

Translation, adaptation and practicability of Nurses' knowledge of high alert medications to the Brazilian culture**Tradução, adaptação e praticabilidade do Nurses' knowledge of high alert medications para a cultura brasileira**

Priscila Peruzzo Apolinario¹, Roberta Cunha Matheus Rodrigues², Juliana Bastoni da Silva³,
Silvia Regina Secoli⁴, Maria Helena de Melo Lima⁵

¹ Nurse, Master in Nursing. Doctoral student of the Nursing Graduate Program of the State University of Campinas (UNICAMP). Campinas, São Paulo, Brazil. E-mail: priscilapolinario@gmail.com.

² Nurse, Ph.D. in Nursing. Full Professor at the UNICAMP. Campinas, São Paulo, Brazil. E-mail: robertar@fcm.unicamp.br.

³ Nurse, Ph.D. in Adult Health Nursing. Support to Teaching and Research at the UNICAMP. Campinas, São Paulo, Brazil. E-mail: jbastoni@unicamp.br.

⁴ Nurse, Ph.D. in Nursing. Associate Professor at the University of São Paulo. São Paulo, São Paulo, Brazil. E-mail: secolisi@usp.br.

⁵ Nurse, Ph.D. in Functional and Molecular Biology. Doctor Professor at the UNICAMP. Campinas, São Paulo, Brazil. E-mail: mhmelolima@gmail.com.

ABSTRACT

This is a methodological study with the aim to translate, adapt and assess the practicability of parts A and B of the instrument Nurses' knowledge of high-alert medications to the Brazilian culture. The translation and cultural adaptation followed the steps recommended by the international literature. The appointed judges assessed the semantic, idiomatic, conceptual and cultural equivalences; the degree of agreement among the judges was quantified by the Content Validity Index. The translation and back-translation stages were successfully performed and the assessment of the synthesized version by the committee resulted in changes of questions, ensuring the equivalence between the original and the translated versions. The specialists suggested three new questions for the instrument. Some questions were reformulated in the pre-testing stage to improve understanding. The Brazilian version of the instrument obtained satisfactory outcomes in terms of translation, cultural adaptation and practicability, being considered as easily applicable and viable for clinical practice.

Descriptors: Validation Studies; Translating; Questionnaires; Medication Errors; Patient Safety.

RESUMO

Estudo metodológico com o objetivo de traduzir, adaptar e avaliar a praticabilidade das partes A e B do *Nurses' knowledge of high-alert medications* para a cultura brasileira. A tradução e adaptação cultural seguiram as etapas recomendadas pela literatura internacional. Os juízes avaliaram as equivalências semântica, idiomática, conceitual e cultural; a concordância entre os juízes foi quantificada pelo Índice de Validade de Conteúdo. As etapas de tradução e retrotradução foram realizadas com sucesso e a avaliação da versão síntese pelo Comitê resultou em alterações de questões, assegurando as equivalências entre a versão original e a traduzida. Os especialistas sugeriram três novas questões ao instrumento. Foram realizadas reformulações em algumas questões no pré-teste, a fim de melhorar a compreensão. A versão brasileira do instrumento *Nurses' knowledge of high-alert medications* mostrou resultados satisfatórios quanto à tradução, adaptação cultural e praticabilidade, sendo considerado um instrumento de fácil aplicação e viável para a prática clínica.

Descritores: Estudos de Validação; Tradução; Questionários; Erros de Medicação; Segurança do Paciente.

INTRODUCTION

High-alert medications are described in the international literature as potentially dangerous, since they present greater risks of significant damage to patients when misused⁽¹⁾. This definition does not indicate that mistakes associated with these drugs are the most frequent, but rather that the consequences of a mistake related to such drugs are generally more severe⁽¹⁻²⁾.

In this sense, incidents of serious damage and/or death are often related to inadequate use of high-alert medications, although medication errors usually occur in health services, and in most cases, patients are not injured. A previous study, which analyzed data from the the American platform MedMarx for reporting medication errors, showed that the five major drugs mentioned in the reports of all incidents with medication (whether damaging or not) were high-alert medications⁽³⁾. Such data make it evident that medication errors related to high-alert medications represent a potential risk for non-fatal errors as well as for harmful incidents.

Errors and undesirable complications related to the treatment of patients currently represent one of the major challenges for the improvement of quality and safety of patients⁽⁴⁻⁵⁾. Medication errors associated with high-alert medications, as a result of severe consequences for patients, have become part of recommendations and priority strategies of health agencies and organizations specialized in the improvement of patient safety⁽⁶⁻⁷⁾.

