

第19回IHEワークショップin愛知
愛知医科大学

IHE

『DICOM接続の問題点』

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本日のMENU

- DICOM復習
- DICOM委員会活動
- 接続事例集(DICOM委員会)
- 接続問題点
- まとめ



DICOM

(Digital Imaging and COmmunication in Medicine)

適応範囲

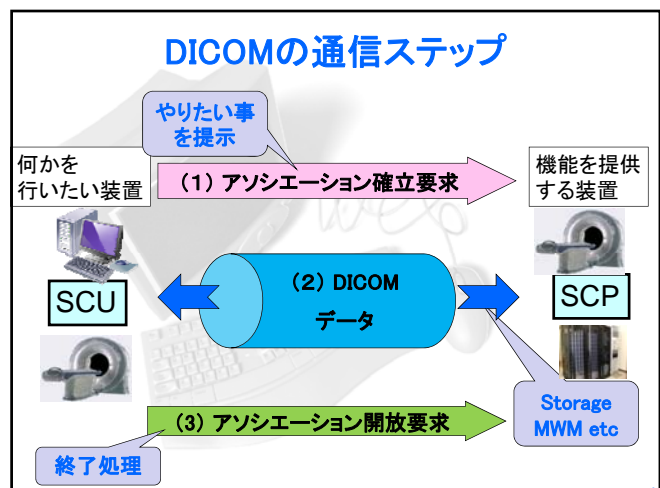
- 画像通信
- 文字情報
- レポート
- メディア交換

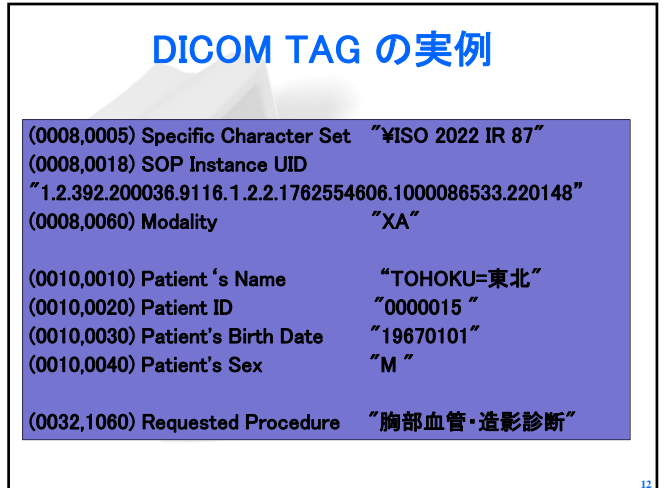
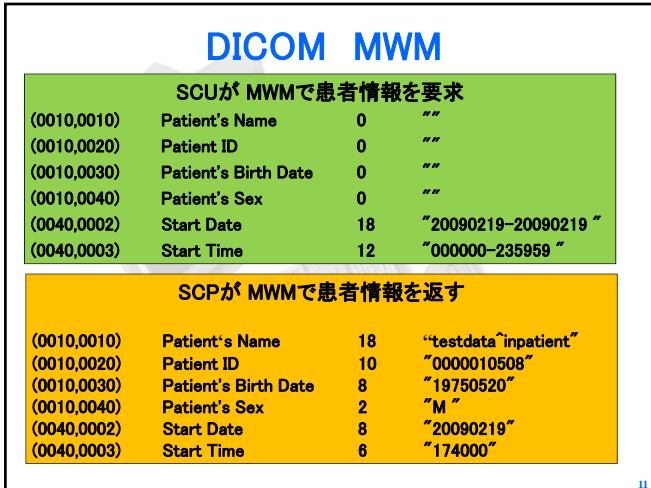
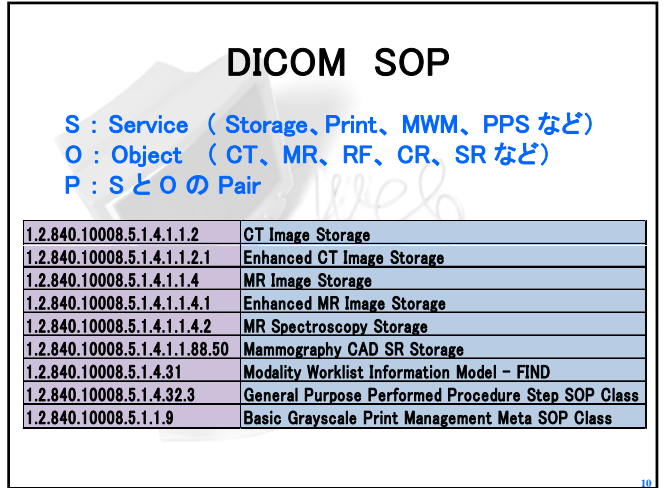
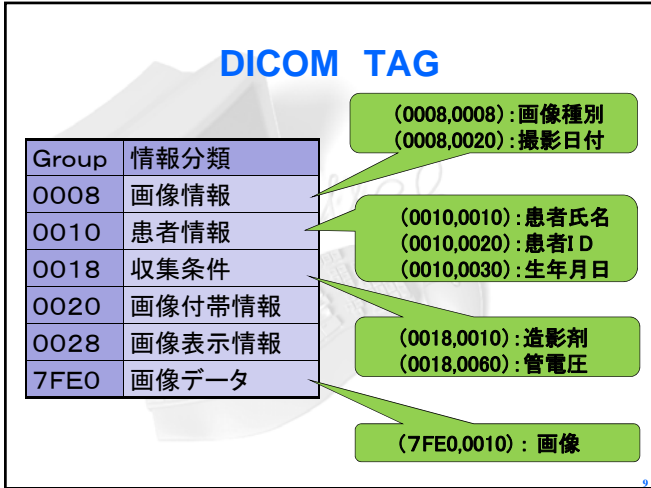
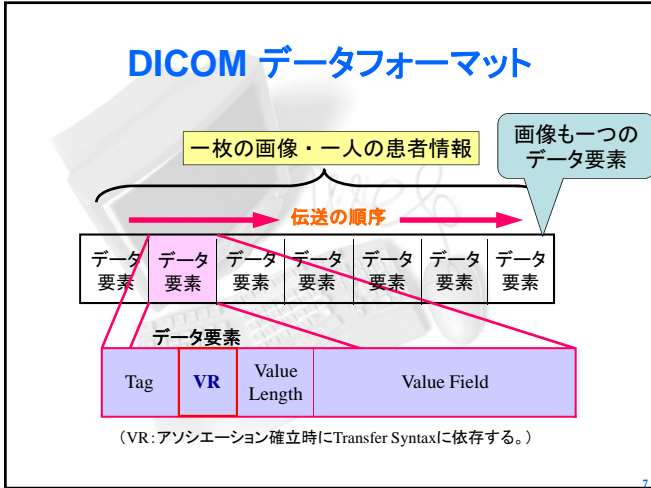
DICOM規格を読む

