	0104	LO	Code Meaning	Cubic centimeter
844	0040	A30A	DS	Numeric Value	78
845	0040	A730	SQ	Content Sequence	+ Sequence +
846	0040	A010	CS	Relationship Type	HAS CONCEPT MOD
847	0040	A040	CS	Value Type	CODE
848	0040	A043	SQ	Concept Name Code Sequence	+ Sequence +
849	0008	0100	SH	Code Value	G-C171
850	0008	0102	SH	Coding Scheme Designator	SRT
851	0008	0104	LO	Code Meaning	Laterality
852	0040	A168	SQ	Concept Code Sequence	+ Sequence +
853	0008	0100	SH	Code Value	T-04080
854	0008	0102	SH	Coding Scheme Designator	SRT
855	0008	0104	LO	Code Meaning	Both breasts
856	0040	A010	CS	Relationship Type	HAS CONCEPT MOD
857	0040	A040	CS	Value Type	CODE
858	0040	A043	SQ	Concept Name Code Sequence	+ Sequence +
859	0008	0100	SH	Code Value	121401
860	0008	0102	SH	Coding Scheme Designator	DCM
861	0008	0104	LO	Code Meaning	Derivation
862	0040	A168	SQ	Concept Code Sequence	+ Sequence +
863	0008	0100	SH	Code Value	112187
864	0008	0102	SH	Coding Scheme Designator	DCM
865	0008	0104	LO	Code Meaning	Unspecified method of calcul...
866	0040	A010	CS	Relationship Type	HAS PROPERTIES
867	0040	A040	CS	Value Type	NUM
868	0040	A043	SQ	Concept Name Code Sequence	+ Sequence +
869	0008	0100	SH	Code Value	R2cn019
870	0008	0102	SH	Coding Scheme Designator	99R2TECH
871	0008	0103	SH	Coding Scheme Version	1.0
872	0008	0104	LO	Code Meaning	Vb:Volume of breast
873	0040	A300	SQ	Measured Value Sequence	+ Sequence +
874	0040	08EA	SQ	Measurement Units Code Sequence	+ Sequence +
875	0008	0100	SH	Code Value	cm3
876	0008	0102	SH	Coding Scheme Designator	UCUM
877	0008	0103	SH	Coding Scheme Version	1.4



	12/31/2013						
	Total	R	L	RCC	RMLO	LCC	LMLO
Quanta	V20						
Vfg (cm3)	78	45	33	21	45	18	33
Vb (cm3)	1558	780	778	509	780	501	778
Vbd (%)	5	6	4	4	6	4	4
Abd (%)	0	0	0	0	1	0	0
Vbd-score	-1.32	-1.32	-1.68	-1.6	-1.03	-1.84	-1.53
Vfg-score	-0.93	-0.93	-1.16	-1.32	-0.53	-1.48	-0.85
Q_abd	1	1	1	1	2	1	1
q_abd	1.44	1.44	1.23	1.27	1.62	1.15	1.31

**HOLOGIC®**

	A	B	C	D	E	F	G	H	I
1	Hologic Imaging Biomarkers								
2	病歴號: 10... 姓名: WU... HUA 検査號: K34... 101 検査日: 20131231 152049								
3									
4	Per Subject	Total							
5	Quanta								
6	Vfg(cm3)	78							
7	Vb(cm3)	1558							
8	Vbd(%)	5							
9	Vfg-score	-0.93							
10	Vbd-score	-1.32							
11	Abd(%)	0							
12	q_abd	1.44							
13	Q_abd	1							
14									
15	Per Image	RCC	RMLO	LCC	LMLO				
16	Quanta								
17	Vfg(cm3)	21	45	18	33				
18	Vb(cm3)	509	780	501	778				
19	Vbd(%)	4	6	4	4				
20	Vfg-score	-1.32	-0.53	-1.48	-0.85				
21	Vbd-score	-1.6	-1.03	-1.84	-1.53				
22	Abd(%)	0	1	0	0				
23	q_abd	1.27	1.62	1.15	1.31				
24	Q_abd	1	2	1	1				
25									
26	Per Breast	R	L						
27	Quanta								
28	Vfg(cm3)	45	33						
29	Vb(cm3)	780	778						
30	Vbd(%)	6	4						
31	Vfg-score	-0.93	-1.16						
32	Vbd-score	-1.32	-1.68						
33	Abd(%)	0	0						
34	q_abd	1.44	1.23						
35	Q_abd	1	1						



# DICOM PS/SR for measurement

DICOM PS (presentation States)

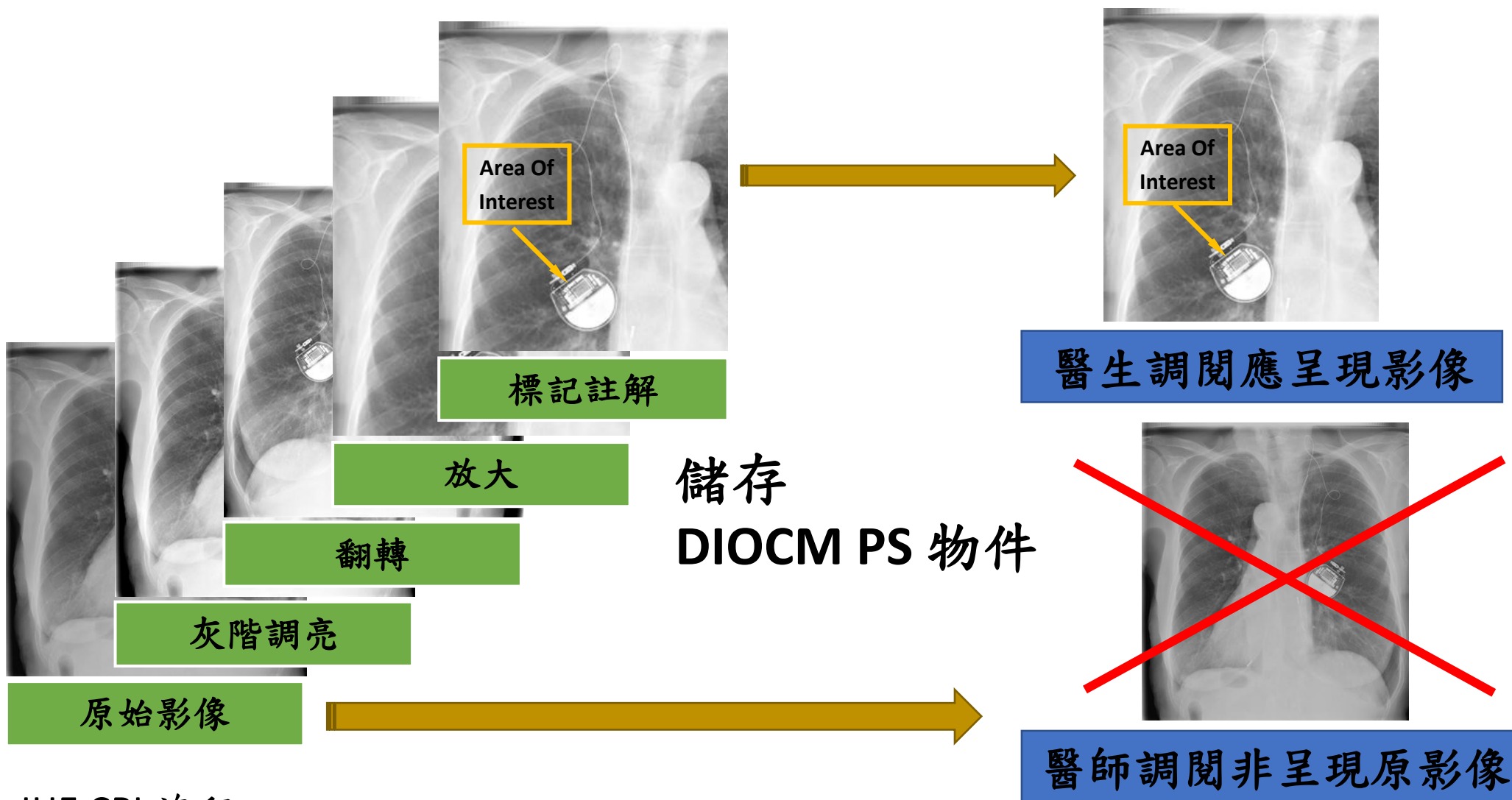


# 規範探討 – IHE CPI 一致性醫學影像呈現要求

- **IHE Radiology Technical Framework, Volume 1: Integration Profiles**
  - CPI (Consistent Presentation of Images)  
一致性灰階影像呈現之要求
- **在不同系統下影像調整結果可一致呈現**
  - 可將每次影像調整結果儲存，下次可還原調整後結果
  - 或將原始影像與調整結果傳送至另一系統，亦可一致呈現調整後之影像