It is known that approximately 60% of medication errors occur in the drug administration process⁽³⁾, which is one of the main responsibilities of the nursing staff and requires deep knowledge from nurses in terms of mode of action, adverse reactions and interaction of drugs⁽⁸⁾.

Throughout their professional training, nurses gain specific knowledge and skills that qualify them for the administration of drugs. However, the lack of knowledge of nursing professionals has been pointed out as one of

the main reasons for the occurrence of errors in the administration of drugs⁽⁹⁻¹¹⁾. Previous studies have pointed out to the need for improving training of nurses by focusing on pharmacological knowledge, with the aim to improve safety in drug administration^(10,12-13), among which, high-alert medications.

However, the development of educational strategies that aim to reduce errors involving high-alert medications presupposes knowing the complexity of the drug use system, considering the multiprofessional feature of this process, in such a way that all health care professionals be involved in the outline of interventions that seek patients' safety.

In the international literature, there are reports of the importance of the objective assessment of the knowledge of nurses regarding high-alert medications, by means of reliable and valid instruments of measurement⁽¹⁴⁻¹⁵⁾.

The Nurses' knowledge of high-alert medications (NKHAM), developed by researchers from Taiwan in 2006, has proven to be reliable and valid for the assessment of the knowledge of nurses regarding high-alert medications⁽¹¹⁾. The instrument was applied to a sample of 305 nurses selected by the snowball method, in order to evaluate the reliability and validity of content and construct by means of the contrasting groups method.

The reliability of questions, in a true or false design, was estimated through internal consistency by means of the Kuder-Richardson Formula 20 (KR-20), where $\alpha = 0.74$ was found for the total sample of the 305 nurses studied. The validity of the construct showed that the set of 20 questions was able to distinguish the difference of knowledge scores between two groups of nursing students: one group had the Registered Nurse – RN license (n=30) and the other was made up of undergraduate students of the last semester, who had no RN license (n=30) (students with RN vs. students without RN: 63.8 (12.9) vs. 53.0 (14.5), $t=3.01$; $p=0.004$)⁽¹¹⁾.

In the Brazilian culture, the literature shows a significant gap in the use of reliable and valid instruments

that enable the measurement of knowledge of nurses regarding high-alert medications.

Considering the importance of an objective assessment of this knowledge among Brazilian nurses and the recommendations of the literature to use the process of cultural adaptation in the absence of a valid instrument for the desired context⁽¹⁶⁾, the objective of this study was to translate and adapt parts A and B of the Nurses' knowledge of high-alert medications – NKHAM⁽¹¹⁾ into Brazilian Portuguese and assess its practicability.

METHOD

This is a methodological study, which consists of the investigation of the method of production, organization and analysis of data, with the purpose of creating and validating research instruments and techniques⁽¹⁷⁾.

The questionnaire that was submitted to the adaptation to the Brazilian Portuguese language was created by Hsiao et al.⁽¹¹⁾ and aims to assess the knowledge of nurses about high-alert medications. It consists of two sections: Section 1, which assess nurses' knowledge of high-alert medications, and Section 2, which aims to analyze errors related to drug administration.

Section 1, which assesses the nurses' knowledge, is composed of the following parts: **Part A - Drug administration**, composed of 10 true or false questions which assess knowledge of route and dose of drug administration; **Part B - Regulations of drugs**, composed of 10 true or false questions, subsequent to Part A, which determine how high-alert medications must be stored, provided and prescribed; **Part C - Contributing factors**, which consider personal details and those related to respondents' work experience (age, education, time worked) and training programs that contributed to nurses' knowledge of high-alert medications; and **Part D - Self-assessment**, which enables a subjective self-evaluation by respondents about three factors related to high-alert medications - 1. Barriers encountered (composed of 14 barriers presented as multiple-choice

questions; 2. Degree of knowledge (consisting of five levels that range from "sufficient" to "completely insufficient"; and 3. Need for training (consisting of three options "necessary", "no comments", and "unnecessary")

In Section 2, named **Error Events**, respondents are required to describe a common error of drug administration, with information about the nature of the error and its consequences for the patient, if any. Anonymity is ensured to both respondents and their institutions.

The 20 true or false questions that compose parts A and B of section 1 were developed on the basis of a broad review of the literature and of consultation of specialists⁽¹¹⁾. It is a short instrument, designed to be responded individually by means of dichotomous questions, for which respondents answer true or false for each statement, generating arbitrary scores. Each correct answer receives five points, which results in a possible total of 100 points. High scores indicate a high degree of knowledge and low scores indicate a low degree of knowledge of high-alert medications.

The cultural adaptation process that was used followed the recommendations proposed by Beaton et al.⁽¹⁸⁾, which are broadly used in the international literature. It consists of the initial translation, the synthesis of translations, back-translation, an expert committee review and pre-testing⁽¹⁸⁾.