- PS 3.1 Introduction and Overview
- PS 3.2 Conformance
- PS 3.3 Information Object Definitions
- PS 3.4 Service Class Specifications
- PS 3.5 Data Structures and Encoding
- PS 3.6 Data Dictionary
- PS 3.7 Message Exchange
- PS 3.8 Network Communication Support for Message Exchange
- PS 3.10 Media Storage and File Format for Data Interchange

DICOM規格を読む

- PS 3.11 Media Storage Application Profiles
- PS 3.12 Media Formats and Physical Media for Data Interchange
- PS 3.14 Grayscale Standard Display Function
- PS 3.15 Security Profiles
- PS 3.16 Content Mapping Resource
- PS 3.17 Explanatory Information
- PS 3.18 Web Access to DICOM Persistent Objects(WADO)





Conformance Statement

DICOM適合性宣言書(C/S)

- 実際にシステムを組む場合、それぞれの装置がどんな機能を持っているかを調べるには C/S を見る。
- 各社のホームページで機種・ソフトウェア別に C/S が公開されている。

C/S の使い方

- (1) 運用ワークフローを満たすデータの流が C/S に書いてあることを確認する。
 - なければデータは出力はNG/データを受け取れない。
- (2) C/Sを基に出力するデータの詳細を決める。
 - どんなヘッダ情報(タグ)が存在するか
 - 漢字は使えるか
- (3) データ交換の内容に合わせて運用の詳細を決める。
 - 自動配送、自動表示、など

C/S の使い方

●IMPLEMENTATION MODEL

提供機能が図示してある

●AE SPECIFICATIONS

その装置固有のIDや機能の詳細が書いてある
(データ形式、エラーコードなど)

