Portable Data for Imaging - PDI
PDI – The Landscape

- Film is dead
- Ordering physicians need electronic replacement for film
- Transfer and referral of patients to other physicians and facilities need electronic replacement for film
- Cross-enterprise network sharing is not here yet
- The most widespread media choice is CD
PDI - The Problems

In the film world, looking at images was easy; in the digital world, this has been complicated

- Can I read the CD?
- Can I view the images?
- Can I import the images?
PDI – The Problems

- **Barriers to viewing**
  - On-board viewer may not execute, or not be adequate, or not be familiar to user
  - Non-standard or poorly implemented standard media may fail to be readable by previously installed viewer

- **Barriers to import**
  - Non-standard media, incorrectly implemented standards
  - Difficulty of reconciling different patient identifiers
PDI – The Solution

- **PDI goal**
  - is to increase the chances that the contents of the CD can be viewed and imported

- **Single solution**
  - for both viewing and import use cases
  - because sender can’t anticipate recipient's needs

- **Standards-based solution**
  - existing DICOM standard CD is the basis of PDI
  - PDI adds constraints to maximize the chances
  - PDI adds features to support easier access
PDI – The Solution

- **PDI add constraints**
  - Only uncompressed images
  - Only CD media
  - Some restrictions on layout

- **PDI adds features**
  - Explanatory text files
  - Security good practices
  - Optional executable on-board viewer
  - Optional “web content”, viewable in browser
  - Physical labeling recommendations
The importance of a statement by the American Medical Association Expert Panel on Medical Imaging:

“All medical imaging data distributed should be a complete set of images of diagnostic quality in compliance with IHE-PDI.”

The panel emphasized that:

“This standard will engender safe, timely, appropriate, effective, and efficient care; mitigate delayed care and confusion; enhance care coordination and communication across settings of care; decrease waste and costs; and, importantly, improve patient and physician satisfaction with the medical imaging process.”
Interoperability validation is vital for media

- On the network, problems are
  - Immediate, unambiguous
  - Rapidly resolved

- With portable media
  - Long delays in detection and recognition
  - Ambiguous or unknown source vendor/version
  - Long delays in resolution
  - Large volume of non-interoperable media created due to delays
  - Recipients lack technical expertise to debug problems

- Standard set by film
  - No interoperability problems
Validation of devices at IHE Connectathon

- Portable Media Creators
- Portable Media Importers

Validation with IHE sample PDI media

- Anyone can test Portable Media Importers

IHE PDI media validation software

- Anyone can test Portable Media itself
- Debug problems with unreadable media

Currently is no IHE PDI “certification”

- Contrast with German DRG process
PDI – Actors and Transactions

Portable Media Creator
  - Display
  - Image Display
  - Report Reader
  - Print Composer
  - Portable Media Importer
PDI – CD Structure

DICOMDIR

Directory of DICOM files

README.TXT

INDEX.HTM

IHE_PDI

Directory of web files

Other optional content

Web content (optional)
Goal is to addresses users who can’t, won’t or do not need to import or view DICOM images

Any Internet browser should be able to display web content (hence constrained file types)

Web content, if present, is required to reflect “the full set of the exported DICOM data or a subset considered at the time of creation to faithfully represent the patient's clinical condition”

E.g., may be just images selected by key image notes, if present
PDI – Non-goals

**Viewers**
- Does not mandate (or prohibit) the presence of a viewer included on the media
- Does not specify requirements for viewer features
- Does not mandate that any viewer support all objects on the media

**Reports**
- Recommends but does not mandate the presence of a report
- Does not restrict the format of any report that is present (can be DICOM, or other)
PDI - Adoption

- Only a few remaining PACS vendors fail to create PDI media and use proprietary formats
- 3rd party creators have embraced PDI
- Most DICOM creators upgraded to PDI
- Still, few CDs in the field are perfectly compliant, but most are “readable”
PDI - Problems

- Uncompressed CDs too small, too slow
  - Very large cross-sectional datasets (CT/PET)
  - Very large images (mammograms)
  - Multiple prior studies

- Spanning multiple CDs - hard to view

- Media has no privacy protection

- Viewers are not standardized

- Divergence from national requirements
  - DRG in Germany, Australia, UK
PDI - Extensions

- Year 11 (2008-2009) work in progress
- New media types
  - DVD – higher capacity, now widely interoperable
  - USB memory – high capacity, high speed, incremental
- Compression
  - Lossless and lossy
  - JPEG and JPEG 2000
  - Supported by existing DICOM profiles
  - Linked to DVD and USB options
PDI - Extensions

- Year 11 (2008-2009) work in progress
- Privacy protection option
  - Password-based encryption
  - Per file using DICOM secure media profile
  - Does not require installation or administrator privileges for recipient
- Sending software option
  - On-board software to DICOM network send
  - Including decrypt, decompress, unsupported SOP Class fall back conversion, import reconciliation
Basic Image Review Profile

- Year 11 (2008-2009) work in progress
- Requirements for an on-board viewer
  - Support for all objects on the media
  - Side-by-side series comparison
  - Synchronized scroll/zoom/pan
  - Cross-referencing of location
  - Thumbnail based navigation
- Obvious to use: standard icons, tool tips
- No “non-diagnostic” disclaimer!
PDI – Conclusions

- PDI good
- Proprietary media bad
- Poor quality DICOM/PDI also bad

- PDI is the new “standard of care” – sites may not be paid and may be liable if not
- Sites responsible to be sure media is PDI compliant – use 3rd party software if primary PACS vendor is inadequate