After obtaining the author's consent, parts A and B were independently translated from the original version of the instrument by two bilingual translators, whose native language was Brazilian Portuguese. Only one of the translators was informed about the objectives of the study⁽¹⁸⁻¹⁹⁾. There was no exchange of information between translators, so two independent translations of the NKHAM 20 questions were produced: translation 1 (T1) and translation 2 (T2).

In order to synthesize the translations, versions T1 and T2 were analyzed and compared jointly by researchers and an English language specialist⁽¹⁸⁾. The differences between translations T1 and T2 were

analyzed until a consensus was reached between researchers, after which a final version was produced (T12).

The translated synthesis (T12) was back-translated into English by two other translators, whose native language was English and who did not participate in the first translation stage. These translators were not informed about the concepts and objectives of the instrument and did not have a degree in life sciences. At the end of this stage, two versions were produced: back-translation 1 (BT1) and back-translation 2 (BT2). The back-translation of the instrument aims to review data; it is a conference process of the version produced that has the purpose of checking whether the translated instrument reflects the original one, thus ensuring the quality of cultural adaptation⁽¹⁸⁻¹⁹⁾.

Subsequently, a specialist committee was formed to assess the validity of the synthesized version content of the NKHAM questions so as to obtain the version for pre-testing application⁽¹⁸⁻²⁰⁾.

This committee was composed of seven bilingual specialists, namely: two PhD professors in Linguistics, one PhD professor in nursing with experience in research methodology, one PhD professor in nursing with experience in teaching, support and research in high-alert medications and health care of ICU patients, one PhD professor in pharmacy with experience in HAM studies, one Master in nursing with experience in high-alert medications and care of ICU patients, and one nurse with experience in high-alert medications and care of ICU patients.

The assessment of the instrument items was performed in order to obtain the semantic, idiomatic, cultural and conceptual equivalences. The percentage of agreement among specialists as to the instrument assessment and its items was obtained by means of the calculation of the content validity index - CVI⁽²¹⁾.

The judges' analysis was grounded by the translated versions (T1 and T2), the translation synthesis, the back-translations (BT1 and BT2), the NKHAM original version,

as well as by the recommendations of the literature regarding semantic, idiomatic, cultural and conceptual equivalences. Such process aims to ensure that the final translated version respects the meaning of the original English version, to make sure that the situations referred to in the items actually assess the nurses' knowledge of high-alert medications and analyze whether these items are culturally relevant to the target population⁽¹⁸⁻¹⁹⁾.

After the content validity step, a pre-test was performed, with the application of the NKHAM adapted version to 40 nurses, from both genders, with experience in ICU or semi-intensive unit, from a teaching hospital in a countryside city of the state of São Paulo. Nurses with less than 12 months of professional experience were excluded, so as to ensure a minimum experience from participants in the administration of high-alert medications.

After responding to the questionnaire, participants were interviewed with the purpose of investigating the practicability of the instrument, that is, problems encountered by them regarding the understanding of each sentence as well as the detection of difficult terms.

Pre-testing data were submitted to a descriptive analysis by means of the Statistical Package for the Social Sciences (SPSS), version 17.0.

The CVI was used to assess the degree of agreement among judges who participated in this stage of the content validity. This index allows for the analysis of each item individually, and subsequently, the instrument as a whole⁽²⁰⁾. The agreement among reviewers regarding each item of the instrument was measured by means of a Likert scale, with scores ranging from 1 to 4 (1 = not equivalent; 2 = impossible to assess equivalence without reviewing the item; 3 = equivalent, but needs minor changes; and 4 = totally equivalent). Items that obtained scores of 1 or 2 were reviewed or eliminated⁽²⁰⁾. The calculation of the CVI for each item consisted of the division between the number of answers with scores 3 or 4 by the total number of answers⁽²²⁾. The literature

recommends a CVI > 0.78 for analyses of committees composed of six or more judges⁽²¹⁻²³⁾.

The practicability of the Brazilian version of NKHAM parts A and B was investigated by means of the application of a valid questionnaire⁽²⁴⁾, for which the ease to understand, interpret and answer the questions of the adapted instrument was considered.

The study proposal was approved by the university's Research Ethics Committee under number 442.552/2013. All nurses enrolled signed a Free and Informed Consent Form.

