SHORT REPORT

Retention of knowledge regarding mathematics and drug dosage calculation among undergraduate nursing students of a private school of nursing in Pakistan

Nishat Tabassum, Hussain Maqbool Ahmed Khuwaja

Abstract

This study aimed to assess the level of retention of knowledge regarding calculation of drug dose among undergraduate nursing students studying at a private school of nursing. This was a pre- and post-comparison design conducted at the Aga Khan University, Pakistan, from August 2017 to September 2019. All the students enrolled in Bachelor of Science in Nursing (BScN) (Class of 2019) were included in the study. Mean test scores of 141 fourth year BScN students were compared with their own performance in the second year. Mean scores on mathematics and drug dosage calculation test decreased significantly from 21 in second year to 17.97 in the final year of studies. Modifications in assessments as well as curriculum are suggested to improve retention of dose calculation skills among undergraduate nursing students.

Keywords: Nursing education, Drug calculation, Patients safety.

DOI: https://doi.org/10.47391/JPMA.471

Introduction

Undergraduate student nurses have to learn and retain drug calculation skills in order to accurately calculate drug dosages for safe patient outcomes in clinical practice. Inaccurate or incorrect drug calculations may lead to errors in drug administration and consequently cause harm to the patients.[1,2] Medication administration course is an integral part of the baccalaureate nursing curriculum. For undergraduate Bachelor of Science in Nursing (BScN), students should understand and apply the basic mathematical skills in drug calculations, though it has always been a challenge.[3]

According to the Higher Education Commission (HEC) standardised curriculum for undergraduate nursing, BScN students study Mathematics and Drug and Dosage Calculation courses in Year II only. By the time they graduate, they do not have any formal course that could test their learnt concepts. According to the authors of the study conducted in Pakistan,[3] the inability to correctly calculate the dosage was one of the factors that resulted in medication errors. In a cross-sectional study conducted in Turkey,[2] it was found that there was no difference in the frequency of errors reported by the participants' with respect to their progress in academic career within undergraduate education. Hence, students belonging to the eighth semester were no different from the students of second semester.[2]

Hence, it is essential to know how well the students retain their Math skills and competence throughout their four years. In this study, we aimed to assess the math and drug calculation skills of year IV students to understand how well they retained the knowledge till graduation.

Methods and Results

A serial cross-sectional study was conducted between August 2017 and September 2019 using a pre-post comparison by administrating the same questionnaire at two points in time to the same group of students. During the course of four years of undergraduate education, all the students of class of 2019 were evaluated on drug and dosages calculation in year II (which was in 2017). For this study, this exam was considered as pre-test. The same test was again administered in year IV to the same participants as post-test. Scores obtained by the BScN year IV students in the post-test was entered in an excel file against their year II scores that were available with the university's examination cell. The entered data was imported in Stata version 15.0. Descriptive analysis was carried out to show the difference in the performance for each student. Dependent (Paired) t-test was applied to test the significance in the change that occurred between pre and post-test. Furthermore, the analysis was

Table-1: Mean scores of students in pre-test (2017) and post-test (2019).

Test	Mean	Standard Deviation	Range
Pre-test	21.01	4.27	10 - 28
Post-test	17.97	5.17	6 - 28

Department of Nursing and Midwifery, Aga Khan University, Karachi, Pakistan.
Correspondence: Hussain Maqbool Ahmed Khuwaja.
Email: hussainmaqbool.khuwaja@gmail.com

Table-2: Comparison of mean scores between pre-test and post-test.

Group	Mean (SD)	95% Confidence Interval		p-value
		Lower Limit	Upper Limit	
Pre-test	21.01 (4.27)	20.30	21.72	
Post-test	17.97 (5.17)	17.11	18.83	<0.0001
Difference	3.03 (4.94)	2.21	3.85	

*p-value = <0.05
SD: Standard Deviation.

done by keeping 100% passing for pre-test and post-test to assess the ability to achieve 100% increase over the course of four years' education. Consecutive sampling was used as a sampling strategy whereby all students of year IV BScN (class of 2019) were enrolled as study participants.[4] All 141 students were offered pre- and post-tests.

Ethical approval for the study was obtained from the Aga Khan University's (AKU) Ethics Review Committee (2019-1803-4809). Administrative approval to contact the students was obtained from the Dean and Assistant Dean, AKU School of Nursing and Midwifery. Individual consent was not sought as the mean scores of pre-test in year II were to be compared against the post-test in year IV. Both exams were required to be conducted in the same manner. It was assumed that if the students were informed that this exam will not be graded in their transcripts, the students would have performed below par with less keenness to achieve good marks. Students' scores were confidentially maintained as per the standard protocols mentioned under university's examination policy.

