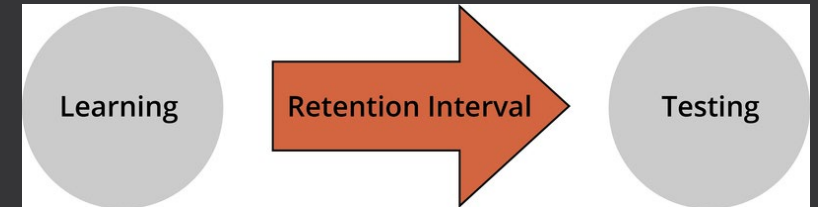


# How Much do Students Remember?

An Examination of Anatomical Knowledge Retention by System Over Time



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Melanie Neumeier MN, RN  
Dr. Raj Narnaware PhD

# Why Anatomical Knowledge Retention?

- Physiological needs
  - Foundation for clinical judgement
  - Entry to practice level competency
  - 30-40% knowledge loss typical in health sciences
-

# Purpose



Determine level of retention through each year



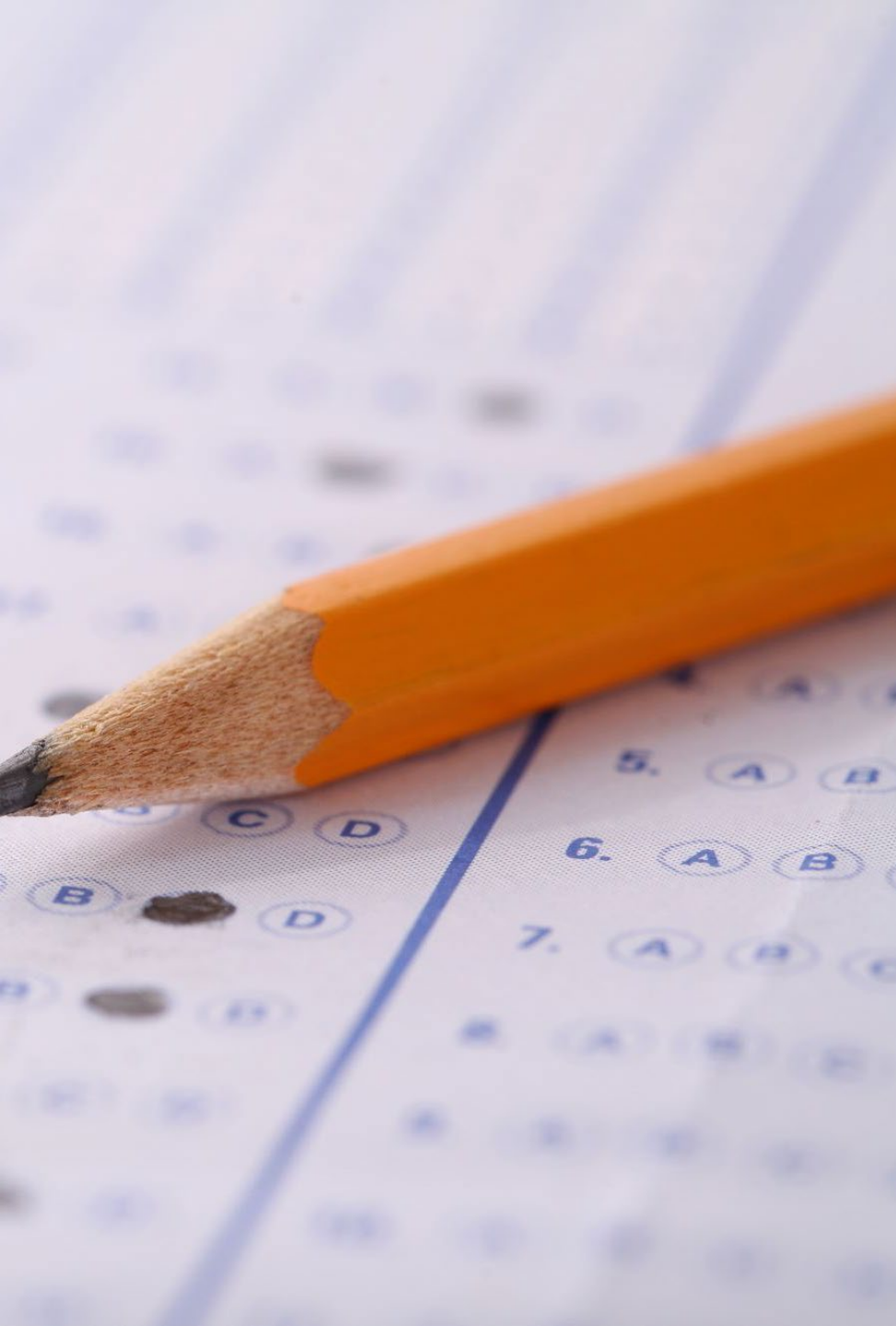
Determine if retention varied by system and over time



