VALIDATION OF INTERVENTIONS FOR THE NIC NURSING DIAGNOSIS – RISK FOR INFECTION (Code 00004) BY EXPERTS OF ACUTE ANAESTHESIOLOGY AND INTENSIVE NURSING CARE IN CLINICAL PRACTICE IN CZECH AND SLOVAK REPUBLICS

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Abstract: The purpose of the study was to determine which NANDA nursing diagnosis are made and which related NIC nursing interventions are carried out most frequently by acute anaesthesiology and intensive nursing care experts in the Slovak and the Czech Republics (hereinafter as SR and CR). Methods: The Likert Scale and Fehring's Diagnostic Content Validity Model (DCV model) were used for the research. Sample: Experts in acute anaesthesiology and intensive nursing care. The cohort consisted of 132 (n_A =132; 81 from SR and 51 from the CR) experts meeting Fehring's criteria. The number of Slovak academic nurses was n_{A1}=47 (31.8%); Czech academic nurses were n_{A2}=16 (10.8%); Slovak clinical nurses were n_{A3}=34 (25.8%); Czech clinical nurses were n_{A4}=35 (26.5%). Experts were part of the total sample. The total number of all participants of the validation research, i.e. academic nurses/educators/experts and clinical nurses/experts (n_c=848) from two countries – SR and CR. A total of 69 items – activities/practices of two interventions for NIC nursing diagnosis: Risk for Infection 00004 were evaluated. Results: We found out that the total set of experts rated all activities/practices of Intervention I and II as significant. Conclusion: The results of an international study provide valid evidence for the development of nursing care and present validated NIC nursing interventions in relation to the diagnosis of Risk for Infection 00004 for practice, research, and education.

Keywords: Acute anaesthesiology and intensive nursing care. NIC. NANDA Clinical Nursing. Expert. Validation.

1 Introduction

The presented scientific study builds on the empirical outputs published by the universities in two countries in the field of nursing diagnostics and nursing interventions, i.e. the Faculty of Social Sciences and Health Care, the University of Constantine the Philosopher in Nitra in collaboration with the Faculty of Health Care Studies, the University of West Bohemia, Faculty of Health Care, the University of Presov and their clinical departments. First with the support of the Kega project entitled *Implementation of Nursing Interventions into Multimedia Technologies in Nursing Education* and now with the support of the follow-up Kega project entitled *Implementation of Nursing Interventions into Multimedia Technologies in Nursing Education 2*. The research investigations and implementation of the findings into nursing education are expected to be completed in 2023. The current research communications present findings of the research studies conducted to validate NANDA nursing diagnoses and NIC interventions internationally at academic institutions and clinical workplaces, where future health professionals are being trained. All the involved respondent pools are made up of nursing experts. Universities employ highly erudite academic staff with both professional and especially specialised competence in particular areas of clinical nursing practice, who are competent to create and manage teams of expert nurses to validate a set of nursing diagnoses and nursing interventions. The respondents meet the new research-based expert criteria for validation studies in the clinical setting (Archalous, 2022). Given the breadth and scope of the investigation, we present a validated set of empirically verified nursing interventions for NIC nursing diagnosis: Risk for Infection 00004 in acute anaesthesiology and intensive nursing care. It is designed for clinical practice and implementation into the training of health professionals, leading to the acquisition of exit competences after completion of undergraduate study programmes (Creason, 2004; Carpenito-Moyet, 2004). With the author's permission, we used in our validation study two nursing interventions included in the Nursing Interventions Classification (NIC; 7th edition) relevant to the nursing diagnosis Risk for Infection 00004 from Taxonomy II NANDA – International (2021-23) entitled *Minimizing Acquisition and Transmission of Infectious Agents* with 36 activities/practices

and *Prevention and Early Detection of Infection in a Patient at Risk* with 33 activities/practices. The validation study was conducted during the Covid pandemic and became highly relevant in all sections of nursing care.

