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Development of Clinical Guideline for Drug Dose Calculation Using the Delphi Method

Prisca A. Koshy[1*], Hepsibah Sharmil. S[2], S. Madhan Kumar[3], M. Rosy[4], R. Gayathri[5], Jebaz B. Raj[6]

[1]BSc Nursing III year,Chettinad College of Nursing,Chettinad Academy of Research and Education, [2]Principal,Chettinad College of Nursing,Chettinad Academy of Research and Education.RNRM,M.Sc (N), MBA, PGDHA, PhD, [3]BSc Nursing III year,Chettinad College of Nursing,Chettinad Academy of Research and Education, [4]BSc Nursing III year,Chettinad College of Nursing,Chettinad Academy of Research and Education, [5]BSc Nursing III year,Chettinad College of Nursing,Chettinad Academy of Research and Education, [6]BSc Nursing III year,Chettinad College of Nursing,Chettinad Academy of Research and Education.

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SUMMARY

Background: Empirical studies in competence are lacking in the field of Drug dose calculation.

Objective: To construct a clinical guideline for drug dose calculation and to enhance the comprehension of the forthcoming nursing students.

Method*s:* Two rounds of the Delphi method were used. Data were analyzed by content analysis and with descriptive statistics.

Results: After two sequential sessions of discussion by the Delphi method, a clinical guideline for Drug dose Calculation was constructed. This guideline includes the formulas for Drug dose Calculations. The reliability was achieved by Median and Consensus percentage.

Conclusions*:*We constructed a clinical guideline for palliative sedation therapy using the Delphi technique. The clinical efficacy of this guideline should be tested in the future.

Keywords: Guideline, Delphi method, Drug dose calculations, Development.

INTRODUCTION

Medication inaccuracy is one of the most frequent types of medical errors that occur in healthcare institutions. Medication errors have also been identified as the most common single preventable cause of adverse events (National Medicines Information Centre, 2007)[1].Safe and accurate medication administration is an essential and potentially provocative nursing responsibility. Medication calculations require numerical and conceptual calculation skills (Guneş et al., 2016; McMullan et al., 2010; Newton et al., 2009)[2,3,4]. Nurses enter the profession relatively earlier than other professionals. Before long the final years of Basic B.Sc. (Nursing), the graduates have many lives placed into their hands.The principles of safe medication administration remain the same throughout a registered nurse's career and can be applied as the

Corresponding author: Prisca A. Koshy, Department of Nursing, Chettinad Academy of Research and Education,Kelambakkam,Tamil Nadu, India
E-mail: prisca2480@gmail.com

knowledge and complexity of the medications are increased (Shihab, 2009). Therefore if students understand the principles developed from practicing with realistic tasks during their education, they are likely to develop an attitude of reflection and critical thinking which, in turn, will improve their medication safety (Wright, 2008).[5] Hence it is essential that the graduating nurses acquire adequate comprehension on calculation of drug doses in order to avoid errors in medication administration.A guideline to direct the student nurses may help to avoid the errors caused due to in naivete. The guideline can also be used by the nurses to amend their existing knowledge and ameliorate their current practices of drug dose calculation and administration.

BACKGROUND AND LITERATURE REVIEW

Administration of the medication is an essential nursing responsibility. The Harvard Medical Practice Study and the Colorado-Utah study(1999 Donaldson)[6] estimated that approximately 44000-98000 deaths are resulted from medical mistakes in hospitals.Park. K15 (2000) says that the basic philosophy of under-fives clinics was to give nurses effective training and responsibility for handling the childcare services. If future nurses are trained accurately, they may be more effective than the interns. According to WHO (2015) there are 65.5 % of nurses are making medication error and there are 1 death per day and 1.3 million injuries occur every year. Dangi Ravi Rai and Sujita Devi (2019)[7] conducted a descriptive study on the Knowledge regarding pediatric drug calculation among the staff nurses. Structured questionnaire was administered to the staff Nurses. There are 100 Staff Nurses participated in this study. This study revealed that maximum 59% participants scored average knowledge ,24% scored good knowledge and 17% scored poor knowledge. The researcher concluded that there is a great need for improving the knowledge in nurses. Wayne Varndella, Margaret Fryb, Matthew Lutzeb, Doug Elliot (2020)[8] conducted a study on Use of the Delphi method to generate guidance in emergency nursing practice. Of 246 data pointed out 22 (8.9%) studies met the inclusion criteria. Eight practice guidance themes were identified. Gross study caliber was high (score 12/14; range 4–13). Based on this review, this study concluded that the Delphi method is an appropriate method for exploring emergency nursing practice. Hence it is essential that the graduating nurses acquire adequate knowledge on calculation of drug doses in order to avoid errors in medication administration.A guideline to guide the student nurses may help to avoid the errors and to improve their existing knowledge and modify their current practices of drug dose calculation and administration. So we here are extending our research to find the best formulas in drug dose calculation and administration to help the upcoming nursing students to gain confidence and comprehension in dispensing medication to the patients.