Gain an understanding of how knowledge retention fluctuates over time



Use this baseline knowledge as a starting point for future investigations



# Methods

- Use first-year human anatomy scores as baseline for knowledge acquisition
- Subsequently quiz students each year on previously attained knowledge
- Compare overall scores and scores by system to first-year scores to determine knowledge retention

A large, dark, 3D-rendered pile of question marks of various sizes, creating a textured, abstract background on the left side of the slide.

# Let's Kahoot!

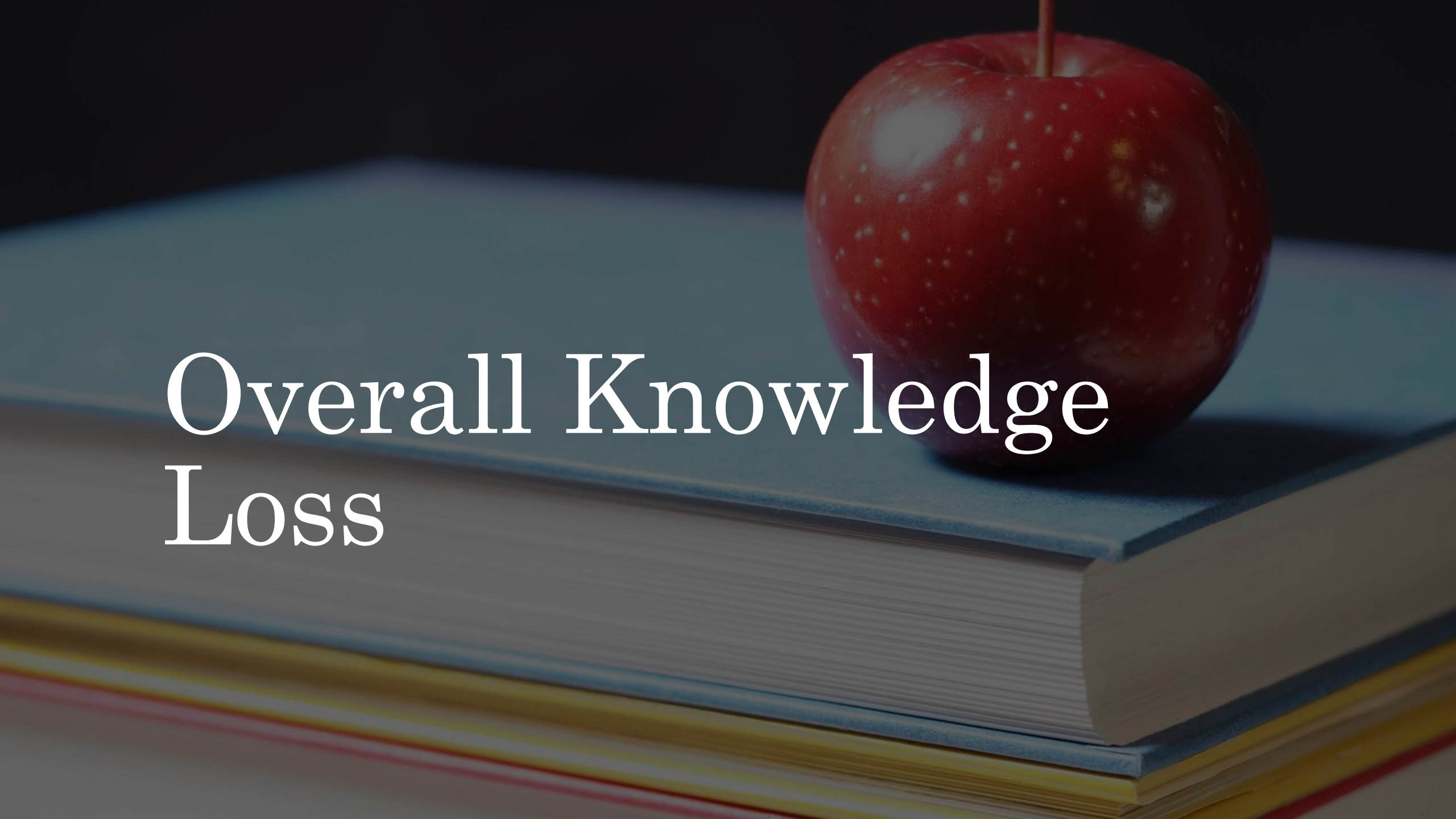
- Fun game-like atmosphere
- 11 systems tested
- 9-11 unique multiple-choice questions per quiz