RESULTS

The translation, synthesis and back-translation steps were satisfactorily performed. In the initial stage of the translation process of the NKHAM 20 questions, the following considerations stood out:

- the terms "Push fast", "Fast IV infusion" and "Fast IV push" were considered as synonymous and were translated as "*infunda rapidamente*",

according to the author's recommendation in the original instrument;

- the concentration of the KCl electrolyte at 15% was changed to 19.1% so as to obtain a cultural equivalence, since the 19.1% concentration is the most common in the Brazilian context;
- considering the cultural and idiomatic equivalences, the terms "drug", "expression" and "port A route" were translated as "*medicamento*", "*medida*" and "port-a-Cath", respectively.

Results of the content validity stage

The semantic, idiomatic, conceptual and cultural equivalences of the synthesized version of the instrument questions were assessed by the committee of judges. At this stage, the CVI was calculated for each item of the NKHAM synthesized version. The degree of agreement among specialists is presented in Table 1.

Table 1: Content validity indexes (CVI) obtained from the specialists committee regarding semantic, idiomatic, conceptual and cultural equivalences of the Brazilian version of the Nurses' knowledge of high-alert medications – NKHAM. Campinas, São Paulo, Brazil, 2014.

Item	Semantic Equivalence	Idiomatic Equivalence	Conceptual Equivalence	Cultural Equivalence
1	0.86	0.86	0.86	0.86
2	1.0	0.86	0.86	0.86
3	1.0	0.86	0.86	1.0
4	0.71	0.71	0.71	0.57
5	1.0	1.0	1.0	1.0
6	0.86	1.0	0.86	0.86
7	1.0	1.0	1.0	1.0
8	0.43	0.43	0.57	0.57
9	1.0	1.0	1.0	1.0
10	1.0	0.86	1.0	0.86
11	0.57	0.57	0.57	0.57
12	1.0	1.0	1.0	1.0
13	1.0	1.0	1.0	1.0
14	1.0	1.0	1.0	1.0
15	1.0	1.0	1.0	0.86
16	0.86	0.86	0.86	0.86
17	1.0	0.86	0.86	0.86
18	1.0	1.0	1.0	1.0
19	1.0	1.0	1.0	1.0
20	1.0	1.0	1.0	0.86

At this assessment stage, questions 5, 7, 9, 12, 13, 14, 18 and 19 obtained CVI = 100%, and of this set of

questions, numbers 5, 7, 13, 14 and 19 were not modified. Although satisfactory CVIs were obtained for questions 9,

12 and 18, changes were made considering the relevance of suggestions made by one of the judges.

Therefore, the translation of question 9 "*Quando ocorrer uma emergência infunde rapidamente 10 ml de CaCl₂10% intravenoso em 1-2 minutos*" (In case of emergency, fast IV push 10 ml de CaCl₂10% in 1-2 minutes) was altered to "*Em situações de emergência, infundir rapidamente Cloreto de Cálcio 10% - 10 ml por via intravenosa em 1-2 minutos*" (In case of emergency, fast IV push 10% calcium chloride in 1-2 minutes) for the sake of clarity. Questions 12 and 18 were changed in order to comply with grammar rules and to replace difficult and/or not frequent terms with a corresponding synonym that was easier to understand.

Questions 1, 2, 3, 6, 10, 15, 16, 17 and 20 obtained a CVI between 0.86 and 0.96, which is considered satisfactory⁽²¹⁻²³⁾. However, questions 1, 2, 6, 15, 16 and 20 were also modified in order to comply with grammar rules, and difficult terms were also replaced with a corresponding synonym. In question 3, the term "*sérico*" (serum) was added to qualify and specify the term "*baixo nível de sódio*" (low level of sodium), and in question 10, the term "*antineoplásico*" (antineoplastic) was added to better qualify the term "*quimioterápico*" (chemotherapeutic).

Questions 4, 8 and 11 obtained a CVI of 0.67, 0.5 and 0.57 respectively and were changed. Question 4 "*A via de Port-a-Cath pode ser usada para retirada de sangue e infusão de medicamentos em geral*" (Port-a-Cath can be used for drawing blood and infusion of medications in general) was changed after a broad debate about the translation and adaptation of the term Port-a-Cath. Thus, the wording of this question was changed to "*Em geral, o cateter venoso totalmente implantável (Port-a-Cath®) pode ser usado para coleta de sangue e infusão de medicamentos*" (In general, totally implantable venous catheters (Port-a-Cath®) can be used for blood collection and medication infusion). Questions 8 and 11 were considered ambiguous regarding the equivalence and were edited for the sake of clarity and objectivity.

After the recommendation by the committee of specialists and the consent of the author of the original instrument, three questions were added to the Brazilian version, two in Part A: Knowledge of drug administration, and one in Part B: Regulations of drugs (Chart 1).

Hence, the Brazilian version of NKHAM Parts A and B for pre-testing application totaled 23 questions, being 12 in Part A and 11 in Part B. The inclusion of these items was considered as essential for the optimization of patient safety in the use of high-alert medications.

