



# FAST AND EFFICIENT SERIAL TUMOR ASSESSMENT WITHOUT THE NEED FOR DICTATION

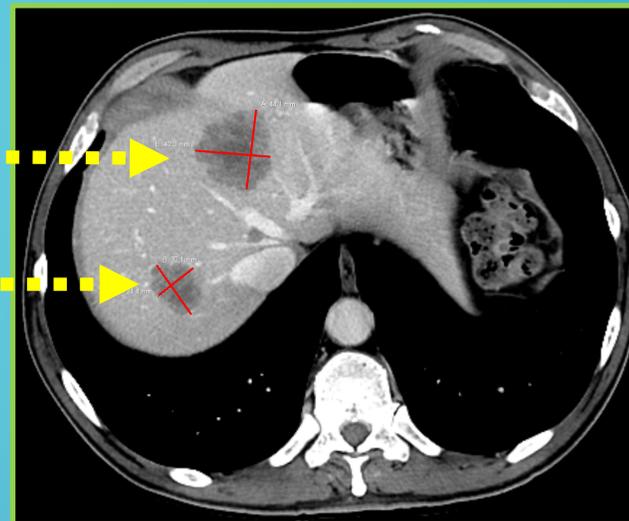
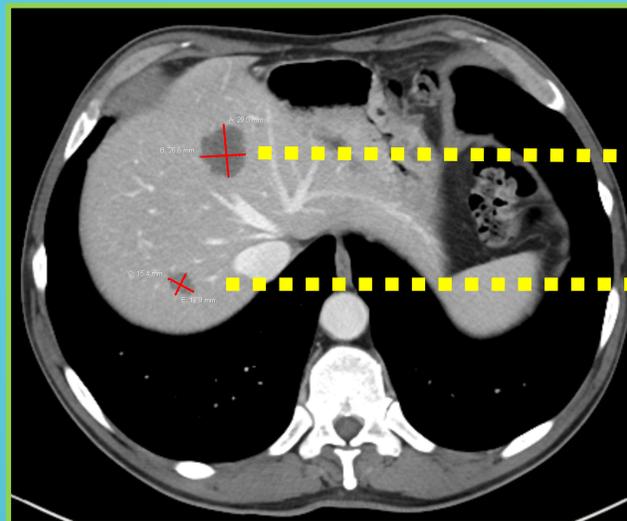
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**CRISTIAN POPOVICI**<sup>3</sup>, **MARK KONTAK**<sup>2</sup>

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<sup>3</sup>PATRISOFT OUTSOURCING, SALCEA, ROMANIA

## PURPOSE:



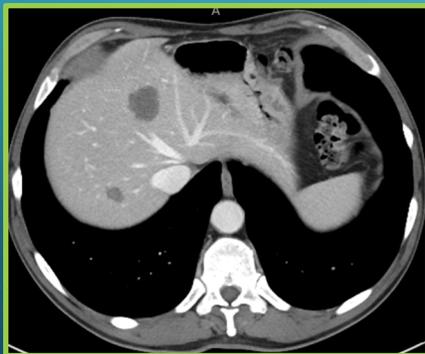
- Serial tumor assessment is tedious and time-consuming when processing multiple exams containing numerous lesions.
- Human and/or transcription error introduced during dictation may result in the reporting of incorrect measurements and/or image locations.
- To improve efficiency and eliminate error, we interfaced an interactive multimedia reporting system to a PACS so that DICOM images and measurements can be transmitted directly into a report without the need for dictation.

