



WHICH ONE ARE WE TALKING ABOUT?

ASSIGNMENT OF NUMERICAL ADDRESSES TO DISTINGUISH FINDINGS IN THE SAME ANATOMICAL LOCATION AND/OR IMAGE

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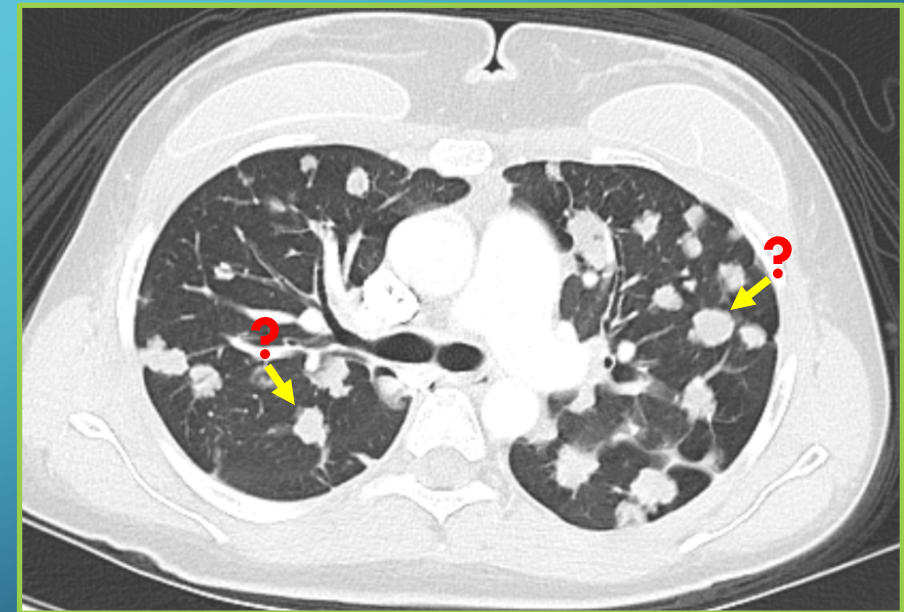
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PURPOSE:

- The identification and communication of information about image findings located in the same anatomical location and/or image can be challenging.
- A solution was developed to automatically assign numerical “addresses” to each finding in an interactive multimedia report to facilitate clear and accurate communication.

Which lesion are we talking about?



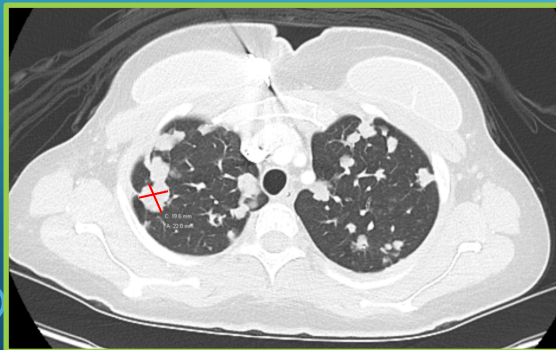
Like finding a needle in a haystack

METHODS:

The interactive multimedia reporting solution works as follows:

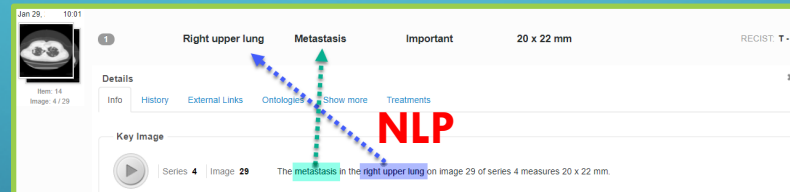
1. Record key images and voice descriptions of findings
2. Tag each finding with anatomy and pathology (diagnosis) using natural language processing (NLP)
3. Assemble multimedia report with related information linked in timelines

Step 1: Record images/voice



The metastasis in the right upper lung on image 29 of series 4 measures 20 x 22 mm.

Step 2: Tag with metadata



Right upper lung Metastasis Important 20 x 22 mm REGIST: T-1

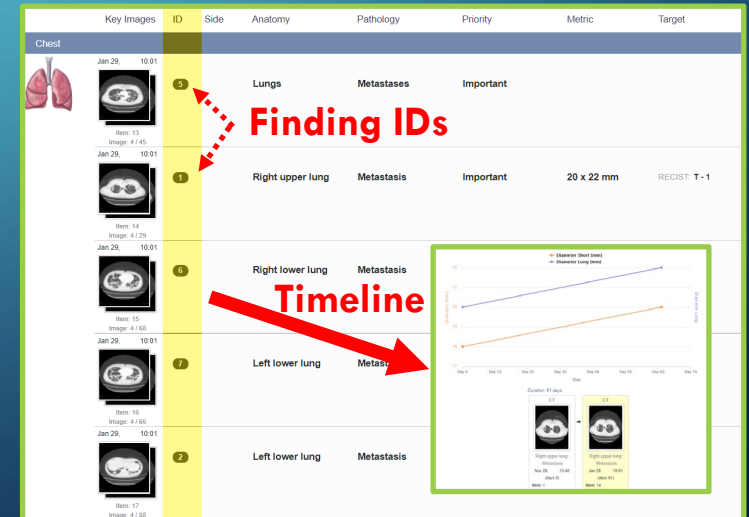
Details







Info History External Links Ontologies Show more Treatments

Key Image

Series 4 Image 29 The metastasis in the right upper lung on image 29 of series 4 measures 20 x 22 mm.