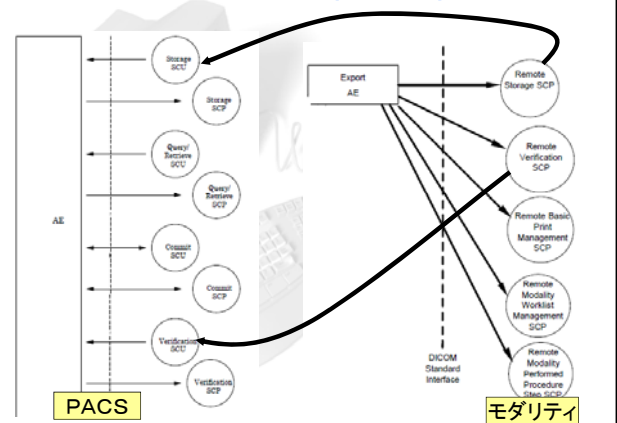
●CONFIGURATION

リトライ回数やタイムアウト時間など

●CHARACTER SETS

日本語が使えるか などが書いている

IMPLEMENTATION MODEL



CHARACTER SETSの例

8.1. Character Sets

Besides the DICOM default character repertoire, ISO 646 Latin Alphabet (ISO-IR 6), the following character sets are supported:

- ISO 8859 Western Europe Supplementary Set 1 (ISO-IR 100)
- JIS X 0201 Japanese Katakana and Romaji (ISO-IR 13 and ISO-IR 14) (only for the patient name)
- JIS X 0208 Japanese Kanji and Hiragana (ISO-IR 87) (only for the patient name)
- JIS X 0212 Japanese Kanji supplementary set (ISO-IR 159) (only for the patient name)

6. SUPPORT OF CHARACTER SETS

This product supports the following character sets:

- ISO-IR 6 (default) ISO 646
- ISO-IR 100 (Latin alphabet No.1) Supplementary set of ISO 8859
- ISO-IR 13 (Japanese)(Option) JIS X 0201 (Katakana)
- ISO-IR 14 (Japanese)(Option) JIS X 0201 (Romaji)
- ISO-IR 87 (Japanese) JIS X 0208 (Kanji)

DICOMにおける日本語対応

- 各国の文字言語に対応すべく **National Extension** が定義されている。

1) ASCIIとその文字間を移行する決まり

➢ ISO 2022 なる **ESC シーケンス**を使う

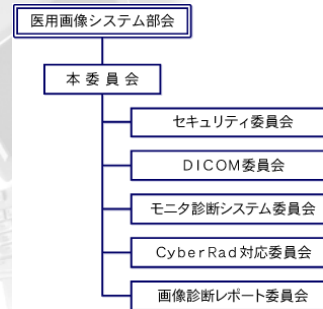
2) その文字を表現する決まり

➢ 国ごとに指定する (ISOで定義されている)

DICOM規格で登録されている 各国文字種

Character Set Description	Defined Term
Default repertoire	ISO 2022 IR 6
Latin alphabet No. 1	ISO 2022 IR 100
Latin alphabet No. 2	ISO 2022 IR 101
Latin alphabet No. 3	ISO 2022 IR 109
Latin alphabet No. 4	ISO 2022 IR 110
Cyrillic	ISO 2022 IR 144
Arabic	ISO 2022 IR 127
Greek	ISO 2022 IR 126
Hebrew	ISO 2022 IR 138
Latin alphabet No. 5	ISO 2022 IR 148
Japanese	ISO 2022 IR 13
Thai	ISO 2022 IR 166
Japanese	ISO 2022 IR 87
Japanese	ISO 2022 IR 159
Korean	ISO 2022 IR 149

(社)日本画像医療システム工業会 JIRA DICOM委員会



JIRAのHP



DICOM接続に関わる事例

1. 概要

医用機器相互の接続方法としてデファクト標準となっているDICOMであるが、規格の複雑さや曖昧さ、更には装置にDICOM機能を実装する各社の規格への理解のばらつきなどから 現実にはうまくつながらない例も見られる。

本書では JIRA DICOM委員会が収集したDICOM接続に関わる事例を基にその原因を分類した。またあるべき姿についてもいくつか言及している。

DICOM接続に関わる事例

2. 事例の収集方法

DICOM委員会メンバー(医用機器のユーザおよびベンダ)が日ごろの業務で体験したDICOM接続に関する問題事例を募集した。個々の事例についてはできるだけ詳細な情報の提供をお願いしたが、集まった事例の内容の詳細さにはかなりのばらつきがあった。

