Medication Calculation Skills of Graduating Nursing Students in Finland

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Abstract. The aim of this study was to describe the basic mathematical proficiency and the medication calculation skills of graduating nursing students in Finland. A further concern was with how students experienced the teaching of medication calculation. We wanted to find out whether these experiences were associated with various background factors and the students’ medication calculation skills.

In spring 1997 the population of graduating nursing students in Finland numbered around 1280; the figure for the whole year was 2640. A convenience sample of 204 students completed a questionnaire specially developed for this study. The instrument included structured questions, statements and a medication calculation test. The response rate was 88%. Data analysis was based on descriptive statistics.

The students found it hard to learn mathematics and medication calculation skills. Those who evaluated their mathematical and medication calculation skills as sufficient successfully solved the problems included in the questionnaire. It was felt that the introductory course on medication calculation was uninteresting and poorly organised. Overall the students’ mathematical skills were inadequate. One-fifth of the students failed to pass the medication calculation test. A positive correlation was shown between the student’s grade in mathematics (Sixth Form College) and her skills in medication calculation.

Key words: calculation, mathematics, medication, nursing student, teaching

Introduction

Administration of medication plays an important part in the alleviation of suffering, the restoration and promotion of health, and also in the prevention of illness (Arndt, 1994). It is a common task, which is fundamental to most branches of nursing (Bayne and Bindler, 1988; Arndt, 1994; Cooper, 1995). The nurse must be aware of the five rights of medication administration: the right drug, the right route, the right dose, the right time and the right patient (Craig and Sellers, 1995).

The process of learning medication administration requires knowledge, reading and understanding of medical orders. To safely fulfil drug use, nurses must have knowledge about pharmacological actions, dosages and therapeutics. Other information is needed as it relates to the patient’s diagnosis, age and condition (Bayne and Bindler, 1988; Gee et al., 1998). Safe administration of medication requires...
the ability accurately to calculate medication dosages (Bayne and Bindler, 1988; Bliss-Holtz, 1994). The frequencies with which nurses have to perform calculation in order to administer a medication vary in different units (Cartwright, 1996).

Medication calculation requires arithmetic and conceptual skills. Arithmetic skills consist of the common basic arithmetic operations: addition, subtraction, multiplication and division. Conceptual skills consist of the ability to convert between measurement systems and to formulate a dosage problem (Shockley et al., 1989). Several studies suggest that nurse students have poor mathematical and medication calculation skills (Blais and Bath, 1992; Bliss-Holtz, 1994; Craig and Sellers, 1995; Kapborg, 1995). Drug administration errors can be costly to health institutions and professionals, but for the patient the error may be life-threatening (Bindler and Bayne, 1991; Gladstone, 1995; Kapborg, 1995). It has been argued that the only way to achieve accurate administration of medication is through a radical overhaul of the hospital system, looking at all procedures and gathering information on possible points for error (Cooper, 1995). It is a major challenge to reduce the number of drug errors: this requires the full commitment of management in health care organisations. However, this is certainly the best long-strategy term to more effective treatment (Arndt, 1994).

**Review of the Literature**

In the United States the medication calculation skills of nurses and students have been assessed in numerous studies (e.g. Bayne and Bindler, 1988; Bindler and Bayne, 1991; Blais and Bath, 1992). Practising nurses \( n = 62 \) did not have the skills they needed for accurate medication calculation: only 35% of the nurses attained a score of 90% or more. Most errors were made when calculating intra-venous medications. Nurses were able accurately to predict their own medication calculation abilities (Bayne and Bindler, 1988). The study was repeated in 1991 (Bindler and Bayne) with similar results. Blais and Bath (1992) studied drug dosage calculation skills and errors among nursing students \( n = 66 \). Difficulties were more likely to be conceptual than computational. In Australia, Cartwright (1996) analysed and categorised a total of 750 medication orders and found that nurses found it hard to calculate drips and the volume per hour (see also Bayne and Bindler, 1988). In Sweden, Kapborg (1995) investigated the mathematical knowledge and skills of beginner nurse students \( n = 975 \) in a two-year nursing programme. Students with an upper secondary education had higher average scores than other groups. Common errors were the misplacement of decimal points and problems with fractions and conversions.

Studies on the teaching and learning of medication calculation have addressed such aspects as teaching methods and the learning of mathematics and pharmacology. Mathematical drills, clinical experience (Adams and Duffield, 1991) and instruction through dimensional analysis improved the students’ ability to calculate drug dosages correctly (Craig and Sellers, 1995). Flynn et al. (1996) compared