

## Purpose

- There is growing concern over the loss of anatomical and physiological knowledge in medical, allied-health & nursing students over time. Numerous studies have demonstrated the difficulty of the students in these disciplines to retain and apply anatomical knowledge as they progress through their programs of study (Narnaware and Neumeier, 2019).
- However, physiological knowledge retention has not been studied as extensively as anatomical knowledge retention in health care disciplines, with very few studies focusing on nursing students (Aari et al., 2004). Of those studies, most are carried out after graduation (Aari et al., 2004), or are focused on a single or limited number of organ systems (Pourshanazari et al., 2013).
- We have previously shown that physiology students retained approximately 86.6% of their first-year physiological knowledge over four months (Narnaware et al., 2020, Narnaware and Neumeier, 2021).
- To improve the acquisition and retention of physiological knowledge, the present study aims to develop an interventional strategy that includes the repeated assessment of vascular physiology knowledge over an eight-week period.

## Methods

- Approximately 70-75 first-year nursing students were quizzed on vascular physiology, blood and defenses using the on-line quizzing system Kahoot.
- Each Kahoot quiz included 9-11 knowledge and comprehension level multiple-choice questions, and new sets of questions were used for each week's Kahoot quiz.
- Data were statistically analyzed using SPSS II, and means were compared using 2-sample t-tests. The scores are described as the mean and standard deviation (SD). Statistical significance was set at  $P \leq 0.05$  for all tests.

## Results

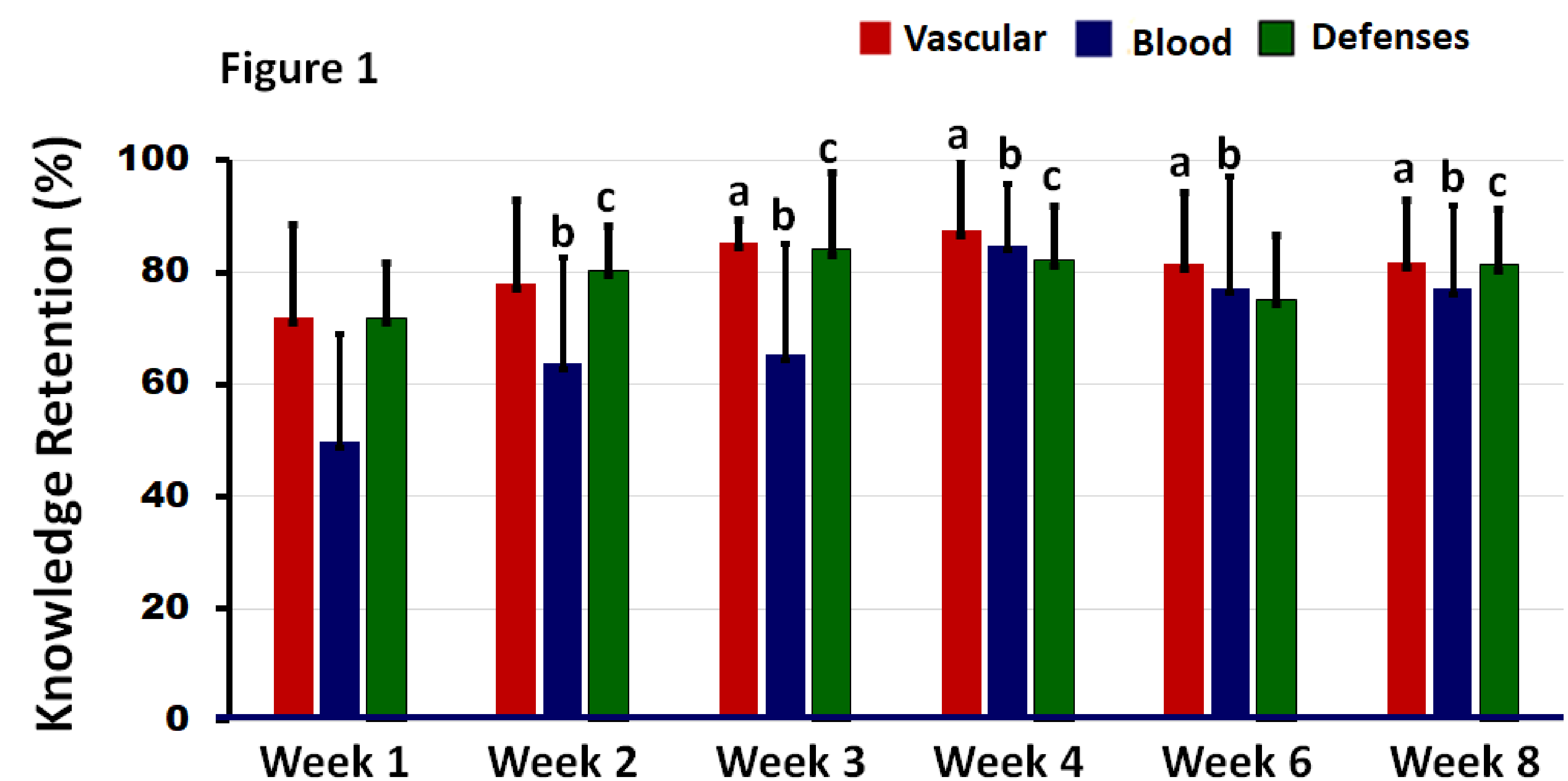
- Compared to week 1, repeating knowledge of the vascular physiology and defenses yielded a significantly higher ( $P < 0.05$ ) knowledge retention at week 2 (8.4% & 11.7%).
- However, this retention was highest at weeks 3 (18.7% & 16.9%) and weeks 4 (21.6% & 14.3%),  $P < 0.001$  in both organ systems, with less significant improvement ( $P < 0.05$ ) at week 6 (13.3%) and no significant difference in defenses (4.6%).