Chart 1: List of questions added to Parts A and B of the Brazilian version of the Nurses' knowledge of high-alert medications – NKHAM, Campinas, São Paulo, Brazil, 2014.

Part A	Part B
11. The concentrations of heparin administered subcutaneously and/or intravenously are the same, and therefore, can be interchanged (As concentrações de heparina administrada por via subcutânea e/ou intravenosa são as mesmas e, portanto, podem ser trocadas entre si).	11. The use of "if needed" for high-alert medication is safer, as it allows nurses to administer medication according to patients' clinical condition, for instance, to administer an analgesic until the pain ceases (O uso do "se necessário" para medicamentos de alta vigilância é mais seguro, pois permite ao enfermeiro administrar o medicamento conforme a clínica do paciente, como por exemplo, administrar um analgésico até cessar a dor do paciente).
12. The prescription of medication with a zero after the decimal point (10.0 ml) improves safety in drug administration (A prescrição de medicamentos utilizando o zero depois da vírgula (10,0 mL) melhora a segurança na administração de medicamentos).	

Pre-testing analysis

The pre-testing sample was mainly composed of female nurses (85.0%), with a mean age of 37.7 (7.7) years, mean experience of 11.0 (7.6) years and working

time at the institution of 10.1 (8.5) years. After pre-testing, the need for changing 16 items was found, which was specified according to parts A and B of the NKHAM Brazilian version.

Regarding Part A: Knowledge of drug administration, questions 4, 5, 10 and 12 remained unchanged. In questions 2, 3, 7, 8 and 9, the electrolytes structural formulas were replaced with the injectable electrolytes nomenclature.

In order to obtain semantic and idiomatic equivalences, the term "*deve-se*" (must) was included before the specification of the drug infusion mode referred to in each item of questions 3 and 9; in question 7, the term "*Os eletrólitos injetáveis*" (the injectable electrolytes) was included at the beginning of the sentence and the term "*e podem ser permutados*" (and can be exchanged) was replaced with "*portanto podem ser trocadas entre si*" (therefore can be interchanged). The grammatical structure of question 6 was switched, with the inclusion of the term "*concentração*" (concentration) and the replacement of "*epinefrina*" (epinephrine) with "*adrenalina*" (adrenaline). In question 11, the term "*portanto intercambiáveis*" (therefore interchangeable) was replaced with "*portanto podem ser trocados entre si*" (can be interchanged).

As for the conceptual equivalence, question 1 was also modified in order to avoid ambiguity in the understanding of the concept expressed in the question.

Regarding Part B: Regulation of drugs, questions 1, 3 and 4 remained unchanged. In questions 6 and 7, the electrolytes structural formulas were replaced with the injectable electrolytes.

In order to obtain semantic and idiomatic equivalences, grammar corrections were made in questions 2 and 8; in question 5, the term "*atracúrio*" (atracurium) was replaced with "*relaxante muscular*" (muscle relaxant). Still regarding semantic and idiomatic equivalences, questions 9 and 10 had the term "*do medicamento*" (of the medication) added at the end of the sentence to define the noun "*dose*". In question 11, the sentence "*como, por exemplo, administrar um analgésico até cessar a dor do paciente*" (for instance, to administer analgesic until the pain ceases) was excluded,

as it was considered unnecessary. The final Brazilian version of the NKHAM was then obtained.

The synthesized version evaluated by the specialists committee and the final version obtained after the process of translation and adaptation of NKHAM parts A and B into Brazilian Portuguese are presented in Chart 2.

Chart 2: Presentation of the synthesized version submitted to content validation and the final version of parts A and B of the Nurses' Knowledge of High Alert Medications translated and adapted to Brazilian Portuguese. Campinas, São Paulo, Brazil, 2014.