# 規範探討 – IHE CPI 一致性醫學影像呈現要求





# 規範探討 – DICOM PS標記註解物件規範內容

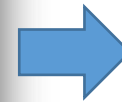
- 依據上述IHE CPI呈現一致性需求，標記註解資訊以DICOM PS(Presentation states)物件儲存
- **DICOM Part 3 Softcopy Presentation State Information Object Definitions**
  - [http://dicom.nema.org/medical/dicom/current/output/cht/html/part03/sect\\_A.33.html#sect\\_A.33.1](http://dicom.nema.org/medical/dicom/current/output/cht/html/part03/sect_A.33.html#sect_A.33.1)
- **規範中C.10.5 Graphic Annotation Module 定義**
  - 圖形註解(Graphic annotation)
    - 點(Point)、折線(Polyline)、內插值曲線(Interpolated)、
    - 圓形(Circle)、橢圓形(Ellipse)
  - 文字註解(Text annotation)
    - 文字粗體、斜體、位置類型
- **定義圖型標記類型、標記方式、文字註解位置**

# BMD “Reports” WHO recommendations

# BMD SR

- DICOM SR Report Export

No.	Group	El...	VR	Description	Value
211	0040	A043	SQ	Concept Name Code Sequence	+ Sequence +
212	0008	0100	SH	Code Value	1001
213	0008	0102	SH	Coding Scheme Designator	GELUNAR
214	0008	0104	LO	Code Meaning	BMD
215	0040	A300	SQ	Measured Value Sequence	+ Sequence +
216	0040	08EA	SQ	Measurement Units Code Sequence	+ Sequence +
217	0008	0100	SH	Code Value	g/cm <sup>2</sup>
218	0008	0102	SH	Coding Scheme Designator	UCUM
219	0008	0104	LO	Code Meaning	g/cm <sup>2</sup>
220	0040	A30A	DS	Numeric Value	0.695
221	0040	A010	CS	Relationship Type	CONTAINS
222	0040	A040	CS	Value Type	NUM
223	0040	A043	SQ	Concept Name Code Sequence	+ Sequence +
224	0008	0100	SH	Code Value	1002
225	0008	0102	SH	Coding Scheme Designator	GELUNAR
226	0008	0104	LO	Code Meaning	BMC
227	0040	A300	SQ	Measured Value Sequence	+ Sequence +
228	0040	08EA	SQ	Measurement Units Code Sequence	+ Sequence +
229	0008	0100	SH	Code Value	g
230	0008	0102	SH	Coding Scheme Designator	UCUM
231	0008	0104	LO	Code Meaning	g
232	0040	A30A	DS	Numeric Value	6.91
233	0040	A010	CS	Relationship Type	CONTAINS
234	0040	A040	CS	Value Type	NUM
235	0040	A043	SQ	Concept Name Code Sequence	+ Sequence +
236	0008	0100	SH	Code Value	1004
237	0008	0102	SH	Coding Scheme Designator	GELUNAR
238	0008	0104	LO	Code Meaning	Area
239	0040	A300	SQ	Measured Value Sequence	+ Sequence +
240	0040	08EA	SQ	Measurement Units Code Sequence	+ Sequence +
241	0008	0100	SH	Code Value	cm <sup>2</sup>
242	0008	0102	SH	Coding Scheme Designator	UCUM
243	0008	0104	LO	Code Meaning	cm <sup>2</sup>
244	0040	A30A	DS	Numeric Value	9.94
245	0040	A010	CS	Relationship Type	CONTAINS
246	0040	A040	CS	Value Type	NUM
247	0040	A043	SQ	Concept Name Code Sequence	+ Sequence +
248	0008	0100	SH	Code Value	1003
249	0008	0102	SH	Coding Scheme Designator	GELUNAR
250	0008	0104	LO	Code Meaning	T-score
251	0040	A300	SQ	Measured Value Sequence	+ Sequence +
252	0040	08EA	SQ	Measurement Units Code Sequence	+ Sequence +
253	0008	0100	SH	Code Value	1
254	0008	0102	SH	Coding Scheme Designator	UCUM



檔案(F)	編輯(E)	格式(O)	檢視(V)	說明(H)
L4				BMD = g/cm <sup>2</sup>
AP Spine				
L1				BMD = 0.695 g/cm <sup>2</sup>
				BMC = 6.91 g
				Area = 9.94 cm <sup>2</sup>
				T-score = -2.9 no units
				Z-score = 0.1 no units
L2				BMD = 0.554 g/cm <sup>2</sup>
				BMC = 4.61 g
				Area = 8.33 cm <sup>2</sup>
				T-score = -4.7 no units
				Z-score = -1.4 no units
L3				BMD = 0.642 g/cm <sup>2</sup>
				BMC = 6.25 g
				Area = 9.74 cm <sup>2</sup>
				T-score = -4.1 no units
				Z-score = -1.0 no units
L4				BMD = 0.668 g/cm <sup>2</sup>
				BMC = 9.38 g
				Area = 14.05 cm <sup>2</sup>
				T-score = -3.9 no units
				Z-score = -0.9 no units
L1-L4				BMD = 0.645 g/cm <sup>2</sup>
				BMC = 27.15 g
				Area = 42.07 cm <sup>2</sup>
				T-score = -3.9 no units
				Z-score = -0.8 no units
DualFemur				

# BMD Reporting

New Bone Densitometry Checklist Reporting Template

Page 1 | Page 2 |

Baseline  Serial Bone Mineral Density (BMD) quantification of [ ] -year-old  
 man  premenopause woman  postmenopausal woman (Menopause at [ ] -year-old)  
at multiple skeletal sites was performed using Dual-energy X-ray Absorptiometry scanner  
(  GE-Lunar Prodigy  GE-Lunar iDXA ), dated [ ] .

**Results:**

The Z-scores should be population specific, calculated by Combined NHANES / Lunar Normative Database.  
 The T-score Normative Database is calculated by using  
 Caucasian Combined NHANES (ages 20-29)  Lunar (ages 20-40) AP spine and Femur Reference Population.

- The BMD at Lumbar spine: average BMD at L1-L4 (L [ ] , L [ ] ) is [ ] g/cm<sup>2</sup>.  
(L [ ] , L [ ] ) not quantified due to artifact / osteophytes/ adjacent T-score > 1.0)

- The BMD at left proximal femur: femoral neck is [ ] g/cm<sup>2</sup> and total femur is [ ] g/cm<sup>2</sup>.  
 \* The Left proximal femur not quantified due to  artifact  surgical intervention.

- The BMD at Right proximal femur: femoral neck is [ ] g/cm<sup>2</sup> and total femur is [ ] g/cm<sup>2</sup>.  
 \* The Right proximal femur not quantified due to  artifact  surgical intervention.

- The BMD at  Left  Right non-dominant forearm: Radius 33% is [ ] g/cm<sup>2</sup>.

- VFA: No vertebral compression fracture is noted  
 - VFA: Compressive fracture at [ ] is noted.

- The lowest T-score is [ ]  
 - The lowest Z-score is [ ]

New Bone Densitometry Checklist Reporting Template

Page 1 | Page 2 |

Baseline  Serial **Densitometric assessment:**

- Complying with 2013 ISCD position, the BMD is defined as:  
 \* Within the expected range for age ( Z-score > -2.0 ).  \* Below the expected range for age ( Z-score ≤ -2.0 ), Cause to be determined.

- Vertebral compression fracture at [ ] , other fragility fracture at [ ]

- The BMD fulfills the WHO densitometric classification for  
 \* Normal BMD ( T-score ≥ -1.0 )  \* Low bone mass ( -2.5 < T-score < -1.0 ).  
 \* Osteoporosis ( T-score ≤ -2.5 ).  \* Established osteoporosis in presence of fracture.

- Since the T-score is between -1.0 and -2.5, so FRAX?10 year probability calculation of:  
 \* Any major osteoporosis-related fracture risk is [ ] %  \* Hip fracture risk is [ ] %

**Integrated Assessment:**

- There is no other available radiogram, especially lateral TL spine.  
 - There is no fragility fracture among the available radiograms.  
 - Clinical diagnosis of (Established) Osteoporosis due to the presence of T [ ] (G [ ] ), L [ ] (G [ ] )  
fracture complying with 2008 NOF Physician's Guide to Prevention and Treatment of Osteoporosis.

**Integrated Assessment:**

- The interval change of BMD is  significant  insignificant at [ ] %/yr (least  increased  decreased )  
as compared to BMD measured at baseline  Spine  Femur  
dated [ ]

Note: This significant difference is based on a LSC of [ ] g/cm<sup>2</sup> at the L1-L4 spine and [ ] g/cm<sup>2</sup> at the total hip.