METHODS

A formal in-depth systematic Qualitative approach was used for this study. The research design adopted for this study was Delphi method.This study aims to understand the drug dose calculations in the hospital settings and to develop a standard guidelines for their practice and provision. The Delphi method is a process used to arrive at a group opinion or decision by surveying a panel of experts. Experts respond to several rounds of questionnaires, and the responses are aggregated and shared with the group after each round. The experts can adjust their answers each round, based on how they interpret the "group response" provided to them. The ultimate result is meant to be a true consensus of what the group thinks. The study was conducted in Chettinad college and hospital, Kelambakkam, Chettinad hospital urban health centre, Karapakkam, Chettinad rural health centre, Poonjeri. The main criterion for the selection of experts include people who had been recognized for their professional knowledge and experience.

No clear rule exists for the number of panel experts and selection criteria in a Delphi study. However, because a Delphi study depends on expert opinions rather than direct data, the composition of the expert panel is crucial for its successful application. The members of the study were selected from the specified settings, nurse 55 and doctors 55(n=110).The content validity of the items identified through clinical observation and literature review was confirmed by two nursing professors and one head nurse working at a tertiary care hospital. In the first Delphi round, preliminary items for guideline for Drug Dose Calculation was identified through clinical observation and literature were presented, the participants were asked to rate each item on a 4-point Likert scale. In the first Delphi round, in account of the experts' various opinions, the survey items were given to the experts and asked to rate the items and suggest some other formulas used for Drug dose Calculations. Based on this information, items could be revised, deleted, or added. In round two, the researchers analyzed the results of the first Delphi round. Through this process, the experts were able to compare their own responses to those of the other participants. This round provided opportunities for the experts to reflect, revisit, and revise their opinions and the reliability was checked using the same method. The guideline developed through the first Delphi round was confirmed and adopted as provisional version.The Delphi process was discussed in the Figure 1.

Data Collection

The expert members of the health care team were selected from Chettinad college and hospital, Chettinad urban and rural health centers. It consisted of 55 doctors, 55 nurses. We conducted a detailed survey on the existing guideline of drug dose calculation practiced in the Hospital setting. We used Delphi method to obtain consensus among the group of experts.The researchers formulated the commonly used drug dose calculation formulas in the hospital setting to draft a guideline. Next the guidelines were divided into brief points\sentences and 3 experts were selected for obtaining content validity for the formulated items. After that participants were selected according to their skills and experiences. In First Round, Consent will be obtained from the participant .The participants were requested to rate the validity of each

Table 1: Frequency and Percentage Distribution of demographic variables

S. no	*Characteristics*	*Category*	*Frequency*	*Percentage*
1	Designation	Doctors	55	50.0%
		Nurses	55	50.0%
2	Department	General Medicine	33	30.0%
		General Surgery	19	17.3%
		Critical care	24	21.8%
		Pediatrics	12	10.9%
		ENT and ophthalmology	11	10.0%
		Orthopedics	11	10.0%
3	Experience of work	1-5 years	65	59.1%
		6-10 years	20	18.2%
		11-15 years	11	10.0%
		Above 15 years	14	12.7%
4	Educational degree	Diploma	13	11.8%
		Bachelors	65	59.1%
		Masters	19	17.3%
		PhD	13	11.8%

item on a 4-point Likert scale from 1(highly irrelevant) to 4 (highly relevant).In second round, The minimum, median and maximum scores disclosed to each member and the difference in opinions discussed. The revised guideline was further modified according to the results of first round and opinion of the participants. The Reliability is evaluated using the same method. The median value and the consensus percentage were assessed and the major difference was resolved. Finally it is adopted as a Standard guideline for Drug dose Calculation.

ANALYSIS

It deals with analysis and interpretation of the data collected regarding the development of the guideline for drug dose calculation. Data was summarized by numbers and proportions, and reported according to proposed methodological criteria for Delphi. Descriptive Statistics was performed using SPSS. On the basis of clinical observation, literature review and validation process, 10 items were drafted. In the first round, the participants rated the importance of the items in a 4-point Likert scale (1 =highly irrelevant ;4 =highly relevant. The data gathered was tabulated, analysed, and interpreted using Descriptive Statistics. The required level of consensus was defined in advance. Two necessary conditions had to be fulfilled: (i) A median value of 4 and (ii)A consensus percentage of at least 80%

ROUND -1 (Delphi Process)

Table 2: Measurement of median for reliability.

