Anatomical Knowledge Retention in Third-Year Nursing Students

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Introduction

- Human anatomy and physiology are considered a cornerstone of any health-related profession and serve as a pre-requisite for future nursing courses and clinicals (McVicar et al., 2015). However, numerous studies suggest that students experience great difficulty in transferring the fundamental anatomical knowledge that they gain in the first year of their programs to future theory/clinical practice (Gunay & Kilinc, 2018).
- Most of the knowledge transfer, loss and/or retention studies have been carried out in medical, allied health disciplines, and this has been assessed only in second-year nursing students recently (Narnaware & Neumeier, 2020). This study seeks to determine the percent of anatomical knowledge retained by third-year nursing students and determine the levels of knowledge retention in the body's organ systems.

Methods

- This study was conducted in the Fall 2018 semester with a class of 33 students. Quizzes were created using an online quizzing platform called Kahoot (Kahoot Inc., Oslo, Norway) to assess knowledge retention. The quizzes were not used for marks, and students were encouraged not to study for them in advance. Between nine and eleven multiple-choice questions reflecting first-year knowledge from eleven major organ system were developed into eleven Kahoots.
- The pooled data from the first-year anatomy course and the third-year acute alterations in health course were subjected to statistical evaluation using SPSS II (IBM Corp; Armonk, NY) to determine overall knowledge loss. Means were compared using 2-sample 't' tests. Significant differences were considered at $P<0.05$.

Results

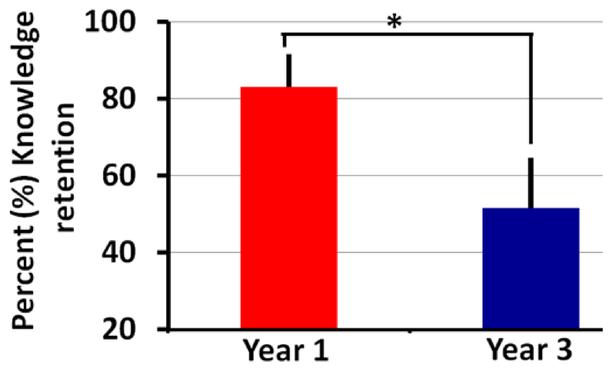
- The mean score for all organ systems in year one was 83.04 ± 7.95 (SD), which was significantly ($P<0.001$) decreased to 51.57 ± 12.5 (SD) by the third-year acute health alterations course. This equates to a 31.8% knowledge loss within two years (**Figure 1**).
- Knowledge retention was highest for the special senses, the integumentary system, the genitourinary, the respiratory, and the nervous system (71-58%). This was followed by the gastrointestinal tract, musculoskeletal and cranial nerves (51-45.6%).
- Retention was significantly lower ($P<0.001$) for the lymphatic head and neck, the lymphatic system, and the vascular system (40-30%) (Table 1).

Table 1. Retention by Organ System

Organ system	Year 1 Mean ± SD	Year 3 Mean ± SD	% Knowledge lost	t-test/ P -values
Integumentary	90.6 ± 6.8	66.7 ± 29.6	23.9%	.0001
Head & neck lymphatic	91.4 ± 11.7	33.8 ± 23.9	57.6%	.0001
Special Senses	88.4 ± 6.9	71.1 ± 21.5	17.3%	.0001
Gastrointestinal	63.6 ± 6.9	51.0 ± 12.2	12.6%	.0001
Respiratory	72.9 ± 5.8	58.9 ± 18.3	14.0%	.0002
Vascular	83.5 ± 5.4	34.5 ± 18.7	49.0%	.0002
Nervous	83.9 ± 8.1	58.8± 15.9	25.1%	.0001
Cranial nerves	88.2 ± 4.4	45.6 ± 18.4	42.6%	.0001
Musculo-skeletal	88.0 ± 7.0	47.7 ± 27.6	40.3%	.0001
Lymphatic	82.6 ± 3.2	45.0 ± 18.6	37.6%	.0001
Genitourinary	80.4 ± 16.4	59.2 ± 27.8	21.2%	.0002

Results

Figure 1. The Summary of Overall Retention



Year 1 and Year 3 bars represent the overall mean scores from all organ systems converted into percent knowledge. There is a significant decrease in knowledge retention between years 1 and 3 ($P<0.001$).

Discussion

- The significant differences between knowledge retention in the third year largely depended upon the individual organ system being assessed.
- These differences in knowledge retention may be attributed to the level of difficulty of the questions, the time period between time learned and time tested, or students' perceived usefulness of the information.
- Future studies could investigate the variables that impact specific system knowledge retention and the interventions that might improve those retention levels.
- Overall, the results of this study are consistent with other studies of medical students that reported an average 30-40% loss of anatomical knowledge within two years (Jurjus et al., 2014).

Conclusion

- In conclusion, the retention of anatomical knowledge varied by body system. The overall loss of 31.8% is consistent with results reported in studies of medical and allied health professional students (Jurjus et al., 2014). This loss is higher than reported for second-year nursing students earlier (Narnaware & Neumeier, 2020).
- While the loss is consistent with other disciplines, it does raise the concern of how much anatomical knowledge is retained by students throughout their program and by registered nurses once they enter practice.
- Studies are currently underway to evaluate anatomical knowledge retention in fourth-year nursing students. Future studies could involve the development and evaluation of teaching strategies to increase the level of anatomical knowledge retention in health disciplines.

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