Reporting



# Ultrasound “Reports”

Laterality = Left  
End Diastole: ICA/CCA = -0.69 no units  
Common Carotid Artery

Topographical Modifier = Distal  
Doppler Angle Correction = 60 degree of angle  
End Diastolic Velocity = 17.6 centimeter per second  
Peak Systolic Velocity = 47 centimeter per second  
Resistivity Index = 0.63 no units  
Systolic to Diastolic Velocity Ratio = 2.67 no units

Internal Carotid Artery

Topographical Modifier = Distal  
Doppler Angle Correction = 60 degree of angle  
End Diastolic Velocity = -17.6 centimeter per second  
Peak Systolic Velocity = -44.4 centimeter per second  
Resistivity Index = 0.6 no units  
Systolic to Diastolic Velocity Ratio = 2.52 no units

Common Carotid Artery

Topographical Modifier = Mid-longitudinal  
Doppler Angle Correction = 60 degree of angle  
End Diastolic Velocity = 15.7 centimeter per second  
Peak Systolic Velocity = 66.6 centimeter per second  
Resistivity Index = 0.76 no units  
Systolic to Diastolic Velocity Ratio = 4.24 no units

External Carotid Artery

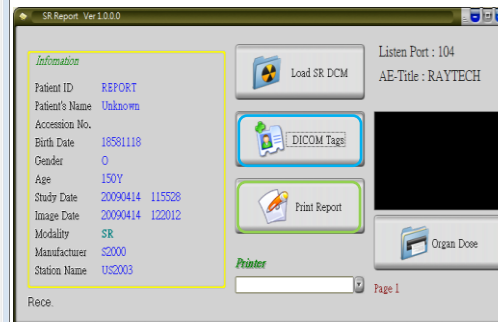
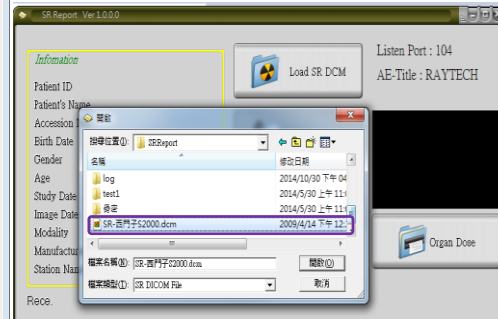
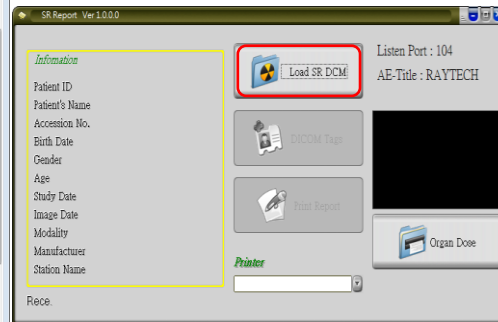
Topographical Modifier = Mid-longitudinal  
Doppler Angle Correction = 60 degree of angle  
End Diastolic Velocity = -11.1 centimeter per second  
Peak Systolic Velocity = -43.7 centimeter per second  
Resistivity Index = 0.75 no units  
Systolic to Diastolic Velocity Ratio = 3.94 no units

Internal Carotid Artery

Topographical Modifier = Mid-longitudinal  
Doppler Angle Correction = 60 degree of angle  
End Diastolic Velocity = -29.4 centimeter per second  
Peak Systolic Velocity = -58.7 centimeter per second  
Resistivity Index = 0.5 no units  
Systolic to Diastolic Velocity Ratio = 2 no units

Vertebral Artery

Topographical Modifier = Mid-longitudinal  
Doppler Angle Correction = 60 degree of angle  
End Diastolic Velocity = -18.9 centimeter per second  
Peak Systolic Velocity = -59.4 centimeter per second  
Resistivity Index = 0.68 no units  
Systolic to Diastolic Velocity Ratio = 3.14 no units  
Volume Flow = 0.007 liters per minute



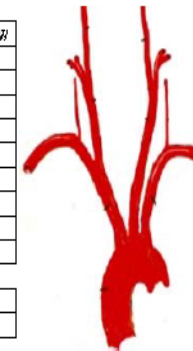
XXXX醫院  
神經內科腦血管超音波(Vascular Ultrasound)報告單

姓名: Unknown 性別: O 檢查日期: 2009/4/14 Duplex No:  
病歷號: REPORT 生日: 1858/11/18 報告醫師: CD 編號:  
年齡: 150Y 開單醫師: 檢查來源:

CLINICAL DIAGNOIS: Acute CVA  
Hypertension( - ), Diabetes( + ), Hyperlipidemia( + ), Heart disease( - )  
Smoking ( + ), Alcohol ( + ), Arrhythmia ( + )  
CT: Right MCA large-scaled infarction

Carotid Color Duplex	Rt.	P/E	Lt.	P/E
	Ophthalmic	/	Ophthalmic	/

Rt.	Diam	P/E	RI	Flow
ECA2	95	/ 24	0.75	
ECA1	59	/ 15	0.75	
ICA3	93	/ 49	0.47	
ICA2	65	/ 37	0.43	
ICA1	45	/ 24	0.47	
BIF				
CCA3	79	/ 32	0.59	
CCA2	85	/ 32	0.63	
CCA1	89	/ 26	0.70	



Lt.	Diam	P/E	RI	Flow
ECA2	44	/ 11	0.75	
ECA1	60	/ 16	0.74	
ICA3	44	/ 18	0.60	
ICA2	59	/ 29	0.50	
ICA1	78	/ 19	0.76	
BIF				
CCA3	47	/ 18	0.63	
CCA2	67	/ 16	0.76	
CCA1	80	/ 27	0.66	

Rt.	P/E
Subclavian	57 / 7

Lt.	P/E
Subclavian	77 / 18

Rt.	Diam	P/E	RI	Flow
VA2	0.27	47 / 20	0.58	60
VA1	0.34	61 / 17	0.72	104

Lt.	Diam	P/E	RI	Flow
VA2	0.18	59 / 19	0.68	7
VA1	0.23	58 / 18	0.70	33

FINDING :

- Color Duplex :
  - Moderate wall thickening and increased intima-media thickness at proximal and distal portion of bilateral CCA.
  - Long and short segments of faintly to moderately echogenic, partly calcified homogeneous plaques with smooth surface at right CCA, bilateral bulb and ECA, causing prominent turbulence pattern.
  - Dampened diastolic signals at bilateral CCA and ECA arteries with small caliber and short diastolic flow reflux indicate high grade distal stenosis, possibly in the intracranial portion.
  - The flow in the vertebral system (R+L = 155ml/min) is within average value. (reference 150-250 ml/min)
  - The right vertebral study shows transient reversed flow which are compatible with subclavian steal phenomenon.
  - Cardiac arrhythmia is noted.

2.Ophthalmic arteries :

- Normal velocity and direction.

# Clinical Data Registry

# Cathlab “Reports”

# 各式報告格式

## PCI

This screenshot shows a medical report form for a PCI procedure. The form includes fields for patient information, procedure details, and clinical information. Key sections include:

- Administration:** Date: 2017/7/14, ER: 人陳錦賢, Xylocaine: c.c., Total Procedure Time: min.
- Risk Factor / Body Surface:** DM, Hypertension, Hyperlipidemia, Family History, Smoking, Height: 164.4 cm, Weight: 59.7 kg.
- Member Details:** Chief Cardiologist: 宋君賢, Cardiology Fellow: 蔡秋霖, 吳廷傑, Technologist: 朱君賢.
- Clinical Information:** Indication: Primary PCI, IABP, Temporary Pacemaker, PPS, ECHO, CPR, Cardioresusc, Debrication, Endotracheal intubation, Ventilator, Pericardocentesis.
- Laboratory Data:** Exam: BUN, Creatine, Paper, Uric acid, TG, T Chol, HDL, LDL.

## Pacemaker

This screenshot shows a medical report form for a Pacemaker procedure. The form includes fields for patient information, procedure details, and clinical information. Key sections include:

- Administration:** Date: 2017/7/14, ER: 林君偉, Xylocaine: c.c., Total Procedure Time: min.
- Risk Factor / Body Surface:** DM, Hypertension, Hyperlipidemia, Family History, Smoking, Height: cm, Weight: kg.
- Member Details:** Chief Cardiologist: 吳大全, Cardiology Fellow: 劉明欽, Technologist: 吳明欽.
- Clinical Information:** Indication: Disconnected old lead and generator by using screw driver. E. Checking pacing, sensing, impedance, and 10-voltage stimulation parameters of old lead by using PSA. F. Lock the new generator to pacing lead and insert generator into subcutaneous pocket. G. Suture and close the wound by 7" needle holder. I. orops, and sissor. II. Post-procedure follow-up. 1, 2-leads ECG for evaluation about pacing and sensing function of PPM system. 2. Change dressing of the surgical wound and observation. 3. Direct wound compression for hemostasis with sandbag.
- Laboratory Data:** Exam: BUN, Creatine, Paper, Uric acid, TG, T Chol, HDL, LDL.