Items	Number of participants	Median values	Minimum values	Maximum values
1	110	4	2	4
2		4	2	4
3		4	2	4
4		4	3	4
5		4	2	4
6		4	2	4
7		4	2	4
8		3	1	4
9		3	1	4
10		4	2	4

NOTE: The item achieved median value 4, is reliable.

Table 3: Consensus percentage distribution

Items	Total score value	Number of participants	Maximum score	Percentage
1	413	110	440	93.8%
2	404			91.8%
3	398			90.4%
4	402			91.3%
5	400			90.9%
6	397			90.2%
7	384			87.2%
8	336			76.3%
9	319			72.5%
10	383			87.0%

NOTE: The items achieved consensus percentage >80%, is reliable.

(Hasson et al., 2000[9]; Keeney et al., 2001; McKenna,1994 [10]; Powell, 2003; Williams and Webb, 1994).In second round, the guideline was revised and the median and consensus percentage was found. The data was presented under the following headings, Table1: Frequency and Percentage Distribution of demographic variables, Table 2: Measurement of median for reliability (First Round),Table 3: Consensus percentage distribution (First Round), Table 4: Measurement of median for reliability (second Round), Table 5: Consensus percentage distribution (Second Round).

RESULT

In order to select items for the standard guideline for Drug dose calculation, this study first selected 13 items based on clinical observation, literature review and validation from the experts. Of the items observed in clinical practice, 1 items did not overlap with those found through the literature review and were thus included in the preliminary items for the standard guideline. The validation of the selected items was confirmed by two nursing professors and one head nurse working at the tertiary hospital. By this process, 3 items were excluded for the preliminary guideline. Finally the preliminary guideline consists of 10items through the above process. In round 1, the draft guideline was given to all members and requested to rate the validity of each item on a 4 point Likert scale from 1 (highly irrelevant) to 4 (highly relevant).The data was analyzed using SPSS. Statistics revealed that out of 10 items,8 items achieved the consensus percentage(>80%).The median value was 4(8 items) and 3 (2 items).The difference between the minimum and maximum was 2 or less in 8 items and 3 in 2 items Items which failed to achieve the consensus percentage(80%) and median value of 4 is excluded(2 items) for the next round. The excluded items were: Frued's rule and young's rule calculation. The

ROUND-2 (Delphi process)

Table 4 :Measurement of median for reliability

Total Items	*Number of participants*	*Median values*	*Minimum values*	*Maximum values*
1	110	4	3	4
2		4	3	4
3		4	2	4
4		4	2	4
5		4	2	4
6		4	2	4
7		4	2	4
8		4	2	4

Note: Items achieved median value 4,is reliable.

Table 5 : Consensus Percentage distribution

Items	*Total score value*	*No of participants*	*Maximum score*	*Percentage*
1	417	110	440	94.7%
2	405			92.0%
3	407			92.5%
4	405			92.0%
5	401			91.1%
6	416			94.5%
7	406			92.2%
8	409			92.9%

NOTE: The items achieved consensus percentage >80%, is reliable.

median, minimum, and maximum values were disclosed to each member, and the differences in opinions were discussed and resolved .Then the revised guideline was divided into 8 items and the validity of the items evaluated by the same method. In second round, all 8 items achieved the consensus percentage (80%) and median value of 4 and the difference between the minimum and maximum was 2 and less. Finally the researcher determined that the major difference had been resolved, and the revised guideline adopted as a Standard Guideline for Drug dose Calculation. The results of the first and second Delphi rounds are shown in the table 2,table 3, table 4 and table 5.

CONCLUSION

Through the Delphi process we identified 8 standard drug dose calculation guidelines which key stakeholders considered to be both important and reliable for Drug dose calculation. These guidelines may be helpful in providing practical direction for drug dose calculation and administration. . The results of this study can be used in nursing education in three main areas: (i) in self and peer evaluation in discussions on professional development between nursing administrations and nursing staff, (ii) in basic and continued education and orientation programmes and (iii) in ensuring quality management in both nursing staff development and patient safety .The nurses should be periodically evaluated to assess their knowledge and practices regarding drug dose calculations.

Conflict of Interest: Nil

Source of Funding : Self

ETHICAL CLEARANCE: The research was conducted according to established ethical guidelines (Pauwels, 2007).The UG Committee clearance and Institutional Ethical Committee clearance was obtained from CARE. Institutional. The purpose of the study was explained to the participants and obtained written consent . The participants were reminded that they may withdraw their participation whenever they wished and the study results will be used solely for research purposes.

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