A COMPARISON OF NURSING EDUCATIONAL PRACTICES RELATED TO MEDICATION DOSAGE CALCULATION WITH PRACTICE EXPECTATIONS

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Learning Objectives:

1. The learner will be able to compare differences between educational practices and bedside practices related to the skill of medication dosage calculation.

2. The learner will be able to identify the medication dosage calculations that are utilized most often in practice.

3. The learner will be able to apply the results of this study when planning content or curriculum in nursing education.

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Why Study Medication Dosage Calculation?

Given the current use of technology in the medication administration system, do nurses use medication dosage calculation at the bedside?

Do hospitals expect nurses to be competent in medication dosage calculation skills?

What are the current teaching practices in academic nursing programs related to the skill of medication dosage calculation?

Patient Safety and Error Reduction

In 2009, the Food and Drug Administration (FDA) estimated that medication errors caused at least one death every day and injured approximately 1.3 million people each year in the United States

Nurses, the last link in the medication administration chain, are in a position to catch their own errors and the errors of others

Previous Research

Polifroni, E. C., McNulty, J., & Allchin (2003). Medication errors: More than a system issue. *Journal of Nursing Education*, 42(10), 455-458.

Polifroni, E. C., Allchin, L., & McNulty, J. J. (2005). Limited math skills: A prescription for change. *Journal for Nurses in Staff Development*, 21(2) 79-81.

Method: Internet Questionnaire

3 groups of nurses:

- Academic nurse educators
- Clinical nurse educators in hospitals
- Practicing staff nurses

Distributed through 3 nursing organizations:

- The Council of Indiana Nursing Deans and Directors (CINDD)
- Indiana Association for Nursing Professional Development (IANPD)
- Indiana State Nurses Association (ISNA)

Questionnaire Topics

Admission requirements related to mathematics

Use of technology for teaching

Frequency of testing

Construction of tests

Calculator use during testing

Use of conversion tables during testing

Required passing score

Consequence of failure

Use of remediation

Perceptions of dosage calculation instruction

Importance of individual medication dosage calculation skills

Frequency of use of individual medication dosage calculation skills

Medication Dosage Calculation Skills

Calculations for oral medications (tablets, capsules, and liquids)

Ability to convert measurements

Calculations related to milliliters to draw up into a syringe

Calculations based on body weight or body surface area

Intravenous infusion rates

Intravenous infusion times and ending times

Intravenous infusion rates related to units per hour

Advanced calculations for intravenous rates (microgram/kilogram/minute)

Research Question # 1

Are there differences in educational practices among academic nursing programs (registered nurse programs) in Indiana related to medication dosage calculation skills?

Yes, the differences are related to the use of a variety of passing scores and the timing of tests (maybe).

Research Question # 2

Are there differences in educational practices among hospitals in Indiana related to medication dosage calculation skills as reported by hospital nurse educators in Indiana?

Yes, related to the use of many different percentage passing scores.

Research Question # 3

Are there significant differences in educational and testing practices between academic nursing programs and hospitals in Indiana related to medication dosage calculation skills?

Yes, related to the skills that are taught in academic programs and tested in hospitals, providing conversion factors during testing, remediation (maybe).

Research Question # 4

Are there significant differences between the medication dosage calculation skills taught in academic nursing programs, tested in hospitals, and used in practice by nurses?

Yes. There were significant differences in all skills except determining intravenous rate in mL/hr.

Research Question # 5

Are there significant differences in perception about mathematics ability and the effectiveness of medication dosage calculation across three groups of nurses, educators in academic nursing programs, educators in hospitals, and practicing nurses?

Yes, related to the ability to perform basic mathematical calculations and comfort level with these skills.

Research Question # 6

Are there significant differences in the perception of importance of individual medication dosage calculation skills between nurse educators in academic nursing programs, hospital nurse educators, and practicing nurses?

Yes, related to the skills of conversion (within the metric system or other units of measurement). A marginal difference was found related to calculations based on body weight or body surface area.

Implications

For academic nurse educators:

Provide calculators and conversion factors during testing

May consider deemphasizing calculations using conversion factors

For hospital nurse educators:

As nurses are not using all of these skills often, refresher courses may be necessary

Education and testing of dosage calculation skills may need to be unit-specific

For practicing staff nurses:

Double-checks of weight-based dosages and high-risk medications is recommended by the FDA and ISMP. Do not rely on technology!

Future Research

For academic nurse educators:

- Explore test timing and frequency on student outcomes
- Explore the use of technology for teaching these skills on outcomes

For hospital nurse educators:

- What are the true expectations and what type of tests are given?
- The use of refresher courses for nurses
- Education and testing in specialty units

For practicing staff nurses:

- Attitudes toward dosage calculation with the use of technology
- The use of independent double-checks

Thank you!

Questions?

Thanks to Dr. Susan Kiger and Dr. Betsy Frank for their advice and support during this study.