2 Purpose

The purpose of the research was to assign nursing interventions of the Nursing International Classification system (NIC) to the nursing diagnosis evaluated by experts in *acute anaesthesiology and intensive nursing care* as the most common, and to validate them in clinical practice. Within the research investigation, experts/clinical nurses and experts/academic nurses defined the most important and most frequently used nursing diagnosis in each nursing discipline, by which means the nursing diagnosis of *The NANDA International: Nursing Diagnoses. Definitions and Classification* 2021-2023 **Risk for Infection** Code 00004, Domain 11, Class 1, *defined as susceptibility to infestation and multiplication of pathogenic organisms that may lead to impaired health* was included in the research. To the diagnosis, activities/practices of two interventions of the *Nursing Interventions Classification (NIC) 7th edition, St. Louis: Elsevier: 2018* were assigned. A group of experts constructed a measurement tool with criteria for the selection of a nursing intervention validation expert and with the items (activities/practices of interventions NIC) identified for validation (with respect to NIC copyright). The purpose of the study was to determine which activities/practices of two NIC interventions for the nursing diagnosis Risk for Infection 00004 are rated as significant, i.e. core (acute) and secondary by experts/nurses/midwives from academic and clinical nursing settings in the Slovak Republic (hereinafter as SR) and the Czech Republic (hereinafter as CR). Furthermore, to find out which of them are considered as insignificant, i.e. discarded, in care.

3 Methods

For the validation study, a measurement tool, i.e., an anonymous questionnaire that included the activities/practices related to the chosen nursing diagnosis was used. All 69 activities/practices of the two interventions NIC for the nursing diagnosis Risk for Infection 00004 NANDA-I were validated by the clinical and academic experts/nurses who met the established criteria. The first intervention applying to the nursing diagnosis Risk for Infection 00004, entitled **Intervention I: Infection Control**, defined as - *Minimizing of Acquisition and Transmission of Infectious Agents,* code 6540 (NIC, 7th Edition), was included in the measurement tool and contained a total of 36 items (activities/practices) plus one false item. A second intervention, **Intervention II: Infection Protection**, defined as *Prevention and Early Detection of Infection in the Patient at Risk*, code 6550 (NIC, 7th ed.) was included in the measurement tool with a total of 33 items (activities/practices) plus one false item (Table 1, Table 2). The Diagnostic Content Validity Model (DCV) was used for validation. Fehring's method was used for the research utilizing an anonymous questionnaire that included selected interventions NIC (Fehring, 1986; 1994). The total number of all participants in the validation research, i.e. academic nurses/educators/experts and clinical nurses/experts (n_c=848) of two countries – SR and CR included four subsets (n_1=443, n_2=342, n_3=47, n_4=16). The number of experts/nurses was 785 (92.25%), the number of experts/academic nurses/educators was 63 (7.75%), and the total sample size was 848.

Table 1 Activities/practices of Intervention I **Infection Control**, code 6540 (items No.1-37; one false item)

1.	Allocate the appropriate square meters per patient, as indicated by Centers for Disease Control and Prevention (CDC) guidelines
2.	Clean the environment appropriately after each patient use
3.	Change patient care equipment per agency protocol
4.	Isolate persons exposed to communicable disease
5.	Place on designated isolation precautions, as appropriate
6.	Maintain isolation techniques, as appropriate
7.	Limit the number of visitors, as appropriate
8.	Teach improved hand washing technique to health care personnel
9.	Instruct patient on appropriate hand washing techniques
10.	Instruct visitors to wash hands on entering and leaving the patient's room
11.	Use antimicrobial soap for hand washing, as appropriate
12.	Wash hands before and after each patient care activity
13.	Institute universal precautions
14.	Wear gloves as mandated by universal precaution policy
15.	Wear scrub clothes or gown when handling infectious material
16.	Wear sterile gloves, as appropriate
17.	Scrub the patient's skin with an antibacterial agent, as appropriate
18.	Shave and prepare the area, as indicated in preparation for invasive procedures and/or surgery
19.	Maintain an optimal aseptic environment during bedside insertion of central lines
20.	Maintain an aseptic environment when changing total parenteral nutrition (TNT) tubing and bottles
21.	Maintain a closed system during invasive haemodynamic monitoring
22.	Change peripheral IV and central line sites and dressings according to current Centers for Disease Control and Prevention guidelines
23.	Ensure aseptic handling of all IV lines
24.	Ensure appropriate wound care technique
25.	Use intermittent catheterisation to reduce the incidence of bladder infection
26.	Teach patient to obtain midstream urine specimens at the first sign of return of symptoms as appropriate
27.	Encourage deep breathing and coughing, as appropriate
28.	Promote appropriate nutritional intake
29.	Encourage fluid intake, as appropriate
30.	Encourage rest
31.	Administer antibiotic therapy, as appropriate
32.	Administer the immunizing agent, as appropriate
33.	Instruct patient to take antibiotics, as prescribed
34.	Teach patient and family about signs and symptoms of infection and when to report them to the health care provider
35.	Teach patient and family members how to avoid infection
36.	Promote safe food preservation and preparation
37.	Serve an ice cream sundae