# METHODS:

An interactive multimedia reporting system was developed that works as follows:

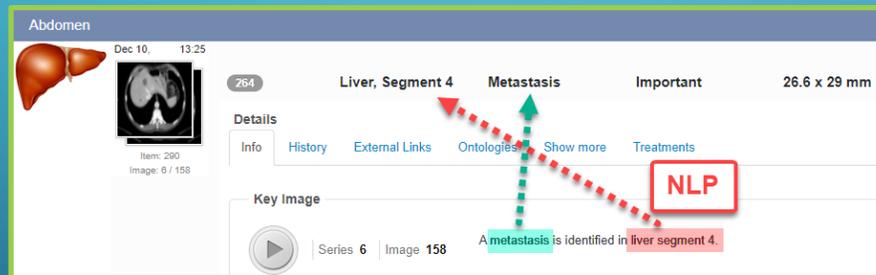
1. Record key images and dictate descriptions of baseline findings
2. Tag baseline findings with metadata using natural language processing (NLP) referenced to an ontology to define anatomy and pathology
3. Assemble multimedia report with related data linked in timelines for disease response calculations

## Step 1: Record images/voice



*A metastasis is identified in liver segment 4.*

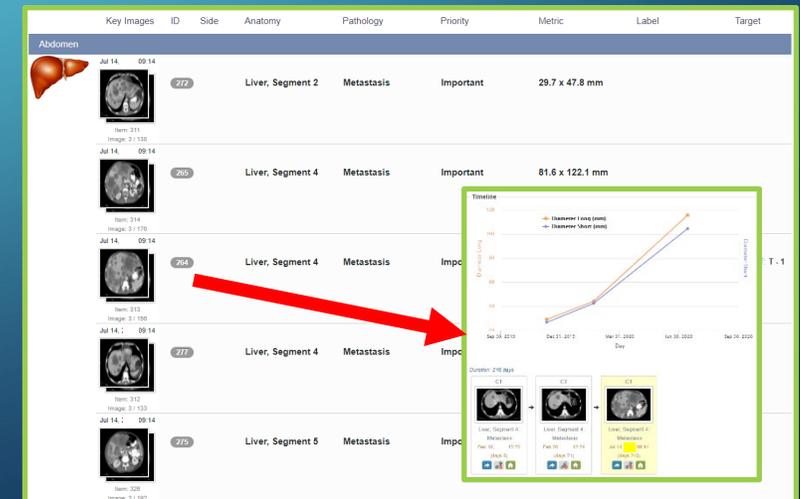
## Step 2: Tag with metadata



Abdomen  
Dec 10, 13:25  
264  
Liver, Segment 4 Metastasis Important 26.6 x 29 mm  
Details  
Info History External Links Ontologies Show more Treatments  
Key Image  
Series 6 Image 158  
A metastasis is identified in liver segment 4.  
NLP

Disease metrics and series/image numbers are transmitted automatically using PACS API.

## Step 3: Assemble multimedia report



Key Images	ID	Side	Anatomy	Pathology	Priority	Metric	Label	Target
	277		Liver, Segment 2	Metastasis	Important	29.7 x 47.8 mm		
	265		Liver, Segment 4	Metastasis	Important	81.6 x 122.1 mm		
	264		Liver, Segment 4	Metastasis	Impc			
	277		Liver, Segment 4	Metastasis	Impc			
	275		Liver, Segment 5	Metastasis	Impc			