## EP

This screenshot shows a medical report form for an EP study. The form includes fields for patient information, procedure details, and clinical information. Key sections include:

- Administration:** Date: 2017/7/14, ER: 林君偉, Xylocaine: c.c., Total Procedure Time: min.
- Risk Factor / Body Surface:** DM, Hypertension, Hyperlipidemia, Family History, Smoking, Height: cm, Weight: kg.
- Member Details:** Chief Cardiologist: 林君偉, Cardiology Fellow: 李君賢, 李君賢, 李君賢, Technologist: 李君賢.
- Clinical Information:** Indication: V lead => Threshold: 1.1 V, Sensitivity: 15.3 mV, Imped: 858 ohms. E: 置入雙腔起搏器及永久性人工心臟起搏器. F: 關閉雙腔起搏器. G: 手術後注意事項: 1. 心臟置入後應觀察及感測功能. 2. 傷口換藥及觀察, 壓閉4小時.
- Laboratory Data:** Exam: BUN, Creatine, Paper, Uric acid, TG, T Chol, HDL, LDL.

## PTA

This screenshot shows a medical report form for a PTA procedure. The form includes fields for patient information, procedure details, and clinical information. Key sections include:

- Administration:** Date: 2017/7/13, ER: 吳廷傑, Xylocaine: 5 c.c., Total Procedure Time: min.
- Risk Factor / Body Surface:** DM, Hypertension, Hyperlipidemia, Family History, Smoking, Height: 163.2 cm, Weight: 72 kg.
- Member Details:** Chief Cardiologist: 吳廷傑, Cardiology Fellow: 蔡秋霖, Technologist: 李君賢.
- Clinical Information:** Indication: Primary PCI, IABP, Temporary Pacemaker, PPS, ECHO, CPR, Cardioresusc, Debrication, Endotracheal intubation, Ventilator, Pericardocentesis.
- Laboratory Data:** Exam: BUN, Creatine, Paper, Uric acid, TG, T Chol, HDL, LDL.

## Biopsy

This screenshot shows a medical report form for a Biopsy procedure. The form includes fields for patient information, procedure details, and clinical information. Key sections include:

- Administration:** Date: 2017/5/22, ER: 謝明峰, Xylocaine: 5 c.c., Total Procedure Time: min.
- Risk Factor / Body Surface:** DM, Hypertension, Hyperlipidemia, Family History, Smoking, Height: cm, Weight: kg.
- Member Details:** Chief Cardiologist: 李君賢, Cardiology Fellow: 蔡秋霖, Technologist: 朱君賢.
- Clinical Information:** Indication: Biopsy after adequate anesthesia, endotracheal biopsy was done via R2V with biptome. The patient tolerated the procedure smoothly. He was sent to ward for further care.
- Laboratory Data:** Exam: BUN, Creatine, Paper, Uric acid, TG, T Chol, HDL, LDL.

## Other

This screenshot shows a medical report form for an Other procedure. The form includes fields for patient information, procedure details, and clinical information. Key sections include:

- Administration:** Date: 2017/7/14, ER: 李君賢, Xylocaine: c.c., Total Procedure Time: min.
- Risk Factor / Body Surface:** DM, Hypertension, Hyperlipidemia, Family History, Smoking, Height: cm, Weight: kg.
- Member Details:** Chief Cardiologist: 李君賢, Cardiology Fellow: 蔡秋霖, Technologist: 李君賢.
- Clinical Information:** Indication: Severe stenosis at proximal LAD (about 90% stenosis). (SRV): ENLARGED RV, MILD SUB-PS WITH ANEURYSM FORMATION AT RVOT, ENGORGED MPA, ADEQUATE SIZE OF BRANCH PAs. DIAGNOSIS: (1)TETRALOGY OF FALLOT (w/ SURGICAL CORRECTION WITH NO RESIDUAL VSD (2)HSCOTRY OF SUPRAVALVULAR PS (w/ BALLOON DILATION (3)CAD: 1,NO WITH SEVERE STENOSIS AT PROXIMAL LAD (4)MILD IMPAIRED LV SYSTOLIC FUNCTION, LVEF=47%.
- Laboratory Data:** Exam: BUN, Creatine, Paper, Uric acid, TG, T Chol, HDL, LDL.

# 統計-業務量統計

統計作業 1. 統計區間

統計區間 2016/ 7/17 ~ 2017/ 7/17 查詢 產出報表 5. 匯出產生Excel表 離開

業務量統計 耗材統計 關鍵字搜尋 2. 統計類型

報告 處置 上傳報告 診斷類別 CAG檢查結果  
Cadiologist Fellow Technologist 3. 統計條件

#	病歷號	姓名	性別	報告日期	報告種類	處置	報告醫師	上傳時間
1	25509324	戴瑋君	女	2017/03/23	EP	AVNRT	鍾法博	2017-04-21 14:06:33
2	43552870	周松青	男	2017/03/27	EP	AVNRT	鍾法博	2017-04-21 13:57:10
3	38076163	鄧何生	男	2017/03/28	Pacemaker		趙子凡	2017-04-06 17:18:32
4	43754025	鄭東岳	男	2017/04/05	Cath	Diagnosis	林彥璋	2017-04-10 13:01:00
5	43754025	鄭東岳	男	2017/04/05	EP	AVNRT	林彥璋	2017-04-21 14:30:30
6	23873485	許淑貞	女	2017/04/06	Cath	Diagnosis	羅力璋	2017-04-10 12:54:49
7	23873485	許淑貞	女	2017/04/06	EP	AF	羅力璋	2017-04-21 13:57:07
8	41902209	何艾蓉	女	2017/04/10	EP	AVNRT	張世霖	2017-04-24 09:45:58
9	27275985	江惠恩	女	2017/04/10	EP	AVNRT	林彥璋	2017-04-24 09:46:33
10	35374357	曹栩綾	女	2017/04/10	EP	AVNRT	林彥璋	2017-04-24 09:46:58
11	27682673	林政雄	男	2017/04/11	Cath	Diagnosis	林彥璋	2017-04-14 10:09:11
12	27682673	林政雄	男	2017/04/11	EP	VT	林彥璋	2017-04-24 09:47:53
13	42625070	楊雅卿	女	2017/04/12	EP	AVNRT	羅力璋	2017-04-21 13:36:23
14	35097746	劉昌傑	男	2017/04/13	EP	AF	張世霖	2017-04-21 13:38:21
15	29027303	李雅文	男	2017/04/14	EP	AF	林彥璋	2017-04-24 13:16:48
16	41196365	王淵原	男	2017/04/17	EP	EPS	張世霖	2017-04-21 13:20:53
17	42963940	劉耕宇	男	2017/04/17	EP	VT	張世霖	2017-04-24 09:48:37
18	7797435	張家澤	男	2017/04/18	EP	EPS	鍾法博	2017-04-24 09:52:11
19	43762250	劉文典	男	2017/04/18	EP	AFL	林彥璋	2017-04-24 09:52:30
20	32068710	徐怡蓉	女	2017/04/19	EP	AFL	張世霖	2017-04-21 13:42:38

總數 80 筆 4. 統計筆數

# 統計-耗材統計

統計作業

1. 統計區間

統計區間 2016/ 7/17 ~ 2017/ 7/17

查詢 產出報表 離開

業務量統計 耗材統計 關鍵字搜尋

2. 統計類型

耗材 廠商 類型 (根據耗材或廠商而顯示) 資材碼 (根據耗材而顯示) 匯出Excel表

Stent

病歷號

3. 統計條件

#	病歷號	姓名	性別	報告日期	耗材種類	廠商	類型	Size	Length
1	14050045	劉金本	男	2017/03/21	Stent	Medtronic	Resolute integrity	3.0	38
2	14050045	劉金本	男	2017/03/21	Stent	Medtronic	resolute integrity	2.75	30
3	27932930	林經木	男	2017/03/21	Stent	BOSTON	Synergy	2.5	32
4	27932930	林經木	男	2017/03/21	Stent	BOSTON	Synergy	2.5	38
5	27932930	林經木	男	2017/03/21	Stent	BOSTON	Synergy	3.5	20
6	27932930	林經木	男	2017/03/21	Stent	BOSTON	Synergy	2.75	16
7	30966484	李立仁	男	2017/03/21	Stent	Biosensor	biomatrix neoflex	3.5	18
8	30966484	李立仁	男	2017/03/21	Stent	Biosensor	biomatrix neoflex	3.0	28
9	7796830	陳清文	男	2017/03/21	Stent	Abbott	Xience Xpedition	3.0	15
10	43397553	陳金龍	男	2017/03/22	Stent	Medtronic	Resolute integrity	3.5	30
11	15377114	陳添	男	2017/03/22	Stent	Abbott	xience xpedition	2.5	15
12	20364787	丁進登	男	2017/03/23	Stent	BOSTON	omega	4.5	16
13	20364787	丁進登	男	2017/03/23	Stent	Medtronic	resolute integrity	3.5	18
14	24049910	黃新平	男	2017/03/23	Stent	Abbott	Absorb	3.0	23
15	24049910	黃新平	男	2017/03/23	Stent	BOSTON	Synergy	2.5	16
16	22463656	陳美鳳	女	2017/03/23	Stent	Medtronic	Resolute integrity	2.5	26
17	23810799	吳鄒桂香	女	2017/03/23	Stent	Biosensor	Biomatrix neoflex	2.75	18
18	22871994	李印	男	2017/03/23	Stent	Abbott	XIENCE XPEDITION	2.75	18
19	17287024	王兩發	男	2017/03/23	Stent	Medtronic	Resolute integrity	4.0	34
20	41124018	陳明洲	男	2017/03/23	Stent	CARDIAC WALL STENT		7	40