Table 2 Activities/practices of Intervention II **Infection Protection**, code 6550 (items No.1-34; one false item)

1.	Monitor for possible systemic and localized signs and symptoms of infection
2.	Monitor vulnerability to infection
3.	Review histories of international and global travels
4.	Monitor absolute granulocyte count, WBC, and differential count
5.	Follow neutropenic precautions, as appropriate
6.	Limit the number of visitors, as appropriate
7.	Avoid close contact between pet animals and immunocompromised hosts
8.	Screen all visitors for transmissible disease
9.	Maintain asepsis for patient at-risk
10.	Maintain isolation techniques, as appropriate
11.	Provide appropriate skin care to oedematous areas
12.	Inspect skin and mucous membranes for redness, extreme warmth, or dryness
13.	Inspect condition of any surgical incision and wound
14.	Obtain cultures, as needed
15.	Promote sufficient nutritional intake
16.	Encourage fluid intake, as appropriate
17.	Encourage rest
18.	Monitor for change in energy level or malaise
19.	Encourage increased mobility and exercise, as appropriate
20.	Encourage deep breathing and coughing, as appropriate
21.	Administer an immunizing agent, as appropriate
22.	Instruct patient to take antibiotics as prescribed
23.	Maintain judicial use of antibiotics
24.	Do not attempt antibiotic treatment for viral infections
25.	Teach the patient and patient´s family the differences between viral and bacterial infections
26.	Teach the patient and family about the signs and symptoms of infection and when to report them to the health care provider
27.	Teach patient and family members how to avoid infections
28.	Eliminate fresh fruits, vegetables, and pepper in the diet of patients with neutropenia
29.	Remove fresh flowers and plants from patient areas, as appropriate
30.	Provide private room, as needed
31.	Ensure water safety by instituting hyperchlorination and hyper-heating, as appropriate
32.	Report suspected infections to infection control personnel
33.	Report positive cultures to infection control personnel
34.	Discharge the patient

Out of the total pool of n_c=848 experts, the total number of Slovak and Czech experts/clinical nurses was n_k=785 (Table 3 Expert/clinical nurse sets in the process of validation of Nursing Diagnosis Risk for Infection 00004 Interventions I, II). The experts of the total set were from universities and teaching hospitals of SR and the CR. Two interventions for the nursing diagnosis (NIC) Risk for Infection 00004 (NANDA-I) containing a total of 71 activities/practices (two were false items) were validated in academic and clinical settings of different nursing disciplines. The experts of the total sample (nc=848) identified all 69 validated items as significant (i.e., core and secondary) in the nursing diagnosis of Risk for Infection 00004, with 49 core (acute) and 20 secondary items. The first intervention with a weighted score – VS 0.91 - 0.71 (37 activities (one false), 33 core, 3 secondary), the second intervention VS 0.89 – 0.53 (34 activities (one false), 16 core, 17 secondary).

