













BENEFITS OF A COMPOSITE REPORT

INCORPORATING INTERACTIVE MULTIMEDIA REPORTING PRINCIPLES

Composite Report 27

6 Findings

Details Insignificant findings Settings

Key Images	ID	Side	Anatomy	Pathology	Priority	Metric	Label	Target
Neck								
 Jan 1, 2020 11:09  Item: 200 Image: 1 / 23	207	Right	Thyroid	Nodule	Indeterminate	6.9 x 9.83 x 14.2 mm	This is a user-defined label.	
Abdomen								
 Dec 6, 2012 05:59  Item: 6 Image: 5 / 30	4		Liver, Segment 8	Metastasis, Colon adenocarcinoma	Important	70 x 88 mm		RECIST: Target 1
 Apr 12, 2017 02:55  Item: 3 Image: 2 / 10	3		Gallbladder	Cholelithiasis	Insignificant	12 mm		
 Sep 15, 1999 08:00  Item: 202 Image: 1 / 1	2		Ascending colon	Adenoma	Important	10 mm		
Pelvis								
 Dec 1, 2019 07:06  Item: 172 Image: 5 / 11	133		Prostate	Normal size	Insignificant	38.8 x 65.1 mm		
Lower extremity								
 Feb 4, 1963 16:55  Item: 1	1	Right	Femur	Fracture	Insignificant -			

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INTRODUCTION:

- Standards development organizations (i.e., HIMSS, SIIM, IHE) are advocating for **Interactive Multimedia Reporting (IMR)** that incorporates images, video, tables, and graphs in radiology reports to better communicate information.
- However, multimedia alone does not address the discontinuity between disparate sources of information (e.g., radiology, pathology, laboratory, surgery) that often are stored in silos within an electronic health record (EHR).

Multispecialty Enterprise Imaging Workgroup Consensus on **Interactive Multimedia Reporting** Current State and Road to the Future: HIMSS-SIIM Collaborative White Paper

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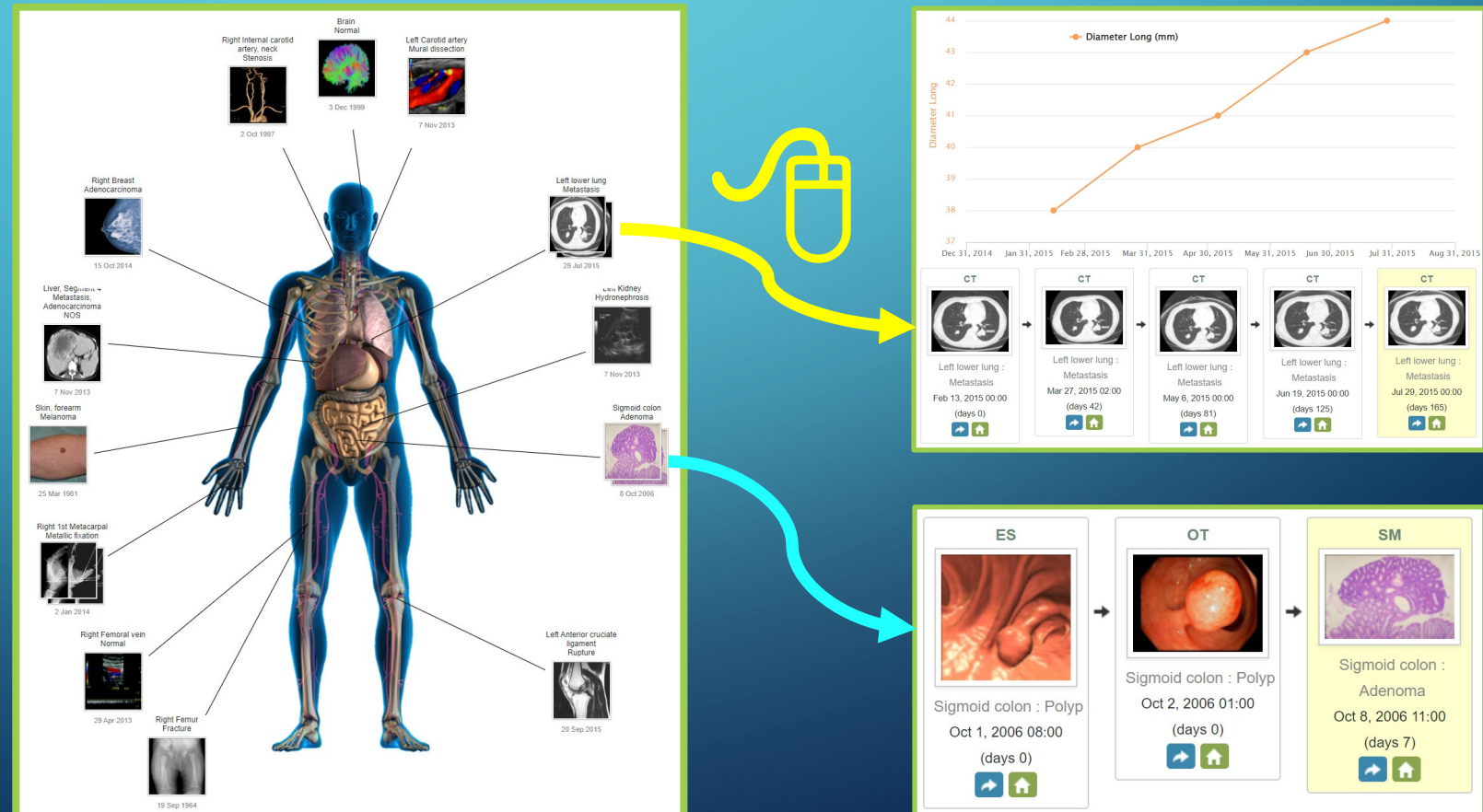
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- We created an IMR solution that addresses this problem by connecting data from serial exams and medical events in a **Composite Report**.
- The novel report display shows the most recent finding for each site of disease. When a user clicks on a finding, a graphical timeline will portray the history of that finding.