4. 統計筆數

總數 822 筆

# 統計-關鍵字搜尋

統計作業 1. 統計區間

統計區間 2016/ 7/17 ~ 2017/ 7/17 查詢 產出報表 離開

業務量統計 耗材統計 關鍵字搜尋 2. 統計類型

搜尋位置 關鍵字  
Summary cto 3. 統計條件 5. 匯出Excel表

#	病歷號	姓名	性別	報告日期	欄位名稱	字串位置
1	30966484	李立仁	男	2017/03/21	Summary	-P: "CTO"
2	19731476	林盧桂玉	女	2017/03/22	Summary	70% stenosis, -PL: "CTO"
3	7664575	史玉耿	男	2017/03/24	Summary	12 atm. Due to the "CTO" lesion, a Xience Xpe
4	39539861	林信和	男	2017/03/24	Summary	-P: "CTO"
5	14352262	吳小冬	男	2017/03/24	Summary	to 14 barr. Due to "CTO" lesion, a Resolute I
6	43710721	林國文	男	2017/03/27	Summary	-M: "CTO" with autocolateral
7	20922285	林文榮	男	2017/03/27	Summary	-Os: "CTO"
8	20922285	林文榮	男	2017/03/27	Summary	-M: "CTO"
9	20922285	林文榮	男	2017/03/27	Summary	: 50% stenosis, -D: "CTO"
10	34050550	黃彩珊	女	2017/03/27	Summary	-PL: "CTO"
11	17159954	季長春	男	2017/03/28	Summary	-M: "CTO" with collaterals fro
12	43857198	陳清良	男	2017/03/28	Summary	"CTO"
13	7751191	孫萬愛蓮	女	2017/03/30	Summary	-Os: "CTO"
14	23798596	黃督汝	男	2017/03/31	Summary	-M: "CTO" ; -P: 40% stenosis
15	12213239	程延南	男	2017/04/01	Summary	-P: "CTO"
16	12213239	程延南	男	2017/04/01	Summary	o slide through the "CTO" leision of LAD with
17	43574192	林健雄	男	2017/04/05	Summary	eision and function "CTO"
18	39058065	彭湘森	男	2017/04/06	Summary	-M: "CTO"
19	43066133	李治宏	男	2017/04/10	Summary	functional "CTO".
20	43066133	李治宏	男	2017/04/10	Summary	M: functional "CTO"

總數 168 筆 4. 統計筆數



# 統計-Registry Form

統計作業

統計區間 2017/12/ 1 ~ 2017/12/21

查詢 產出報表 離開

業務量統計 耗材統計 關鍵字搜尋 病患資訊統計

年齡區間 歲 ~ 歲 性別 所有 報告 Cath

#	病歷號	姓名	性別	年齡	生日	體重	身高	收縮壓(檢查前)	舒張壓(檢查前)	Heart rate(檢查前)
49	38016976	張育傑	男	28	1989/11/20	88.8	175.4			
50	44111526	胡周俊明	男	67	1950/1/7	68.4	159.5			
51	20268148	董環治	女	67	1950/9/24	65.8	151.1			
52	32310499	何津根	男	69	1948/9/28	65.7	161.8			
53	24638446	楊正華	男	83	1934/1/10	77.5	0			
54	25505742	陳紀瑞蓮	女	88	1929/11/20	46.8	0			
55	16162199	管劉競衡	女	96	1921/3/15	68.8	0			
56	27076784	陳為柱	男	89	1928/9/12					
57	4571226	沈志明	男	91	1926/8/12	61.9	162			
58	29703706	林盟祐	男	48	1968/12/27	99.6	181.3			
59	1509837	歐陽杏如	女	68	1949/3/22	53.5	155			
60	11834847	方覺明	男	93	1924/9/23	69.6	152.6			
61	44221456	沈清龍	男	56	1961/9/11	64.3	0			
62	42397411	安後祺	男	50	1967/5/21	84.35	0			
63	2736358	林省城	男	86	1931/9/17	61.4	161.4			
64	32822814	楊仁祥	男	60	1957/7/8	72.2	172.9			
65	31545092	陳宇祥	男	26	1991/9/5	62.3	176.1			
66	13625928	林寶珠	女	55	1962/8/30	53	161			
67	34973814	王文雄	男	77	1940/1/4	79	160.1			
68	44240414	呂知剛	男	40	1968/7/27	80.5	0			

總數 194 筆

# Exercise ECG “Reports”

心電圖報告 <R201408120027>

**基本資料**

姓名 [Redacted]

病歷號碼 [Redacted] 20C

檢查單號 [Redacted] 6

性別 [Redacted]

年齡 [Redacted]

檢查日期 [Redacted] /12

開單醫師 [Redacted]

身分別 民眾

掛號類型 [Redacted]

檢查目的

DEMO

影像程式

暫存(F9)

上傳報告

離開(ESC)

刪除報告

**Pre-Exercise**

Pre-exercise ECG Standing BP [Redacted]

**Exercise Test**

	Stage I	Stage II	Stage III	Stage IV	Stage V	Stage VI
Time	03:00	03:00	03:00	03:00	01:33	
BP		158/74				

**Exercise Terminated Because**

Maximal effort  
 90% maximal heart rate obtained  
 ST Depression  
 Patient's chest pain  
 Patient can't follow up  
 Arrhythmia(specify) [Redacted]  
 Other (specify) [Redacted]

Dizziness  
 Dyspnea  
 Fatigue  
 Chest tightness

Total Time 13:33  
 Maximal Achieved Rate 148  
 Maximal Predicted Rate 163  
 90% Predicted Rate 147  
 Score [Redacted]

**Interpretation of exercise ECG**

Normal ECG at maximal effort : heart rate [Redacted]  
 Normal ECG at submaximal (90%) predicted heart rate  
 Normal ECG at "inadequate" heart rate of [Redacted]  
 Abnormal ST Junction and segment shift (three consecutive beats)

a. Junction [Redacted] mm  
 b. St segment :  Downsloping  Flat  Slowly Rasing [Redacted] (from J Point ti at least 0.08 seconds)  
 c. Lead's where changes seen Lead  I  II  III  aVR  aVL  aVF  V1  V2  V3  V4  V5  V6 [Redacted]

ST junction depression but segment normal (probably a normal response)  
 Other (specify) [Redacted]

Conclusion [Redacted]

報告醫師 張 [Redacted] 總醫師 潘 [Redacted] 醫檢師 譚 [Redacted]

開始 健保IC卡 V3.0 臺中榮總全球... 欣欣道歡 3千... 運動心電圖... 醫檢師專業具... TMEKG WORKLIST搜... 桌面 下午 03:38

# Breast MRI CAD “Reports”

```

</value title="Mass (Finding Volume)" />
- <value title="Mass" type="composite" columns="2">
  <value title="Assessment Category" type="enumerated">Category 6 - Known biopsy-proven malignancy</value>
  - <value title="Segmentation Finding" type="composite">
    
    - <value title="Quadrant Description" type="composite" columns="1">
      <value title="Laterality" type="enumerated">Left</value>
      <value title="Quadrant" type="enumerated">Lower/Inner</value>
    </value>
    - <value title="Diameters" type="composite" columns="1">
      <value title="Principal Axis 1" type="string">3.3 cm</value>
      <value title="Principal Axis 2" type="string">2.1 cm</value>
      <value title="Principal Axis 3" type="string">1.7 cm</value>
    </value>
    - <value title="Distances" type="composite" columns="1">
      <value title="Distance to Nipple" type="string">5.5 cm (Distance modified by user)</value>
      <value title="Distance to Skin" type="string">1.2 cm</value>
      <value title="Distance to Chest Wall" type="string">4.7 cm</value>
    </value>
    <value title="Volume Composition" type="string">Center: 69.71,-46.73,17.78 Total enhancing volume: 2.60 cc Initial Phase (60%,150%,200%): 80.0 %
    Slow Enhancement 17.0 % Medium Enhancement 2.9 % Rapid Enhancement Delayed Phase (-20%,20%): 56.8 % Persistent Enhancement 38.0 %
    Plateau Curve 5.3 % Washout Curve</value>
    <value title="Enhancing Volume" type="string">2.60 cc</value>
    <value title="Finding Volume" type="string">3.33 cc</value>
    <value title="Comment" type="string">= Lobulated irregular-margin enhancing grouped nodules or invasive carcinoma in the left lower inner quadrant,
    between 08-09 O'clock, middle 1/3 in depth, 5.5 cm from nipple; Approximate 3.3cm in assessment. = Associated with duct dilation. = Ipsilateral
    axillary adenopathy</value>
  </value>
  <value title="Shape" type="enumerated">Lobular</value>
  <value title="Margin" type="enumerated">Irregular</value>
  <value title="Enhancement" type="enumerated">Heterogeneous</value>
- <value title="Kinetic Curve Assessment" type="composite">