Synthesized version - Nurses' Knowledge of High Alert Medications		Brazilian version - Nurses' Knowledge of High Alert Medications
Part A - Knowledge of drug administration		
1	"cc" or "ml" are the dosage units for insulin injection.	"cc" or "ml" are the units of measurement used in the insulin syringe scale.
2	In the event of emergencies such as ventricular fibrillation, perform a fast IV infusion of 10ml of KCl 19.1%.	In emergency situations, such as ventricular fibrillation, 19.1% potassium chloride must be infused via intravenous route.
3	Fast IV push of 3% NaCl 500ml for patients with low levels of sodium.	Sodium chloride at 3% - 500ml must be pushed fast via intravenous route in patients with low levels of sodium serum.
4	The Port-a-Cath route can be used for blood draw and drug medication infusion in general.	Usually, the implantable venous system (Port-a-Cath [®]) can be used for blood draw and medication infusion.
5	Insulin syringe can be replaced with a 1ml syringe.	Insulin syringes can be replaced with 1ml syringes.
6	Fast IV infusion of 1 ampoule of epinephrine 1:1000 for patients with moderate allergic reaction.	For patients with slight allergic reactions, the adequate treatment is 1 ampoule of adrenaline, at a 1:1000 concentration, by a fast IV infusion.
7	Sodium gluconate 10% and CaCl ₂ 10% are the same drug and are interchangeable.	The injectable electrolytes sodium gluconate 10% and calcium chloride 10% are the same drug and therefore they can be interchanged.
8	KCl 19.1% is best added to the Ringer's solution for fast infusion.	For fast infusion, it is better to add potassium chloride 19.1% to the Ringer's solution.
9	When an emergency occurs, push fast 10ml of CaCl ₂ 10% IV in 1-2 minutes.	In emergency situations, potassium chloride 10% - 10ml must be infused via intravenous route in approximately 1 to 2 minutes.
10	For the calculation of the chemotherapeutic dose, body weight is used for adults, whereas body mass index is used for children.	For the calculation of the antineoplastic chemotherapeutic dose, body weight is used for adults and the body mass index is used for children.
11	Question added	The concentrations of heparin administered subcutaneously and/or intravenously are the same, and therefore, can be interchanged.
12	Question added	The prescription of medication with a zero after the decimal point (10.0 ml) improves safety in drug administration.
Part B - Regulation of drugs		
1	Use a fentanyl patch for the skin as a regulated drug.	Use a fentanyl patch as a controlled drug.
2	Use different tags in similar medications.	Use different labels in similar medications.
3	For more convenience, heparin and insulin must be stored together in the refrigerator.	For more convenience, heparin and insulin must be stored together in the refrigerator.
4	Use "ampoule" or "flask" for dose measurement instead of "mg" or "g".	Use "ampoule" or "flask" for dose measurement, instead of "mg" or "g".
5	If any ward stores atracurium for tracheal intubation, the medication must be stored with other drugs and be easily accessible to nursing professionals.	If any ward stores muscle relaxant for tracheal intubation, it is recommended that this medication be kept with other drugs of the unit and be easily accessible to nursing professionals.
6	KCl 19.1% is frequently used, that is why it must be easily and freely accessible to nursing professionals.	The potassium chloride is frequently used, that is why it must be easily and freely accessible to nursing professionals.
7	If the patient can tolerate, potassium can be administered orally instead of intravenously.	If the patient can tolerate, it is recommended that potassium chloride be administered orally instead of intravenously.
8	It is better that each medication have multiple concentrations for nursing professionals to choose from.	It is indicated that each medication have different concentrations so that nursing professionals can correctly choose.
9	For pediatric dosage, use "teaspoon" as a dose measure.	For pediatric dosage, use a teaspoon as a dose measure for the medication.
10	Use 'U' instead of "unit" to express the dose.	Use 'U' instead of "unit" to express the drug dose.
11	Question added	The use of "if needed" for high-alert medication is safer, as it allows nurses to administer medication according to patients' clinical condition.

* Items 1 to 10 form Part A: Knowledge of drug administration and items 11 to 20 form Part B: Regulation of drugs of the NKHAM Brazilian version.

Analysis of the practicability of the NKHAM Brazilian version

Regarding the practicability of the Brazilian version of NKHAM parts A and B, assessed at the pre-testing stage (n=40), results showed that 87.5% of participants agreed that the questionnaire instructions were easy to interpret, 85.0% stated that they had no difficulties in answering the questions and 80.0% reported having understood the questionnaire wording. The mean time of completion was 16.5 (1.9) minutes.

DISCUSSION

The objective of this study was to translate and adapt parts A and B of the Nurses' Knowledge of High Alert Medications - NKHAM into Brazilian Portuguese and assess its practicability when applied to nurses of semi-intensive and intensive units of a teaching hospital in the countryside of the state of São Paulo. After a strict adaptation process, performed in compliance with the recommendations of the international literature⁽¹⁸⁻¹⁹⁾, the adapted version was considered as equivalent (semantically, idiomatically, culturally and conceptually) for the Brazilian context.

In the process of translation and adaptation, it is necessary to adapt the language from a cultural and conceptual point of view to the concerned population, while keeping the objective of the original instrument. The degree of agreement among the specialists committee had 85% of questions with a CVI above 0.78, which is the minimum value recommended in the international literature⁽²¹⁻²³⁾. For the other questions, the face-to-face meeting between the committee members enabled a broad discussion of all items until a consensus was reached regarding the translation, with the purpose of making it easier to understand the instrument.