The "Homunculus" view is one way to access the data, but more often it is displayed in a "List" mode as shown in the next slide.

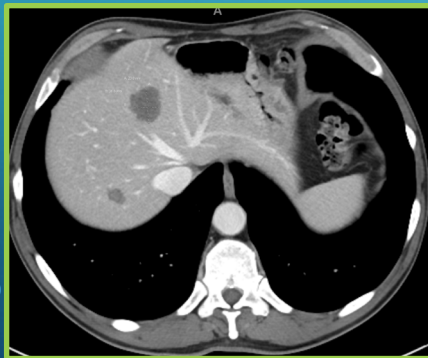


METHODS:

The IMR reporting solution works as follows:

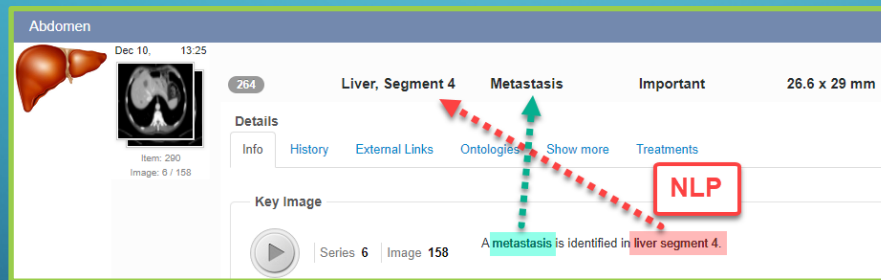
1. Record events (e.g., radiological findings, surgical procedures) and voice descriptions.
2. Tag the information with metadata referenced to an ontology using natural language processing.
3. Assemble an IMR **Composite Report** with images and related data linked in graphical timelines.

Step 1: Record images/voice



Voice: *A metastasis is identified in liver segment 4.*

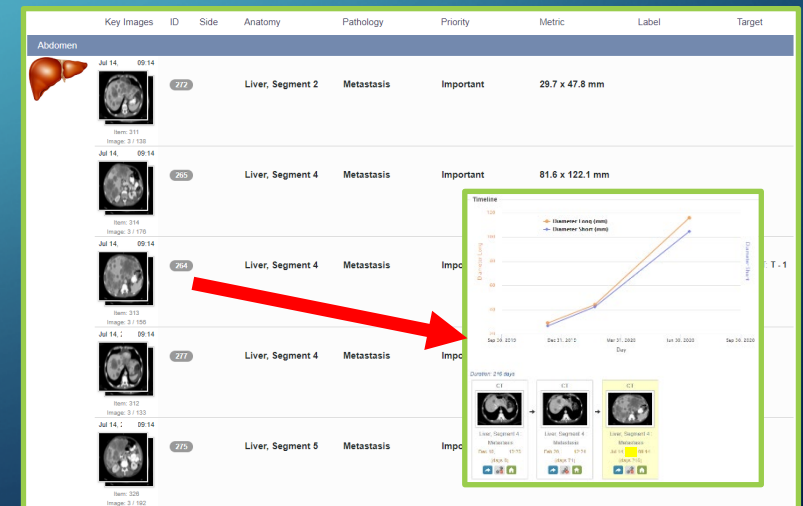
Step 2: Tag with metadata



The screenshot shows a PACS interface for an abdominal CT scan. The finding is labeled "Liver, Segment 4 Metastasis" with a size of "26.6 x 29 mm" and an "Important" priority. A red dashed arrow points from the text "A metastasis is identified in liver segment 4." (highlighted in a red box) to the "NLP" label in a red box. A green dashed arrow points from the "NLP" label to the "Ontologies" tab in the interface.