3. 事例の解析方法

DICOM委員会の中に事例解析サブワーキンググループを設置し、資料の回覧という形式でコメントを蓄積し最終的に本紙にまとめた。

Mammography Image の例

表示の例



- 指定通りの画像の並び順。
- 指定通りの画像の方向。

乳房画像(モンモグラフィ)の切り分け

● SOP Class UID(0008,1150)

- 1.2.840.10008.5.1.4.1.1.1.2 : Digital Mammography X-Ray Image Storage - For Presentation
- 1.2.840.10008.5.1.4.1.1.1.2.1 : Digital Mammography X-Ray Image Storage - For Processing

乳房画像(モンモグラフィ)の切り分け

● SOP Class UID(0008,1150)

- 1.2.840.10008.5.1.4.1.1.1 : CR Computed Radiography Image Storage - For Presentation
- 1.2.840.10008.5.1.4.1.1.1.1 : CR Computed Radiography Image Storage - For Presentation

DICOM Tag

R : DICOMでもIHEでも必須

R+ : DICOMでは必須ではないが、IHEでは必須

RC+ : DICOMでは必須ではないが、IHEでは条件付必須(DICOMの1Cと同等)

DICOM Tagがあればいいという訳ではなく、値がDICOM規格にあった形で入っていないとダメ。

DICOM Tag

DIC Technical Framework - MAMMO Profile Draft for Final Implementation

Table 4.8.4.1.2.1. Required Additional Attributes in Mammography Images

Attribute	Tag	DR	CR	File	Rationale
Patient's Name	(0010,0010)	R+	R+		Used for identification during display.
Patient ID	(0010,0020)	R+	R+		Used for identification during display.
Patient's Birth Date	(0010,0030)	R+			Used for identification during display.
Patient's Age	(0010,1010)	R+			Used for identification during display.
Acquisition Date	(0008,0020)	R+	R+		Used for identification during display.
Acquisition Time	(0008,0030)	R+	R+		Used for identification during display.
Operator's Name	(0018,1070)	R+			Used for identification during display.
Manufacturer	(0018,0070)	R+			Used for quality control display.
Institution Name	(0008,0050)	R+			Used for identification during display.
Institution Address	(0008,1001)	R+			Used for quality control display.
Manufacturer's Model Name	(0018,1090)	R+			Used for quality control display.
Device Serial Number	(0018,1080)	R+			Used for quality control display.
Detector ID	(0018,7010)	R+			Used for quality control display. This attribute in the Mammography DICOM defines the location in the CR, DR, or Flat-Panel or Computed CR for a CR mammography image.
Software Version	(0018,1030)	R+			Used for CAD systems to be able that processing is appropriate to the software version that created the image.
Station Name	(0008,1010)	R+			Used for identification of the system that acquired the image during display.
Station ID	(0008,1020)	R+			Used for identification of the system that acquired the image during display.
Station ID	(0008,1020)	R+			Used for identification of the system that acquired the image during display. Required for images acquired by CR, since the Station Name (0008,1010) will already identify the acquisition device.
Source Image Sequence	(0008,1012)	R+			Specifies other image sequences to apply CAD results to the presentation image when CAD was performed on the processing images.
Original Image Orientation	(0028,0104)	R+			Specifies other image sequences to apply CAD results to the presentation image when CAD was performed on the processing images, see also DICOM CP 94. Shall be "1102" only if a 90 degree rotation of the image pixel data has been performed.
View Type	(0018,0040)	R+			Used for display of the MLO technical factor.
View Type	(0018,1152)	R+			Used for display of the CC technical factor.
View Type	(0018,1150)	R+			Used for display of the spot view technical factor.
View Type	(0018,1160)	R+			Used for display of the magnification view technical factor.
View Type	(0018,1182)	R+			Used for display of the magnification view technical factor.
Study Date	(0008,1140)	R+			Used for display of the acquisition date technical factor.
Study Time	(0008,1150)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1160)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1170)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1180)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1190)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1200)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1210)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1220)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1230)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1240)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1250)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1260)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1270)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1280)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1290)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1300)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1310)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1320)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1330)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1340)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1350)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1360)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1370)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1380)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1390)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1400)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1410)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1420)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1430)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1440)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1450)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1460)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1470)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1480)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1490)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1500)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1510)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1520)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1530)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1540)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1550)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1560)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1570)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1580)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1590)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1600)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1610)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1620)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1630)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1640)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1650)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1660)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1670)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1680)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1690)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1700)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1710)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1720)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1730)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1740)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1750)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1760)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1770)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1780)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1790)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1800)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1810)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1820)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1830)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1840)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1850)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1860)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1870)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1880)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1890)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1900)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1910)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1920)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1930)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1940)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1950)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1960)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1970)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1980)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,1990)	R+			Used for display of the acquisition time technical factor.
Study Time	(0008,2000)	R+			Used for display of the acquisition time technical factor.

