Tab. 1. *Didactic test*

Question number	Question	Right answer		Value difficulty (Q)
1.	It is possible to arbitrarily replace an insulin syringe with a standard 2-ml syringe when administering insulin		NO	9.17
2.	Before opening, insulin must be stored in its storage bottle in a refrigerator (at a temperature of 2-8 °C)	YES		4.58
3.	7.5 % KCl can be stored in the pharmacy alongside other commonly available medications		NO	7.50
4.	1 ml of undiluted adrenaline can be administered intravenously for common allergic reaction (itching, redness, urticaria)		NO	7.50
5.	Calcium gluconicum 10 % can be used to replace Calcium chloratum Biotika 10 % in the case of shortage of the latter		NO	22.08
6.	When you dilute Thiopental 0.5 g into a 20-mL syringe, 5 ml will contain 0.1 g		NO	8.75
7.	Nurses can administer opioid analgesics into an epidural catheter		NO	80.83
8.	It is possible to dilute an antibiotic (e.g. gentamicin) in a balanced crystalloid solution for intravenous administration, e.g. Plasmalyte		NO	12.08
9.	Administration of crushed slow-release theophylline tablets into a nasogastric tube is considered the correct procedure		NO	12.50
10.	Unasyn 1.5 g (containing ampicillin and sulbactam) can be administered intravenously to a patient with an allergy to penicillin antibiotics		NO	12.08
11.	Intramuscular injection of FRAXIPARINE is contraindicated	YES		11.67
12.	Dyskinesia (e.g. Parkinson syndrome) can occur after intravenous administration of Degan	YES		25.83
13.	In the preparation of an infusion, furosemide may be mixed with pH-lowering agents, e.g. vitamin B		NO	7.92
14.	VUAB Hydrocortisone 100 mg is diluted for intravenous infusion using 4 mL of sterile water for injection		NO	37.50
15.	Another drug can be added into an infusion containing Helicid 40 mg for infusion		NO	9.17
16.	20 % glucose solution can cause venous irritation following peripheral administration	YES		5.00

mistakes. Nearly two-thirds of serious medical errors in ICUs occurred during the ordering or execution of treatments, especially medications (5). The consequences of medication error in critical care are often serious: according to Osmond et al., 9.8 % of medication errors require life-sustaining treatment (6).

Nurses play a key role in the prevention of the medication errors. Therefore, it is important to provide them sufficient information about the issue and adequate training in its prevention and reporting. They should be motivated to report medication errors without fear of any negative consequences (7, 8).

Currently, there are nurses with three different levels of education in the Czech Republic. The first level of education includes secondary nursing school. Nurses were educated at secondary nursing schools from 1950 s until 2004. Since then, only higher nursing schools or universities graduate general nurses. The second level of education is represented studying at higher nursing schools. Graduates of this type of education are awarded a certified specialist and entitled to use the designation nurse and allowed to work without supervision. The third level of education is the university degree in nursing. University graduates are receiving a Bachelor's or Master degree and are allowed to work without supervision.

Besides these educational levels, specialization courses for general nurses are also available at the National Centre of Nursing and Non-medical Health Professions. For the nurses' work at an ICU, it is recommended (but not absolutely necessary) to undergo specialization course in intensive care nursing.

Hitherto, many studies using the method of questionnaire survey to ascertain the knowledge of nurses about proper handling of medicines were published. Their methodology is of varying quality and often is focused on single type of medications or nurses of specific medical specialization. Also, these studies rarely compare the knowledge of nurses with different level of education. We believe that of high-quality methodology is the study by Lan et al., performed at the cohort of pediatric nurses (9). Therefore, we have considered useful to adapt methodology of this study for the survey focused on nurses working at ICUs for adult patients.

The main objective of this study was to determine the level of nurses' knowledge about correct use of medications at ICUs. The other objectives were to compare the differences of nurses' knowledge according to their education level and experience in the field, to determine the factors contributing to errors occurrence during the use of medications at IUCs and find out the prevalence of these errors at IUCs at selected hospitals in the Czech Republic.

Methods

Sample of respondents

The research was conducted in selected hospitals in Olomouc, Zlín, South Moravia, Moravia-Silesia and Prague Regions. The research sample consisted of nurses working at hospital IUCs. Their highest education level was secondary nursing school, higher nursing school or university. Some respondents also have completed specialization course in intensive care nursing.

Questionnaire

Development and validation

A combination of quantitative and qualitative research was used for this study. Both types of research were performed by a questionnaire. The modified questionnaire published by Lan et al. (9) was used after adjustment to the field of intensive care nursing. This questionnaire was pilot tested and several items were adjusted based on the results of this preliminary research. Content and construct validity were applied to examine whether the 30 questions were appropriate and sensitive enough to differentiate knowledge levels.