```

Category 6 - Known biopsy-proven malignancy

**Segmentation Finding**

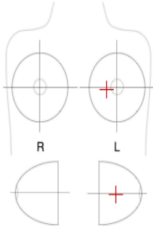


Figure 1: Location Markers

**Quadrant Description**  
**Laterality** Left  
**Quadrant** Lower/Inner

**Diameters**  
**Principal Axis 1** 3.3 cm  
**Principal Axis 2** 2.1 cm  
**Principal Axis 3** 1.7 cm

**Distances**  
**Distance to Nipple** 5.5 cm (Distance modified by user)  
**Distance to Skin** 1.2 cm  
**Distance to Chest Wall** 4.7 cm

**Volume Composition**  
Center: 69.71,-46.73,17.78  
Total enhancing volume: 2.60 cc  
Initial Phase (60%,150%,200%): 80.0 %  
Slow Enhancement 17.0 %  
Medium Enhancement 2.9 %  
Rapid Enhancement Delayed Phase (-20%,20%): 56.8 %  
Persistent Enhancement 38.0 %  
Plateau Curve

**Enhancement** Heterogeneous  
**Kinetic Curve Assessment**  
**Initial Rise** Rapid  
**Delayed Phase** Washout

**Kinetic Curve Values**  
**Enhancement Curve Values**  
Voxel:L74.9,A42.2,H17.4 Average 3x3  
Time Time in Sec. abs. Value rel. Value  
0 0 s 35 AU 0 %  
1 106 s 125 AU 260 %  
2 165 s 104 AU 199 %  
3 225 s 90 AU 159 %  
4 285 s 86 AU 148 %  
5 345 s 69 AU 100 %

**Peak Value**  
Peak Enhancement:  
260 %

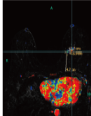


Fig. 2: Mass Location

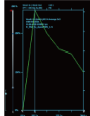


Fig. 3: Mass Curve

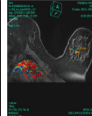


Fig. 4: Mass Principal Axis 1

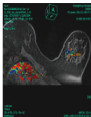


Fig. 5: Mass Principal Axis 2

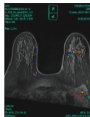


Fig. 6: Mass Principal Axis 3

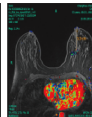


Fig. 7: Mass Distance To Nipple

# FHIR Standard



**F**ast (to design & implement)

**H**ealthcare

**I**nteroperability

**R**esources

# Emerging standards make “apps” a reality



- FHIR = “Fast Health Interoperability Resources”
- A standard for accessing health care data (“Resources”)
- RESTful API design leverages Internet standards (HTTP, etc.)
- Created by Health Level 7 International (HL7)
- Emerging support by most major HIT providers (e.g., Argonaut Project)
- Meets EHR Certification for MU3



- SMART = “Substitutable Medical Applications and Reusable Technology”
- A SMART App is a Web App
  - HTML5 + JavaScript
  - Typically embedded in EHR
- EHR Data Access is via FHIR
- OAuth2 for security and context passing
- Also supports smart-phone and patient-controlled apps



Mobile Solutions Change the World

# Patient Information Verification for Bedside Monitor





病歷號

T15120402



病床位置

請掃描病床的條碼



病歷號：

T15120402

患者姓名：

性別：

床號：

生日：

監視器號：

傳送



病歷號：

99999999

患者姓名：

測○患者

性別：

男

床號：

3T22-1

生日：

1958/12/21

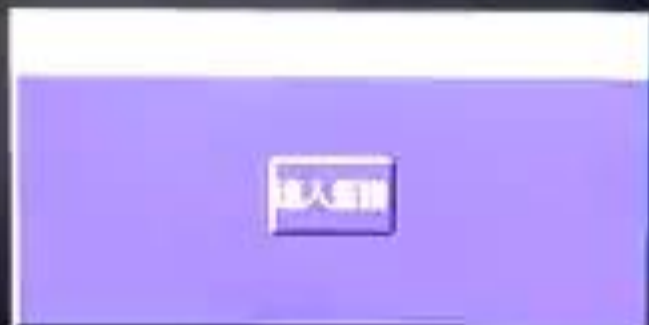
監視器號：

傳送

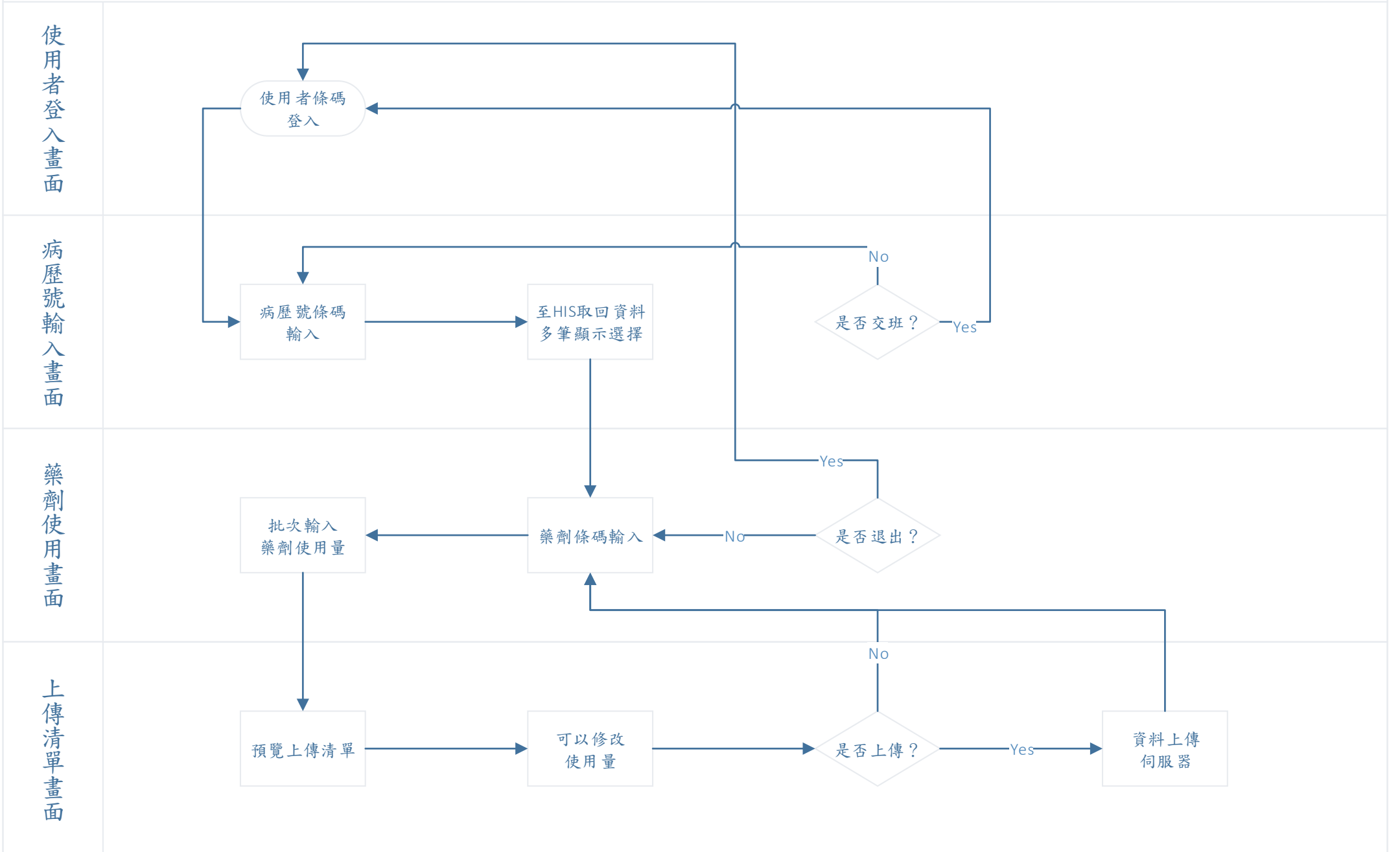
CCU00

成人

空床



# Patient Information Verification for AIMS



# 登入畫面

掃描個人識別條碼(QR code)

Login

Username

掃描



當前版本0.9.9





# 掃描病患條碼

確認資料無誤後按[確定]