DICOM Tagの利用

Patient Orientation (0020,0020)

MLO, ML画像で、どちらが頭側かを判断

Image Laterality (0020, 0062)

CC画像で、頭→足か、足→頭で撮影

View Code Sequence (0054, 0220)

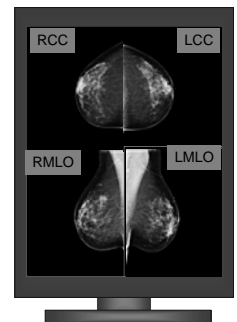
表示用に見えるコード

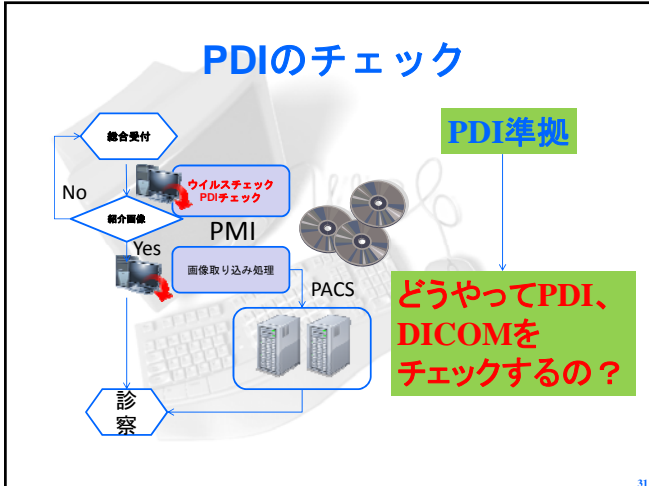
View Modifier Code Sequence (0054, 0222)

表示用に見えるコード

DICOM TAGが満たされれば

- View Type (CC vs. MLO)
- Specialty View Type (Spot, Mag)
- Laterality
- Patient Orientation





DICOM Tagが正確に入っていることが絶対条件

- Modalityは値を正しく入れる必要がある。
- Viewerは正しくそれを読み取って表示する。

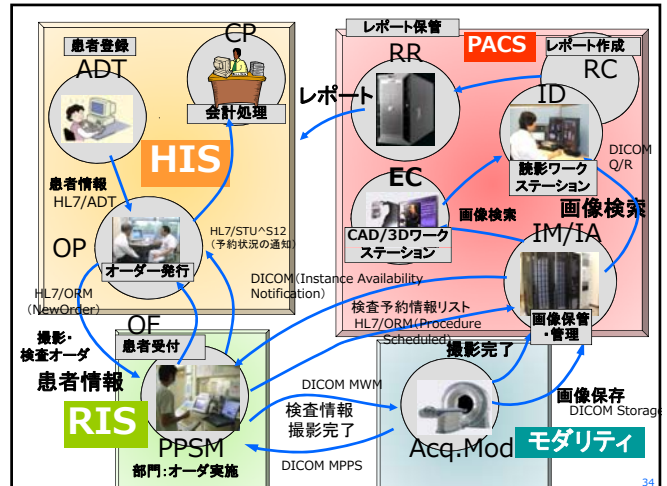
DICOMだけではNG

基本的な業務シナリオ (IHE が決めている プロファイル)

入札仕様 :

- ・ 検査及び患者情報を受け取ること
- ・ 検査終了後 検査結果を報告すること
- ・ 生成した画像に患者情報を付帯させること
- ・ 生成した画像を画像サーバーに送信すること
- ・ 画像サーバーに画像の保管確認をすること

→ IHE プロファイルの SWF(Standard Work Flow) に対応していること



まとめ

- DICOMだけでは接続、連携問題のすべてが解決しない。
- ユーザの知識向上が必要
- IHEを利用する。

情報提供

DICOM
 NEMA: <http://medical.nema.org/medical/dicom/2008/>
 JIRA : <http://www.jiranet.or.jp/commission/system/index.html>

IHEプロファイル
 IHE: <http://www.ihe.net/profiles/index.cfm>
 IHE-J : <http://www.ihe-j.org/material/index.html>

装置各社のホームページから 各装置の DICOM: Conformance Statement(C/S) が入手できる