It is noteworthy that, at this stage, the translation and adaptation process involved the discussion with several health professionals in the search of the equivalence of terms that are unusual to the Brazilian culture. Thus, questions related to the concentration of the potassium

chloride electrolyte had to be modified in order to replace with an equivalent concentration, more common in the Brazilian culture. For the same reason, the medication "atracurium" was replaced, since it is not frequently used in our context, with its therapeutic meaning "muscle relaxant", thus keeping the meaning of the original question.

The discussion among the members of the specialist committee and the authors of this study resulted in the recommendation to include three questions in the original instrument, which aimed to assess the knowledge of nurses regarding aspects related to the safe administration of drugs (question 12 of part A and question 11 of part B), and further examine nurses' knowledge of the administration of injectable anticoagulant (question 11 of part A). After the consent of the author of the original instrument, three questions were added to the Brazilian version of the NKHAM for application at pre-testing. Hence, the instrument final score totaled 115 possible points, being 60 in part A and 55 in part B.

The Brazilian version was submitted to pre-testing, which aimed to respect the meaning of the original version, to improve understanding, to find errors and/or problems in the application of the adapted instrument⁽¹⁸⁻¹⁹⁾. The results of the pre-testing stage of the Brazilian version of NKHAM parts A and B showed that, despite changes made at the content validity stage after recommendation by the specialist committee, some questions of the instrument were not easily understood by health professionals of intensive and semi-intensive departments of the university hospital, who had long working time at the institution (mean of 10 years) and large experience (mean of 11 years). It was possible to detect some words and expressions that led to confusion and ambiguity, with consequences on the quality of the measurement, with new adaptations being made in the instrument so as to ensure understanding and coherence of items.

Regarding the practicability of the instrument, although the mean length of application (16.1 minutes) had no consequence for respondents, additional instructions were included to facilitate and speed up the completion of the questionnaire and to improve its understanding.

The relevance of the findings of this study is on the fact that it makes available to the Brazilian scientific community the first questionnaire for assessing nurses' knowledge of high-alert medications, which can be used in the evaluation of the results of interventions made for the optimization of nurses' continued education on high-alert medications, while allowing for the comparison between the findings of multicentric studies⁽¹⁸⁻¹⁹⁾.

The measurement of nurses' knowledge about these drugs is a useful tool in the educational and organizational contexts, since the lack of knowledge on high-alert medications among nurses is directly related to medication errors⁽⁸⁻¹²⁾. The instrument can also be used by professionals as a self-evaluation tool and trigger a critical reflection about the implications of continued education on the quality of health care, managerial and educational practices. The application of measurements that enable the improvement of the medication system is essential for the promotion of safety and quality of care provided to patients^(9,14-15).

As a limitation of this study, we can mention the translation and adaptation of only a part of the original

instrument, as well as the fact that the measurement properties of the adapted version have not been tested. However, the refinement of the measurement of the adapted questionnaire will allow for the objective assessment of the nurses' knowledge on high-alert medications - a nonexistent assessment in our field, which is essential for supporting the implementation of educational programs in place and/or the improvement of nurses' training on safety of drug administration.

Further studies are necessary to test the measurement properties of parts A and B of the Brazilian version of NKHAM and to allow for its wide use in nursing teaching, care and research.

CONCLUSIONS

The adaptation process of the Brazilian version of NKHAM to Brazilian Portuguese strictly followed the methodological steps recommended by the international literature. The adapted version was considered equivalent regarding semantic, idiomatic, cultural and conceptual equivalences, and showed practicability regarding the mean time of completion. However, it is recommended that its psychometric properties be assessed, such as reliability and validity, so as to enable its broad application in different contexts of nurses' action.

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Received: 06/07/2014.

Accepted: 03/20/2015.

Published: 09/30/2015.

APPENDIX

Presentation of the synthesized version submitted to content validation and the final version of parts A and B of the Nurses' Knowledge of High Alert Medications translated and adapted to Brazilian Portuguese. Campinas, São Paulo, Brazil, 2014.