The background of the slide is a dark, semi-transparent image of a line graph on a grid. A pen is visible in the upper right corner, pointing towards the graph. The graph shows a fluctuating line with several peaks and troughs. Some numerical values are visible on the grid, such as '2,5' and '2,47'.

# Results

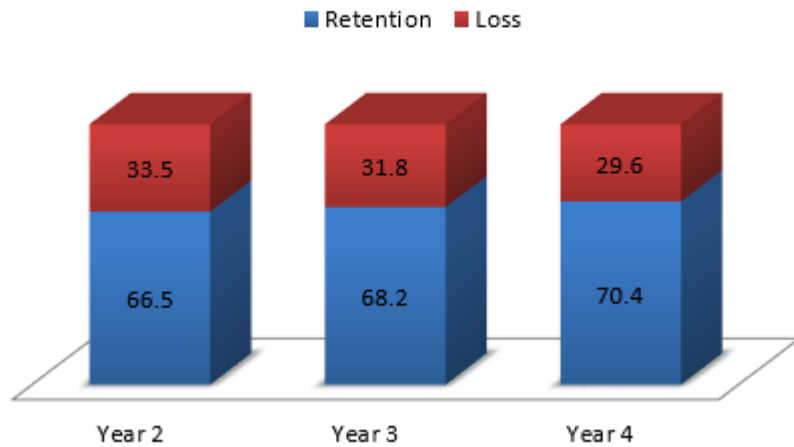
Data gathered were subjected to statistical analysis using SPSS II to determine overall and specific organ system knowledge loss