**Table 1.** Percent Change in Knowledge Retention of Cardiovascular Physiology & Defenses Over Eight Weeks in Nursing Students

Organ System	Percent (%) Change					
	Week 1	Week 2	Week 3	Week 4	Week 6	Week 8
<b>Vascular Physiology</b>	100%	8.40*	18.7**	21.6**	13.4**	13.80*
<b>Defenses</b>	100%	11.70*	16.90**	14.3**	4.6	13.0*
<b>Blood</b>	100%	27.8***	31.2***	69.5***	55.2***	54.7***

Data shown as means  $\pm$  (standard deviation). Percentage change in knowledge retention over eight (8) weeks compared to week 1. \* $P < 0.05$ , \*\*  $P < 0.01$ , \*\*\* $P < 0.0001$ .

- No significant differences in knowledge retention were found between vascular and defenses at week 8.
- However, compared to vascular and defenses, content reinforcement of blood was highly significant at all weeks.
- Compared to week 1, knowledge retention of blood was highest at week 4 (69.5%), week 6 (55.2%), and week 8 (54.7%),  $P < 0.0001$ , with less significant retention at week 2 (27.8%) and week 3 (31.2%),  $P < 0.001$ .



Impact of content reinforcement on knowledge retention of the cardiovascular physiology and defenses over eight weeks in nursing students. a, b, c compared to week 1;  $P < 0.05$ ,  $P < 0.001$ .

## Conclusion

- The present study shows that repeated knowledge assessment can significantly improve knowledge retention of vascular physiology, the blood and defenses in nursing students.
- Organ system-specific improvements in knowledge retention were found study agrees with previously reported studies in medical students (Pourshanazari et al., 2013).
- Therefore, content reinforcement should be used as one of the interventional strategies to improve knowledge retention in nursing students.
- A further research should be conducted to explore effective ways to maintain increased retention over longer periods of time.

## References

- Aari et al., 2004. Biological and physiological knowledge and skills of graduating Finnish nursing students to practice in intensive care. *Nurs Educ Today* 24:293-300.
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- Pourshanazari et al., 2013. Comparing the long-term retention of a physiology course for medical students with the traditional and problem-based learning. *Adv Health Sci Educ* 18:91-97.