Synthesized version - Nurses' Knowledge of High Alert Medications		Brazilian version - Nurses' Knowledge of High Alert Medications
Parte A - Conhecimento sobre administração de medicamentos		
1	"cc" ou "ml" é a expressão de dosagem para injeção de insulina.	"cc" ou "ml" são as unidades de medida utilizadas na graduação das seringas de insulina.
2	Quando ocorrer uma emergência tal como fibrilação ventricular, infunde rapidamente 10 ml de KCL 19,1% intravenoso.	Em situações de emergência como uma fibrilação ventricular, deve-se infundir Cloreto de Potássio 19,1% em bolus por via intravenosa.
3	Infusão rápida intravenosa de NaCl 3% 500ml para paciente que tenha baixo nível de sódio.	Deve-se infundir rapidamente Cloreto do Sódio %3- 500 ml por via intravenosa em pacientes que apresentem baixo nível de sódio sérico.
4	A via de Port-a-Cath pode ser usada para retirada de sangue e infusão de medicamentos em geral.	Em geral, o cateter venoso totalmente implantável (Port-a-Cath®) pode ser usado para coleta de sangue e infusão de medicamentos.
5	Seringa de insulina pode ser substituída por seringa de 1 mL.	As seringas de insulina podem ser substituídas por seringas de 1 mL.

6	Infunda IV rapidamente 1 ampola de epinefrina 1:1000 para pacientes com reação alérgica moderada.	Para pacientes com reação alérgica leve o tratamento adequado é 1 ampola de adrenalina, na concentração de 1:1000, intravenosa infundida rapidamente.
7	Gluconato de Ca 10% e CaCl ₂ 10% são os mesmos medicamentos e permutáveis.	Os eletrólitos injetáveis Gluconato de Cálcio 10% e Cloreto de Cálcio 10% são o mesmo medicamento e, portanto, podem ser trocados entre si.
8	KCl 19,1% é melhor adicionado à solução de hinger para infusão rápida.	Para infusão rápida, é melhor adicionar Cloreto de Potássio 19,1% à solução de Ringer.
9	Quando ocorrer uma emergência infunda rapidamente 10 ml de CaCl ₂ 10% intravenoso em 1-2 minutos.	Em situações de emergência, deve-se infundir rapidamente Cloreto de Cálcio 10% - 10 ml por via intravenosa em aproximadamente 1 à 2 minutos.
10	Para o cálculo de dosagem quimioterápica, enquanto que para adultos é usado o peso corporal, para crianças utiliza-se o índice de massa corporal.	No cálculo de dosagem de quimioterápicos antineoplásicos, em adultos utiliza-se o peso corporal, e em crianças utiliza-se o índice de massa corporal.
11	Questão adicionada	As concentrações de heparina administrada por via subcutânea e/ou intravenosa são as mesmas e, portanto, podem ser trocadas entre si.
12	Questão adicionada	A prescrição de medicamentos utilizando o zero depois da vírgula (10,0 mL) melhora a segurança na administração de medicamentos.
Parte B - Regulamentação de medicamentos		
1	Use adesivo de fentanil para a pele como narcótico regulamentado.	Use fentanil adesivo como narcótico controlado.
2	Use etiquetas diferentes em medicamentos semelhantes	Use rótulos diferentes para medicamentos semelhantes.
3	Por conveniência, heparina e insulina devem ser armazenadas juntas na geladeira.	Por conveniência, heparina e insulina devem ser armazenadas juntas na geladeira.
4	Use "Ampola" ou "frasco" para medida de dosagem em vez de 'mg' ou 'g'.	Use "Ampola" ou "frasco" para medida de dosagem, em vez de "mg" ou "g".
5	Se alguma enfermaria armazena atracúrio para intubação traqueal, o medicamento deve ser armazenado com outros medicamentos e ser de fácil acesso pelo profissional de enfermagem.	Se uma enfermaria armazena relaxante muscular para intubação traqueal, é indicado que esse medicamento seja mantido com os outros medicamentos da unidade e que seja de fácil acesso ao profissional de enfermagem.
6	KCl 19,1% é frequentemente usado, por isso deve ser de fácil e livre acesso para os profissionais da enfermagem.	A ampola de Cloreto de Potássio é frequentemente usada, por isso deve ser de fácil e livre acesso aos profissionais da enfermagem.
7	Se o paciente puder tolerar, potássio pode ser administrado por via oral em vez da via intravenosa.	Se o paciente puder tolerar, é indicado que o cloreto de potássio seja administrado por via oral em vez da via intravenosa.
8	É melhor cada medicamento ter múltiplas concentrações para o profissional de enfermagem escolher.	É indicado que cada medicamento tenha várias concentrações diferentes para que o profissional de enfermagem possa escolher adequadamente.
9	Para dose pediátrica, use "colher de chá" como medida da dose.	Para dose pediátrica, use colher de chá como medida da dose do medicamento.
10	Use 'U' em vez de "unidade" para a expressão da dose.	Use 'U' em vez de "unidade" para expressar a dose do medicamento.
11	Questão adicionada	O uso do "se necessário" para medicamentos de alta vigilância é mais seguro, pois permite ao enfermeiro administrar o medicamento conforme a clínica do paciente.