Timeline  
Duration: 278 days  
T-1

# METHODS:

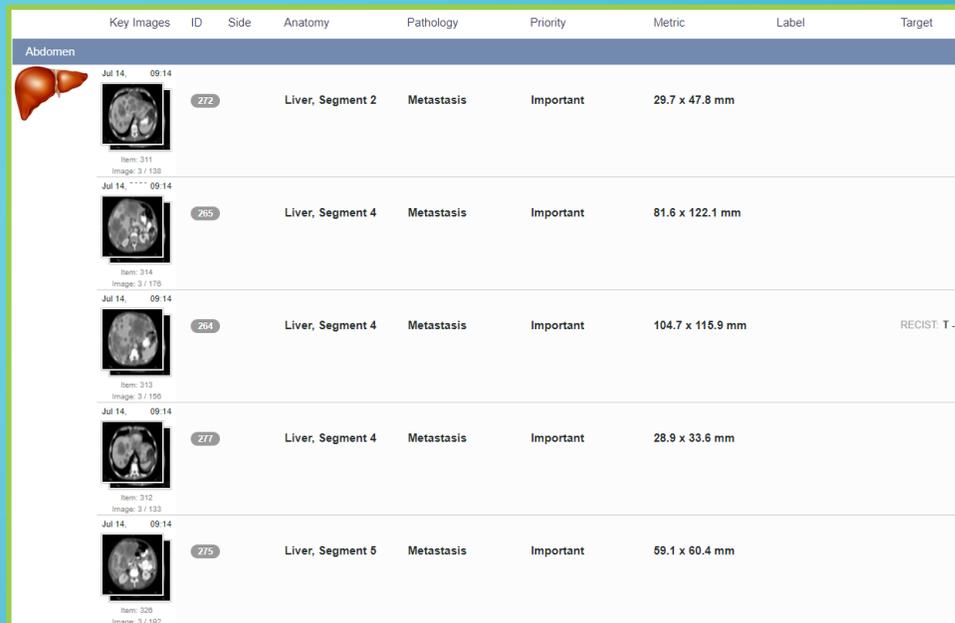
- Originally, radiologists dictated image metrics and series/image numbers that were processed by NLP.
- To improve efficiency and accuracy, a PACS application-programming interface (API) was incorporated to transmit DICOM images and data directly into a report as tumors are measured.
- Reporting system logic recognizes types of metrics, what metrics are associated with which findings, and when metrics are modified.

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```

PACS API transmits DICOM metadata

# METHODS:

- Each finding in a baseline exam is annotated with metadata describing anatomy and pathology using NLP.



Key Images	ID	Side	Anatomy	Pathology	Priority	Metric	Label	Target
	Item: 211 Image: 3 / 138		Liver, Segment 2	Metastasis	Important	29.7 x 47.8 mm		
	Item: 214 Image: 3 / 176		Liver, Segment 4	Metastasis	Important	81.6 x 122.1 mm		
	Item: 213 Image: 3 / 150		Liver, Segment 4	Metastasis	Important	104.7 x 115.9 mm		REGIST: T - 1
	Item: 212 Image: 3 / 133		Liver, Segment 4	Metastasis	Important	28.9 x 33.6 mm		
	Item: 205 Image: 3 / 162		Liver, Segment 5	Metastasis	Important	59.1 x 60.4 mm		

Baseline exam annotated by voice dictation and NLP

- Links between serial exams are achieved by the following steps:
  1. Radiologist “activates” a prior annotated finding by clicking on it in edit mode.
  2. Radiologist measures a corresponding “new finding” in the PACS display.
  3. The radiologist presses a speech microphone function button to record the new finding and initiate the transfer of imaging data that is linked to the prior finding.
  4. Metadata from the prior finding is transferred to label the new finding, and automated text is generated to indicate the event.
  5. Repeat for each finding being evaluated.

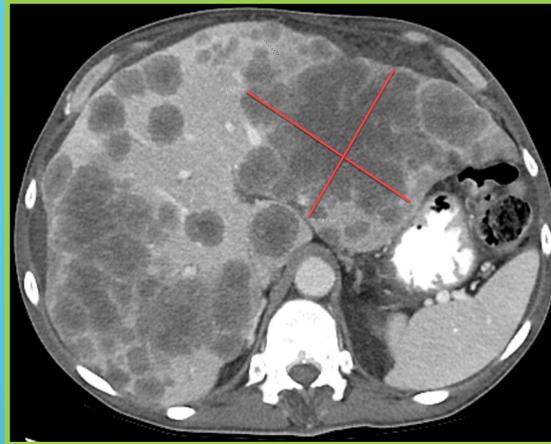
# Link findings without dictation:

## Step 1: Activate prior finding

Key Images	ID	Side	Anatomy	Pathology	Priority	Metric
	Jul 14, 09:14		Liver, Segment 2	Metastasis	Important	29.7 x 47.8 mm
	217		Liver, Segment 4	Metastasis	Important	28.9 x 33.6 mm
	264		Liver, Segment 4	Metastasis	Important	42.4 x 44.1 mm

Activate prior finding by clicking on it

## Step 2: Measure "new finding"



## Step 3: Press microphone button



## Step 5: Repeat for each finding

Key Images	ID	Side	Anatomy	Pathology	Priority	Metric
	Jul 14, 09:14		Liver, Segment 2	Metastasis	Important	29.7 x 47.8 mm
	217		Liver, Segment 4	Metastasis	Important	28.9 x 33.6 mm
	264		Liver, Segment 4	Metastasis	Important	42.4 x 44.1 mm

Indicates that a link has been created

## Step 4: Transfer metadata via PACS API

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{
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}
```

# RESULTS:

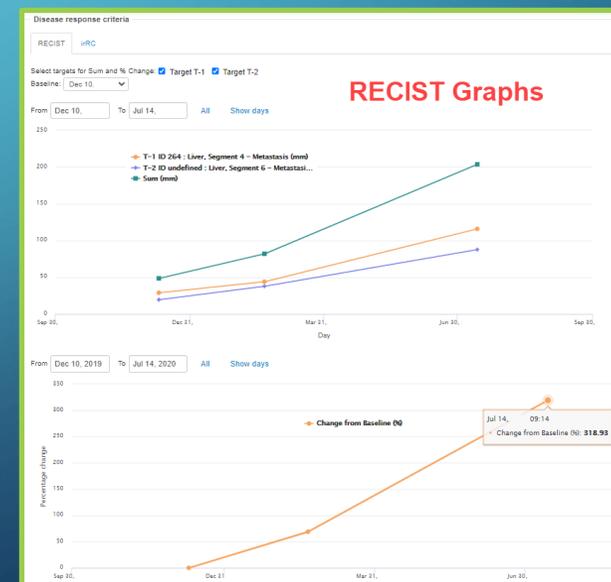
- Unnecessary redundant dictation is eliminated unless a radiologist wants to describe additional details.
- Sans dictation, automated text is generated to describe the event.
- The disease metrics are displayed in graphical timelines.
- Findings designated as Target lesions in the multimedia report are used for disease response calculations (e.g., RECIST, irRC).

The screenshot shows a medical reporting interface with a table of findings and a details panel. The table has columns for Key Images, ID, Side, Anatomy, Pathology, Priority, Metric, Label, and Target. The findings listed are:

Key Images	ID	Side	Anatomy	Pathology	Priority	Metric	Label	Target
	272		Liver, Segment 2	Metastasis	Important	29.7 x 47.8 mm		
	264		Liver, Segment 4	Metastasis	Important	104.7 x 115.9 mm		

The details panel for ID 264 shows a key image and a text box with the following content: "Metrics only recorded. The liver, segment 4 - metastasis measures 104.7 x 115.9 mm on image 156 of series 3." A red arrow points to this text box with the label "Automated text generation".

**Metrics only recorded. The liver, segment 4 - metastasis measures 104.7 x 115.9 mm on image 156 of series 3.**



**Disease Response Assessment**

## RESULTS:

- Substantial time-savings (~10 sec/finding) is achieved using the automated process by eliminating unnecessary redundant dictation.
- The time-savings is cumulative depending on the number of findings in a report.
- The system facilitates the capture of more findings per report which can create new disease insights.
- Direct transmission of DICOM data promotes safety by eliminating human and/or transcription errors.

How long does it take to repeatedly dictate?

*There is a 10 x 20 millimeter metastasis in liver segment 6 on image 50 of series 3.*



# CONCLUSIONS:

The use of interactive multimedia reporting with a PACS interface allows for more efficient reporting of serial tumor assessments and eliminates the potential for human and/or transcription errors.