Natural language processing (NLP) labels the finding with anatomy and diagnosis metadata. Disease metrics and DICOM image data are transmitted directly from the picture archiving and communication system (PACS).

Step 3: Assemble IMR Composite Report



The screenshot shows an IMR Composite Report for the abdomen. It features a table of findings and a graphical timeline. The table lists findings with columns for Key Images, ID, Side, Anatomy, Pathology, Priority, Metric, Label, and Target. The findings are:

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			

The graphical timeline shows the progression of the metastasis over time, with a red arrow pointing from the "Impc" label in the table to the timeline. The timeline includes a line graph and a series of image thumbnails.

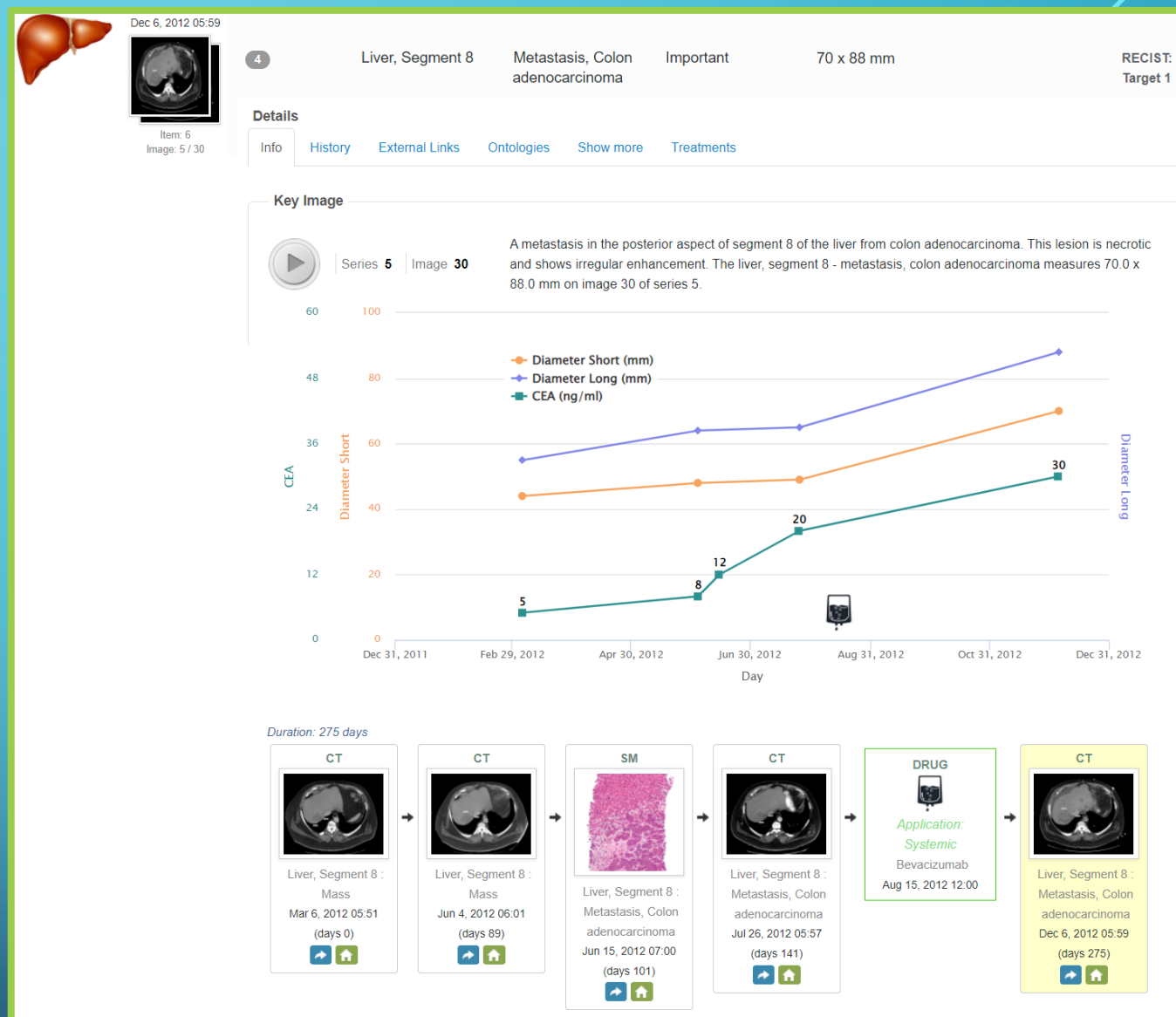
- The composite report organizes findings according to an anatomical hierarchy.
- A “finding” comprises a timeline of connected “items” or “atoms.”
- When a user clicks on a finding, the history of that finding and additional detail is illustrated with images, graphs, and tables.
- Composite report data is most versatile when presented in an interactive web browser, but the same report data can be exported to other formats including PDF, Unicode text, CSV, xml, and json for different purposes.