Table-1 shows the mean scores of 141 students for the same test attempted in 2017 labelled as pre-test and in 2019 labelled as post-test. After assessing the skewedness of pre- and post-tests, paired t-test was applied. A significant difference was observed between the mean scores as the mean scores declined from 21.014 ±5.17 to 17.978 ±4.27, as shown in Table-2.

Discussion and Conclusion

The undergraduate nursing students learn different competencies during their four-year undergraduate degree course which enables them to provide safe and quality nursing care to the patients. One such competency is drug and dosages calculation which enables the nurses to understand the ordered dose, calculate its required amount and administer it safely. Hence, it aims to ensure their capability for administering medication and decrease the risk of medication errors. Many studies make the assumption that numeracy or math skills are essential for successful drug calculations and, therefore, poor numeracy equates to poor drug calculation skills in practice.[5,6]

The current study showed that there is a statistical difference between the pre-test (conducted in year II) and post-test (conducted in year IV) scores of undergraduate nursing students. Drug and dosage calculation is an important capability for nursing students and they are required to retain the mastery when they graduate in order to avoid errors in administering medicines.[5] Currently, BScN students study Mathematics and Drug and Dosage Calculation courses in Year II only. After that, till graduation, they do not have any formal dedicated course that could refresh their concepts and enable them to safely calculate the required dose of medicine. It will be wise to propose revamping the undergraduate nursing curriculum by either including short courses of Maths and drug dosage calculation in year III and year IV or earmarking a portion of final exams for drug calculation questions in mental health nursing, adult health nursing, advanced concepts of adult health nursing and critical care nursing. The section of drug calculation should be marked as 100% passing criteria rather than the current practices of 70% passing criteria in Pharmacology course and 60% passing criteria in nursing subjects.

Evidence suggests that various strategies are being tested that can be effective in retaining skills for drug dosage calculation among undergraduate nursing students, such as calculation workbooks, online maths tutorials and online drug calculation sessions.[7-9] The results of this study calls for the need to assess, implement and evaluate teaching interventions that could increase the knowledge and skills for safe administration of medicine among undergraduate nursing students. Prospective research on testing the efficacy of these teaching strategies is recommended to ensure retention of the knowledge to calculate drug dosage among undergraduate nursing students until they join the formal workforce as registered nurses.

Disclaimer: None

Conflict of Interest: There are no potential conflicts of interest.

Funding Disclosure: None

References

1. Azim M, Khan A, Khan TM, Kamran M. A cross-sectional study: medication safety among cancer in-patients in tertiary care hospitals in KPK, Pakistan. BMC Health Serv Res. 2019; 19:1-12.
2. Cebeci F, Karazeybek E, Sucu G, Kahveci R. Nursing students'

medication errors and their opinions on the reasons of errors: A cross-sectional survey. J Pak Med Assoc. 2015; 65:457-62.
3. Tabassum N, Allana S, Saeed T, Dias JM. Reported Medication Errors Committed by Undergraduate (Four Year BScN) Students at AKU-SoNaM, Karachi, Pakistan. Int J Nurs Educ. 2015; 7:94-8.
4. Polit DF, Beck CT. Nursing research: Generating and assessing evidence for nursing practice. London: Lippincott Williams & Wilkins, 2008.
5. Guneş UY, Baran L. Mathematical and drug calculation skills of nursing students in Turkey. Int J Caring Sci. 2016; 9:220.
6. McMullan M, Jones R, Lea S. Patient safety: numerical skills and drug calculation abilities of nursing students and registered nurses. J Adv Nursing. 2010; 66:891-9.
7. Wright K. An exploration into the most effective way to teach drug calculation skills to nursing students. Nurse Educ Today. 2005; 25:430-6.
8. Wright K. The assessment of drug calculation skills-Time to rethink the whole process. Nurse Educ Today. 2012; 4:341-4.
9. Bagnasco A, Galaverna L, Aleo G, Grugnetti AM, Rosa F, Sasso L. Mathematical calculation skills required for drug administration in undergraduate nursing students to ensure patient safety: A descriptive study: Drug calculation skills in nursing students. Nurse Educ Pract. 2016; 16:33-9.