Step 3: Assemble multimedia report



Key Images	ID	Side	Anatomy	Pathology	Priority	Metric	Target
	Jan 29, 10:01		Lungs	Metastases	Important		
	5						
	1	Right upper lung	Metastasis	Important	20 x 22 mm	REGIST: T-1	
	6	Right lower lung	Metastasis				
	7	Left lower lung	Metas...				
	2	Left lower lung	Metastasis				

Timeline







Timeline 01 Jan

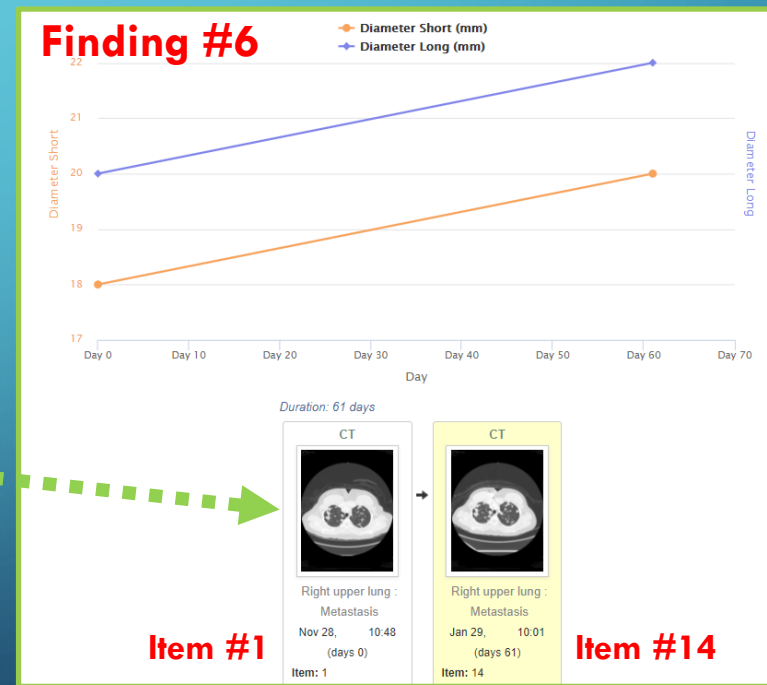
01 Jan 2019 01 Jan 2019

01 Jan 2019 01 Jan 2019

METHODS:

- A “finding” comprises one or more “items” (i.e., key images) linked in a timeline.
- Both findings and items are assigned numerical labels.







Key Images	ID	Side	Anatomy	Pathology	Priority	Metric	Target
							
	5		Lungs	Metastases	Important		
	1		Right upper lung	Metastasis	Important	20 x 22 mm	RECIST: T-1
	6		Right lower lung	Metastasis	Important	17 x 20 mm	
	7		Left lower lung	Metastasis	Important	21 x 29 mm	
	2		Left lower lung	Metastasis	Important	23 x 40 mm	RECIST: T-2








Clicking on a finding reveals more details, including a timeline of linked “items.”

METHODS:

- Numerical IDs are automatically assigned to each finding based on when it first appears in a report.
- Finding IDs help to distinguish multiple findings located in the same anatomical region, especially when labeled with the same metadata (i.e., anatomy, pathology).
- Findings may be sorted in the report based on anatomy, pathology, or finding ID.

Key Images	ID	Side	Anatomy	Pathology	Priority	Metric	Target
							
 Item: 13 Image: 4/45	5		Lungs	Metastases	Important		
 Item: 14 Image: 4/29	1		Right upper lung	Metastasis	Important	20 x 22 mm	RECIST: T - 1
 Item: 15 Image: 4/68	6		Right lower lung	Metastasis	Important	17 x 20 mm	
 Item: 16 Image: 4/68	7		Left lower lung	Metastasis	Important	21 x 29 mm	
 Item: 17 Image: 4/88	2		Left lower lung	Metastasis	Important	23 x 40 mm	RECIST: T - 2

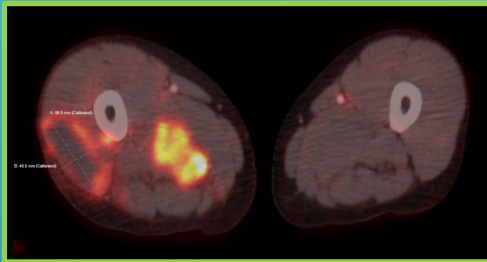
The concept is like a street address except findings are arranged anatomically.