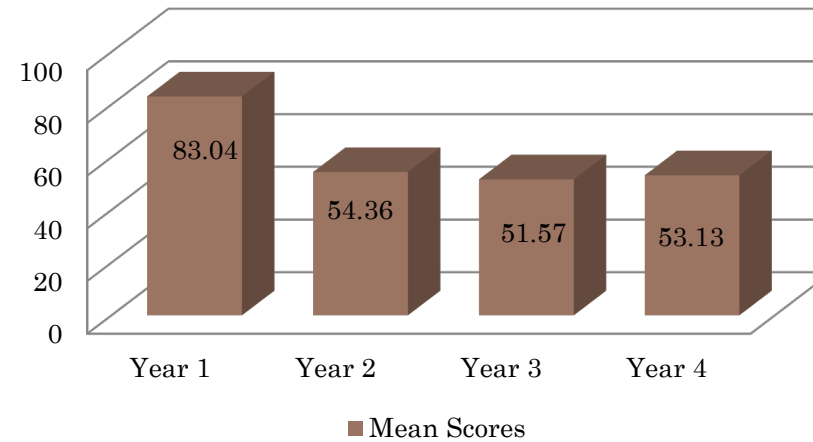
# Overall Knowledge Loss

# Overall Knowledge Retention Year 1-4

## Knowledge Retention Over Time



## Mean Scores





# Knowledge Loss by System

Anatomical Knowledge Retention by System Over Time				
Organ System	Year 1	Year 2	Year 3	Year 4
	Mean Score ± SD	% Knowledge Loss		
Integumentary System	90.6 ± 6.8	19.9%	23.9%	28.2%
Head & Neck Lymphatic	91.4 ± 11.7	57.4%	57.6%	55.7%
Special Senses	88.4 ± 6.9	20.6%	17.3%	37.0%
Gastrointestinal	63.6 ± 6.9	10.3%	12.6%	12.0%
Respiratory System	72.9 ± 5.8	11.0%	14.0%	13.9%
Vascular System	83.5 ± 5.4	46.1%	49.0%	27.6%
Nervous System	83.9 ± 8.1	25.1%	25.1%	25.1%
Cranial Nerves	88.2 ± 4.4	41.2%	42.6%	44.1%
Musculo-skeletal System	88.0 ± 7.0	30.7%	40.3%	26.6%
Lymphatic System	82.6 ± 2.8	35.7%	37.6%	37.6%
Genitourinary System	80.4 ± 16.4	16.4%	21.2%	21.2%



# Why the Variations?

Did initial knowledge acquisition impact the amount of retention?



# Initial Knowledge Acquisition

## Final Knowledge Retention

Organ system	Year 1 Mean $\pm$ SD	Year 4 Mean $\pm$ SD	% Knowledge Loss	P -values
Integumentary system	90.6 $\pm$ 6.8	62.4 $\pm$ 26.3	28.2%	.0001
Head & neck lymphatic	91.4 $\pm$ 11.7	35.7 $\pm$ 18.9	55.7%	.0001
Special Senses	88.4 $\pm$ 6.9	51.4 $\pm$ 24.6	37.0%	.0001
Gastrointestinal	63.6 $\pm$ 6.9	51.58 $\pm$ 17.7	12.0%	.0001
Respiratory system	72.9 $\pm$ 5.8	58.92 $\pm$ 18.3	13.9%	.0001
Vascular system	83.5 $\pm$ 5.4	55.9 $\pm$ 25.6	27.6%	.0001
Nervous system	83.9 $\pm$ 8.1	58.8 $\pm$ 15.9	25.1%	.0001
Cranial nerves	88.2 $\pm$ 4.4	44.1 $\pm$ 20.4	44.1%	.0001
Musculo-skeletal system	88.0 $\pm$ 7.0	61.4 $\pm$ 21.3	26.6%	.0002
Lymphatic system	82.6 $\pm$ 2.8	45.0 $\pm$ 18.6	37.6%	.0001
Genitourinary system	80.4 $\pm$ 16.4	59.2 $\pm$ 25.8	21.2%	.0001



# Why the Variations?

Are certain systems emphasized more at different times?



# Fluctuating Knowledge Loss

Organ System	Year 2	Year 3	Year 4
Special senses	20.6%	17.3%	37%
Vascular	46.1%	49%	27.6%
Musculoskeletal	30.7%	40.3%	26.6%



# Why the Variations?

Did study limitations impact results?

# Impacting Factors

Student demographics

Movement within the  
cohort

Attendance and  
participation







# Implications

- Can be replicated to assess any concept threaded throughout a nursing program
- Identifying knowledge gaps allows for targeted interventions
- Baseline data provides a way to evaluate the effectiveness of interventions
- Addressing knowledge gaps helps prepare better practitioners



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# Acknowledgements

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Contributor Dr. Raj Narnaware

The background of the slide is a dense field of 3D question marks. These question marks are rendered in a light beige or off-white color with a subtle gradient and soft shadows, giving them a three-dimensional appearance. They are scattered across the entire background, with some appearing more prominent than others. The overall tone is muted and professional.

Questions???