

# User Interface Issues for DICOM Presentation States

**Dave Harvey**

# *Overview of Softcopy Presentation State (GSPS)*

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- Added in 1999 as supplement 33
- Major departure for DICOM moving from data content and transmission into display
- Closely related to (but independent of) Supplement 28/Part 14 (Grayscale Standard Display Function)

- GSPS objects may be created at any time after imaging by any equipment
- GSPS are independent of the original image(s) and do NOT require modifications to the original image(s)
- Handled exactly like other instance objects
  - C-STORE, G-FIND, C-MOVE etc.
  - Easy for existing SCPs to handle
- No specific GSPS support in the Q/R model

- All LUTs/transformations
  - Modality
  - VOI
  - Presentation
- Displayed Area & Shuttering
- Rotation & Flipping
- Mask Subtraction
- Independent Annotations
  - Text & graphics
  - Both image & display relative
- Activation of overlays in the image, or in the GSPS object

- Strictly part of one study
- Only refer to image(s) in that study
- In their own series
- May be stored on off-line media etc.
- Generally, they may be treated just like any other composite object

- One “manifest” (Referenced Series Sequence) sequence defines a list of images to which this PS object relates
- Huge choice of granularity
  - All series in a study
  - One or more specific series
  - One or more specific images
  - One or more specific frames within an image
  - Any combination of the above!

# *“Top level” Items*

## *No reference to series / images*

- Masking
- Shuttering (geometric & overlay)
- Spatial Transformation (Rotate & Flip)
- Modality LUT/rescale
- Presentation LUT
- Overlay Activation

# ***“Image specific” Items With Reference Image Sequence***

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- Displayed Area
- Annotations - graphic & Text
- VOI LUT/Windowing



- Automatically by the modality
  - As default or reflection of radiographer choices
  - As part of PGP
- Explicitly by users
  - As part of reporting
  - For conferences etc.
  - For teaching
  - etc.

- Presentation Label
  - type 1 but no coding
- Presentation Description
  - type 2
- Creation Data & Time
- Presentation Creator's Name
  - type 2

- KON (and SR) objects can specify the relationship between images and GSPS objects
- Achieved using the “Referenced SOP Sequence” element (0008,1199) element in the Image Reference Macro
  - This is specialised to allow only a single entry, and to specify a GSPS object only.

# ***Clinical Scenarios: (in a GSPS-capable viewer)***

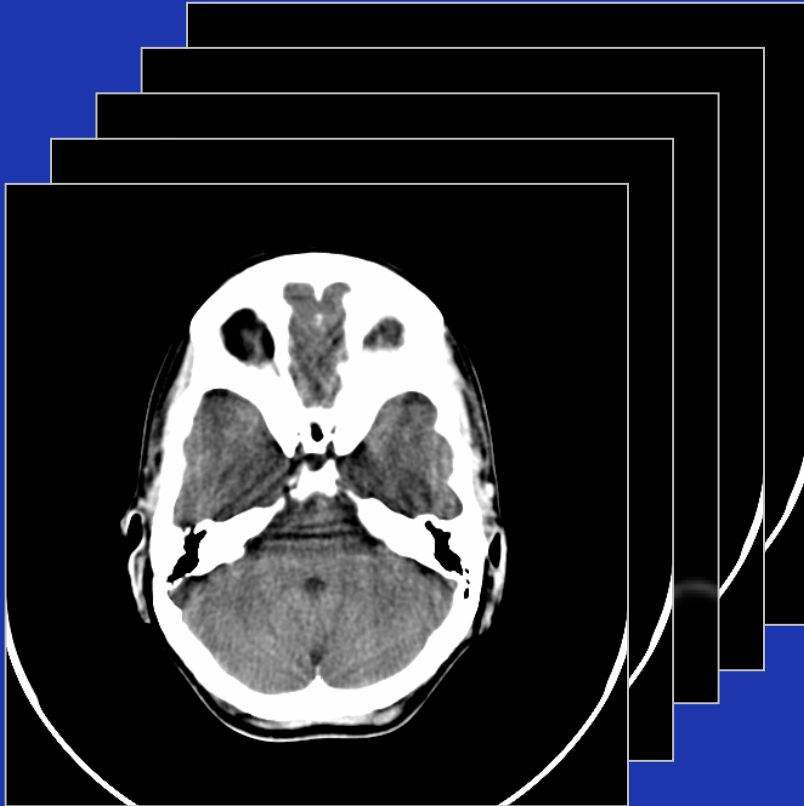
- User has queried for and retrieved image instances directly
  - The PACS has PS objects for that study
  - Possibly many for the same image with different scope
- User selects and retrieves GSPS object
- User selects and retrieves KON object

# ***GSPS Deficiencies, Ambiguities & Problems:***

- No C-FIND method to find GSPS objects for a given instance
- So need to retrieve every PS object in the study to inspect them internally
- What should the viewer do if  $> 1$  possible GSPS for an image?
- There is no predefined coding (like there is in KON) to indicate “intent” of the GSPS object
- How to handle overlapping GSPS

# *Overlapping GSPS Objects*

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- User retrieves a KON (or SR) with GSPS references
  - All is well-defined and unambiguous
- User retrieves a PS and associated images
  - e.g. IHE presentation of grouped procedures (PGP)
  - semantically suspect but technically OK

- There is no clearly defined mechanism to indicate which GSPS object should be used as the default for which image
- There is even a lack of supporting data (such as the document title used in KON – CID 7010) to assist choice algorithms



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# User Interface Issues for DICOM Presentation States

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- Greyscale Softcopy Presentation State
- Colour Softcopy Presentation State
- Pseudo-Colour Softcopy Presentation State
  - Record application of false colour LUT to greyscale images
- Private Attributes
  - Convolution Filters (edge enhancement etc.)
  - ROI stats

- Presentation state created for series
- Multiple states used to record “conceptual” state of one series
- “Streamlined” method to create presentation states for study

- Automatic application of “best” presentation state
- Apply to series
  - Coalescence of “similar” states to form single conceptual state
- Apply to image

- Prompt for metadata on creation
  - Content Label (pick list)
  - Description
- Creator name and date/time
- Used to choose “best” initial state

- Load presentation state + referenced images
- Load study/series/images + relevant presentation states
- Applies to Query/Retrieve and DICOMDIR sources

- Font selection
- Curve algorithms (for INTERPOLATED graphic annotation)
- Representation of existing graphic annotations
  - Angle measurements



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**Questions/Comments?**

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