User: TTT

## Patient ID

掃描

Name:

Birth Date:

Sex:

OP\_NO

確定

取消

# 病患資料顯示

利用病歷號串連開刀房開單簽收資料

User: TTT

## Patient ID

掃描

Name:	王大明
Birth Date:	02-10月-17
Sex:	1
OP_NO	123456

確定

取消

# 掃描藥物條碼

條碼上含有麻醉藥物所有重要資訊

User: TTT



88888888 王大明

## SLS Barcode

掃描

Drug Name:

Concentration:

Expired  
Date/Time:

Diluent:

Inject dose:

Total dose:

儲存

取消

結束

# 輸入注射劑量

會根據濃度計算真實劑量

User: TTT



88888888 王大明

## SLS Barcode

掃描

Drug Name: hydrocortisone

Concentration: 1.5mg

Expired Date/Time: 2020-05-01 11:23:00

Diluent: None

Inject dose:  ml

Total dose: 1.5

儲存

取消

結束

# 送出正確數據

提供修改及刪除功能

## Drug List

88888888 王大明

Drug Name: hydrocortisone

Expired Time: 2020-05-01 11:23:00

Diluent: None

Inject dose: 1 ml

**Total dose: 1.5**

更改劑量

刪除

繼續

傳送

取消

# Point-of-Care Tools for RTMS

# 呼吸治療管理系統

使用者 ID  密碼



呼吸器使用紀錄

病歷資料：

病歷號 123

姓名 測試員 年齡 51

性別 男 出生日期 1964/10/02

病房 病床

收案資料：

收案號 開單號 開單醫師 ???

收案日 收案科別 開始使用日期 2015/9/30 10:23:37

病患來源

呼吸治療分類 使用原因 中樞神經病變

儀器種類 3100A 儀器編號

診斷

理學檢查

呼吸器使用紀錄 工作清單

123

測試員 (男)

生日: 1964/10/02

科室: META

12345678

陳豐 (男)

生日: 1973/03/17

科室: CS

7777777

小羅女 (女)

生日: 1998/10/28

科室: AIR

登入者：

RT收案

藥物吸入治療

動態波形顯示

呼吸器使用紀錄

呼吸訓練或復原

登出

呼吸紀錄

呼吸器設定	呼吸指數監測	自呼生理指標	檢驗數據	換管紀錄
Type of Ventilator		Mode of Ventilation		
Tidal Volume		Pressure level PCV / PSV		
FiO <sub>2</sub> / PEEP		Sensitivity / Cuff pressu		
Peak Flow / Rate		Pressure Limit H / L		
Ti / I:E ratio		Volume Limit V / V		

RT收案

侵襲式 非侵襲式

意識狀態  不清楚

氣管內管種類

氣管內管內徑

RT收案 確定要送出?

RT收案 工作清單

87654321

愛麗絲·德拉·埃克托爾 (女)

生日: 1994/03/27

科室: 夢遊仙境

RT收案 工作清單

87654321

愛麗絲·德拉·埃克托爾 (女)

生日: 1994/03/27

科室: 夢遊仙境

RT收案

病歷資料：

病歷號 35215783

姓名 中神通 年齡 74

性別 男 出生日期 1940/06/21

病房 03A 病床 2-2

收案資料：

收案號 201504150001 開單號 ABC12345

收案日 2015/04/15

收案科別 AIR 開始使用日期 2015/9/30 10:23:37

病患來源 O1 門急診 呼吸治療分類 侵襲式

使用原因 中樞神經病變 儀器編號 1234

儀器種類 3100A

診斷

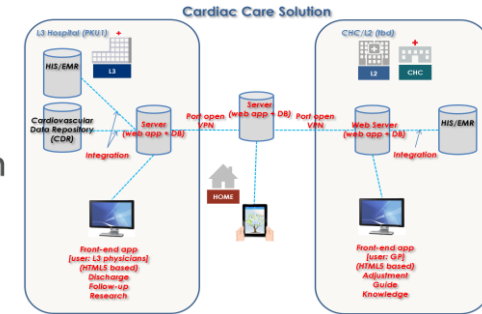
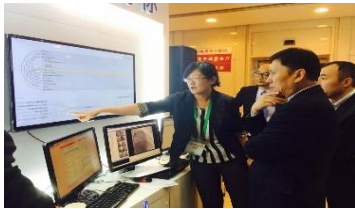
體溫 37.1 脈搏 73 次/分 呼吸 次/分

IT Plays a key role



# Infrastructural IT Vendor

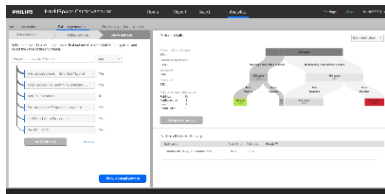
# Create Value from Data (across the Health Continuum)



Deployment    Data Acquisition

Knowledge

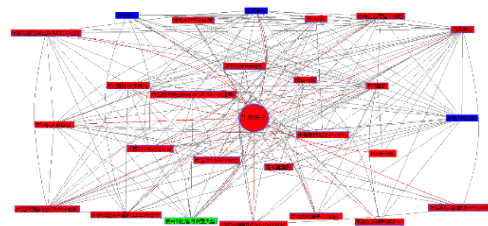
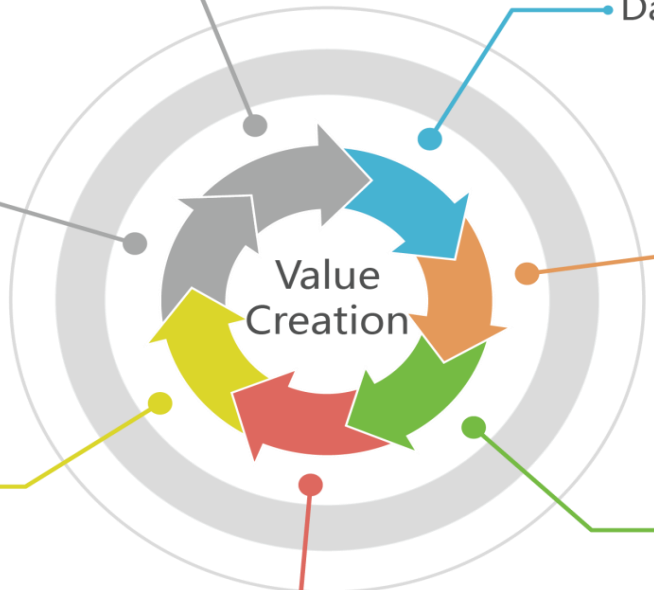
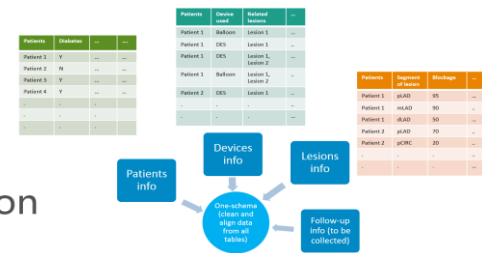
Data Normalization  
( One-Schema )