Composite report demonstration
(Advance the slide to start video)

RESULTS:

- To date the system has been used to generate 2505 composite IMR reports from 1509 patients with a total of 12,943 findings comprising 37,769 items.
- The average timeline consists of 4 items with the longest being 24 items.



A “Finding” in a composite report consists of a collection of linked “items” from serial exams and medical events, including laboratory and treatments.

DISCUSSION:

- Analyzing historical data in an EHR to comprehend the course of disease and treatment is tedious and time-consuming.
- Consequently, radiologists often compare a current exam to a limited number of prior studies to obtain a gestalt of what is happening with a patient.
- A composite IMR renders a more complete picture of a patient's health status and offers benefits over conventional medical reporting.



BENEFIT – UNEXPECTED INSIGHTS

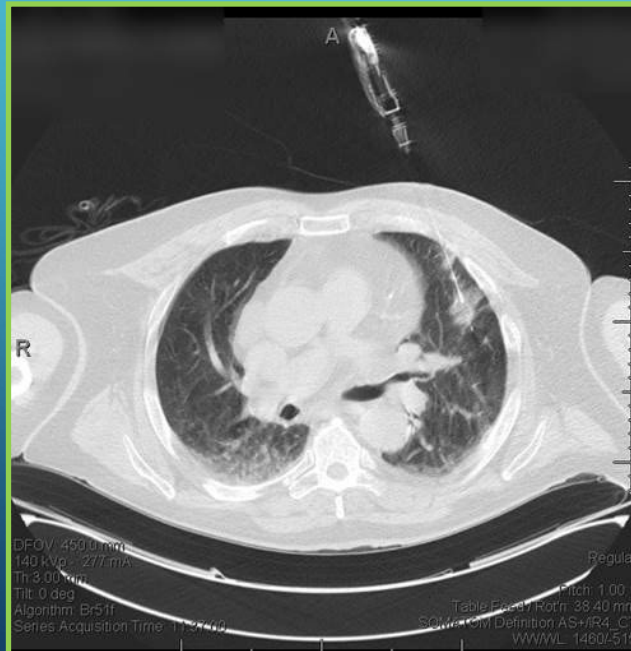
- Quantitative disease graphs constructed from the entire compendium of radiological data can reveal insights that may not be evident when a radiologist compares a current exam to only a limited number of prior studies.
- In this example, 50+ metastases have been recorded (A). Filtering the data (B) reveals an outlier that is growing at a faster rate than others.



BENEFIT – ERROR MITIGATION

- Data discontinuity and errors can negatively impact patient safety. A composite IMR can perform compliance checks and mitigate discrepant results.
- In this example, a pathologist reports a right upper lung specimen, but it is from a left upper lung biopsy. The IMR can immediately alert report authors when errors occur.

Radiology performs
Left upper lung
biopsy



Submitted Clinical History
Adenocarcinoma of sigmoid colon [C18.7].

Diagnosis
A. Lung, right upper lobe, biopsy:
METASTATIC COLORECTAL ADENOCARCINOMA

Electronically signed by [redacted]

Gross Description
A:
Lung, right upper lobe, biopsy: Five cores of soft tan-pink tissue (0.2 x 0.1 cm to 1.3 x 0.1 cm), entirely submitted in A1.

Biomarker Block(s)
Metastatic
Tumor block: A1

Disclaimer
"Some tests reported here may have been developed and performance characteristics determined by UT MD Anderson Pathology and Laboratory Medicine. These tests have not been specifically cleared or approved by the U.S. Food and Drug Administration. If applicable, controls were reviewed and showed appropriate reactivity."

Specimen Collected: [redacted] Last Resulted: [redacted]

[Order Details](#) [View Encounter](#) [Lab and Collection Details](#)
[Routing](#) [Result History](#)

Pathology reports
Right upper lung
specimen

CONCLUSION:

- A **Composite** IMR report connects data from a medical record to better tell a patient story and cultivate knowledge.