Key Images	ID	Side	Anatomy	Pathology	Priority	Metric
 Item: 14 Image: 4/29	1		Right upper lung	Metastasis	Important	20 x 22 mm
 Item: 17 Image: 4/88	2		Left lower lung	Metastasis	Important	23 x 40 mm
 Item: 18 Image: 3/168	3		Liver, Segment 3	Metastasis	Important	42 x 58 mm
 Item: 20 Image: 3/168	4		Liver, Segment 6	Metastasis	Important	43 x 54 mm
 Item: 13 Image: 4/45	5		Lungs	Metastases	Important	

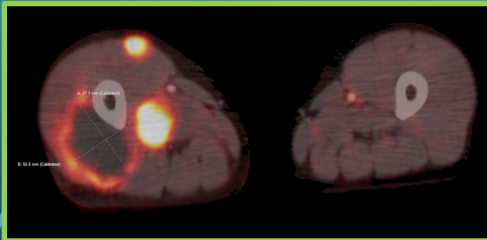
Findings resorted by numerical order.

Another example of where numerical IDs help to distinguish findings labeled with the same metadata

#1 Right Vastus lateralis muscle

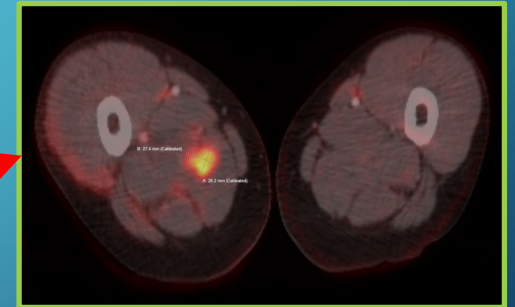


#3 Right Vastus lateralis muscle

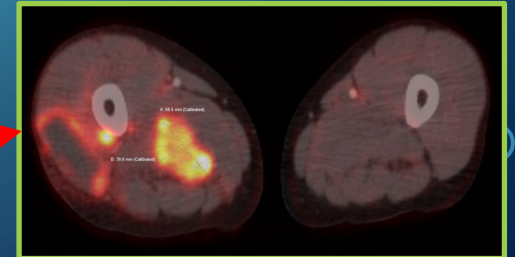


Lower extremity								
	May 5, 11:54		40	Right	Rectus femoris muscle	Metastasis	Important	17.9 x 23 mm
	Item: 150 Image: 1201 / 382							
	May 5, 11:54		1	Right	Vastus lateralis muscle	Metastasis	Important	40.6 x 86 mm
	Item: 134 Image: 1201 / 366							
	May 5, 11:54		3	Right	Vastus lateralis muscle	Metastasis	Important	65.6 x 87.1 mm
	Item: 133 Image: 1201 / 380							
	May 5, 11:54		39	Right	Adductor magnus muscle	Metastasis	Important	66.2 x 27.4 mm
	Item: 149 Image: 1201 / 353							
	May 5, 11:54		2	Right	Adductor magnus muscle	Metastasis	Important	39.8 x 68.6 mm
	Item: 143 Image: 1201 / 367							

#39 Right Adductor magnus muscle



#2 Right Adductor magnus muscle



User-defined labeling

- In addition to findings IDs, user-defined labeling is available.
- In this example, brain MR images are reported, and radiation oncology codes used for gamma knife planning are added for correlation.
- Thus, several means exist for distinguishing findings in a multimedia report.

The screenshot displays a medical reporting interface with a table of findings and a 3D brain model. The table has columns for Key Images, Side, Anatomy, Pathology, Priority, Metric, ID, Label, and Target. The findings are as follows:

Key Images	Side	Anatomy	Pathology	Priority	Metric	ID	Label	Target
	Right	Frontal lobe	Metastasis	Important		8	2RF1	
	Left	Parietal lobe	Metastasis	Important		12	6LP2	
	Left	Parietal lobe	Metastasis	Important		7	1LP1	
	Right	Parietal lobe						
	Right	Parietal lobe						
	Left	Occipital lobe						
	Right	Occipital lobe	Metastasis	Important		10	4R01	

Red arrows point from the 'Automated Finding ID' label to the 'ID' column and from the 'User-defined label' label to the 'Label' column. A yellow highlight is on the '1LP1' label. A 3D brain model is shown with a segmentation dialog box open, where '1LP1' is selected in the 'Name' list.

Rad Onc 1LP1 = 1st lesion, Left parietal lobe, 1st treatment

RESULTS:

- The interactive multimedia reporting system is in use at our institution where 2,342 reports with 11,448 findings have been generated using this process.
- The concept of applying numerical addresses to image findings helps to describe specific lesions when multiple lesions exist in the same location, particularly during surgical planning or when correlating lesions that have undergone local therapy (e.g., ablation or stereotactic radiosurgery).
- This simple yet powerful concept facilitates clear communication and eliminates ambiguity that may exist with conventional radiology reporting.

CONCLUSION:

Automatic assignment of numerical “addresses” to image findings in an interactive multimedia report helps to distinguish lesions in the same anatomical region and improve the clarity of radiology communication.