Data Visualization

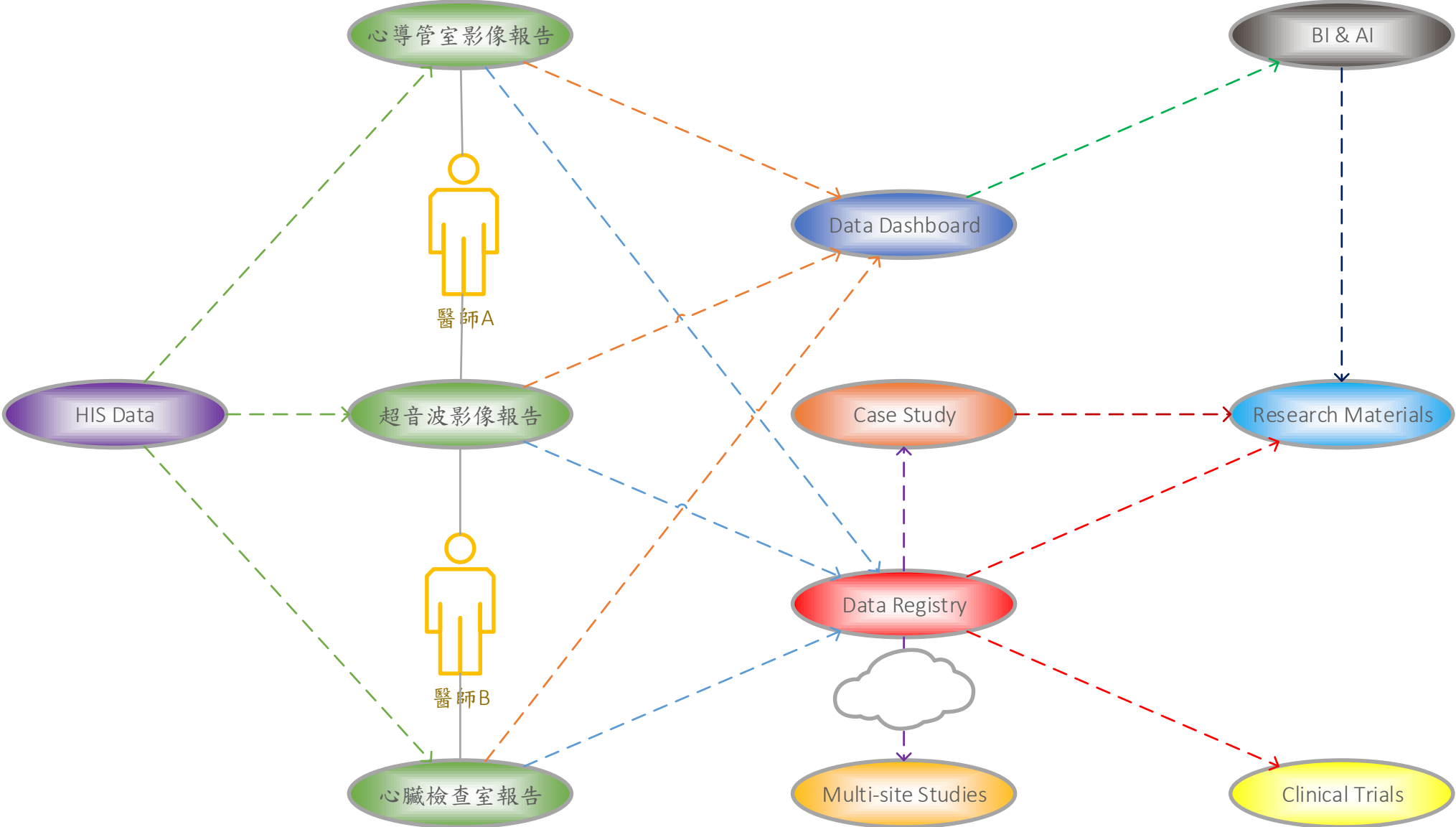
Data Validation

Data Analytics



# System Architect & Coordinator

# 台北榮民總醫院心臟內科大數據規劃示意圖



健保及自費量

年 < 2018 > 年 查詢

主治醫師: 總醫師: 放射師:

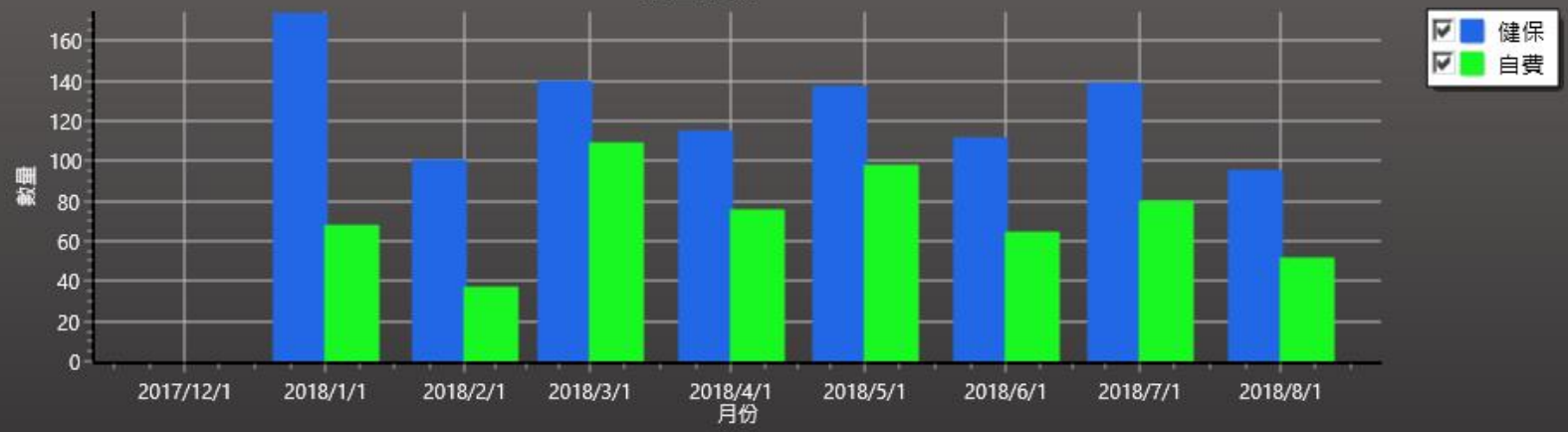
Stent使用總數: 1593



病患 Stent使用總數: 870



數量統計



健保清單

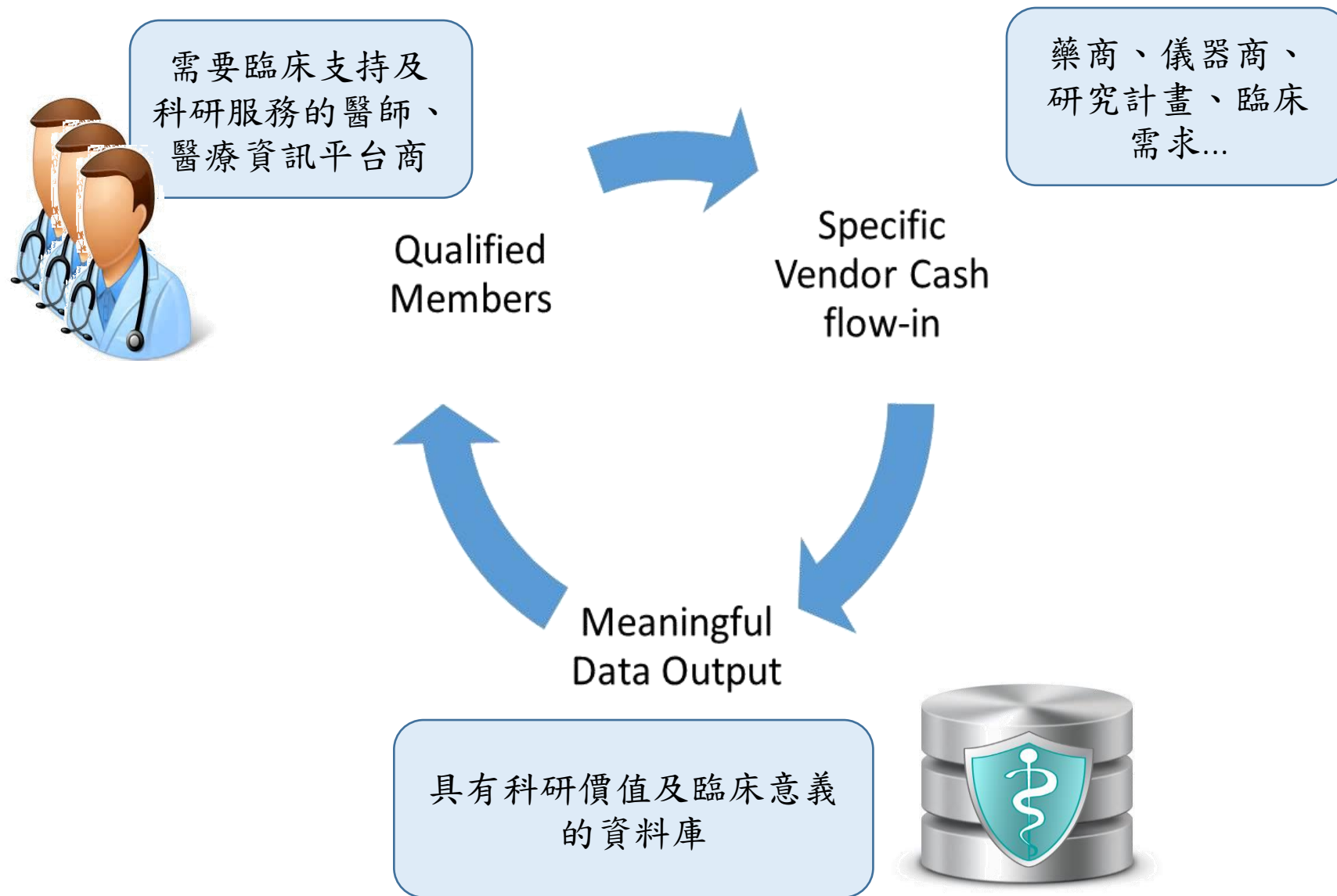
Abbott	307
Biotronic	4
ABBOTT/IREL...	52
BIOTRONIK/S...	2
BOSTON	232
ELIXIR	17
Cook	2
HexaCath	3

自費清單

Abbott	99
Biotronic	1
ABBOTT/IREL...	14
BOSTON	82
ELIXIR	5
Cook	1
Medtronic	117
Meril	43

Data Visualization

# 醫療物聯網的生態圈



羊毛出在狗身上，由豬來買單

Believing is Seeing

有堅定信念方能創造未來