Table 3 Expert/clinical nurse sets in the process of validation of Intervention I, II for nursing diagnosis Risk for Infection 00004

Sets	n_k	%
Slovak Republic – nurses n_1	443	52.24
Czech Republic – nurses n_2	342	40.33
Slovak Republic – nurses $n_{A\ acute,\ anaesthesiology\ and\ intensive\ nursing}$	81	61.35
Czech Republic – nurses $n_{A\ acute,\ anaesthesiology\ and\ intensive\ nursing\ care}$	51	38.75

NIC intervention activities for nursing diagnosis Risk for Infection in acute anaesthesiology and intensive nursing

The aim of the research study was to determine which activities/practices of the two NIC interventions for the nursing diagnosis Risk for Infection 00004 are evaluated by experts/nurses from the academic and clinical obstetric-neonatal nursing care settings in SR and CR as significant, i.e. core (acute) and secondary within acute anaesthesiology and intensive nursing care. Furthermore, to find out which of them they consider as insignificant, i.e. excluded, in obstetric and neonatal nursing. The research was carried out at the Faculty of Social Sciences and Health Care, the University of Constantine the Philosopher in Nitra in collaboration with the Faculty of Health Care Studies, the University of West Bohemia and Faculty of Health Care, the University of Presov with the support of the Kega project entitled *Implementation of Nursing Interventions in Multimedia Technologies in Nursing Education 2*. The research investigations and implementation of their results in nursing education took place from 2020 to 2023.

Methods and Data Set. The Likert Scale and Fehring's Diagnostic Content Validity Model (DCV model) were used for the research. The Likert Scale with a five-point significance rating on a scale of 1 to 5 (1-no significance, 2-low significance, 3-medium significance, 4-high significance, 5-topmost significance). In the next stage of Fehring's Diagnostic Content Validity Model (DCV model), a weighted score for each item/activity was calculated by summing the values assigned to each response and then dividing it by the total number of responses. The values are assigned to the answers as follows: 5=1; 4=0.75; 3=0.5; 2=0.25; 1=0. Responses that achieve a weighted score greater than 0.80 (0.75 according to Fehring, 1986, p. 188; Creason, 2004, p. 124) are considered significant. These activities referred to as highest priority, core, or acute (major, critical). Activities with a weighted score of less than 0.80 and more than 0.50 are of lower priority. Activities with a weighted score≤ 0.50 were considered clinically invalid and therefore diagnostically insignificant and suitable for exclusion.

A total of four measurement tools in two languages were used for the validation study in acute anaesthesiology and intensive nursing care. The measurement tool was an anonymous questionnaire consisting of an anamnestic section that contained selection criteria for the nursing intervention validation expert, and an investigation section. The latter one included the activities of the two interventions NIC for Infection Control (defined as *Minimizing Acquisition and Transmission of Infectious Agents*), code 6540, and Infection Protection (defined as *Prevention and Early Detection of Infection in the Patient at Risk*), code 6550 related to the NANDA-I Nursing Diagnosis Risk for Infection 00004. A total of 71 items (code 6540 items No.1-37; code 6550 items No.1-34) were included in the questionnaire (Table 4, Table 5).

The selected sample included a total of 132 experts/nurses (n_A=132) of the academic and clinical acute anaesthesiology and intensive nursing care. It consisted of four subsets (n_1, n_2, n_{A3}, n_{A4}) of which 81 experts meeting Fehring's criteria were from SR and 51 experts from CR. Slovak educators were n_{A1}=47 (31.8%); Czech educators n_{A2}=16 (10.8%); Slovak clinical

nurses n_{A3}=34 (25.8%); Czech clinical nurses n_{A4}=35 (26.5%). A total of 71 items of the two NIC interventions for the nursing diagnosis Risk for Infection were evaluated, which included 69 activities/practices and two false items.

4 Results

We found out that Slovak and Czech experts/nurses and experts/educators unanimously evaluated all activities/practices as important. For Intervention I, the overall set of experts rated items No. 4 and 19 as the most significant (VS=0.95) and excluded one item (false item). Items rated by the overall expert set with the highest weighted score were *Isolate persons exposed to communicable disease* and *Maintain an optimal aseptic environment during bedside insertion of central lines*.

For Intervention II, the overall set ranked item No.10 (VS=0.95) as the most important. The overall set of experts gave the item *Maintain isolation techniques, as appropriate* the highest weighted score. There were differences between the subsets of experts in rating the magnitude of importance of activities/practices for both interventions. Table 4 Validation of the activities/practices of Intervention I named Infection Control, code 6540, in acute anaesthesiology and intensive nursing care by experts n_{A1} - n_{A4} presents the validated results for Intervention I. Table 5 Validation of the activities/practices of Intervention II named Infection protection, code 6550, in acute anaesthesiology and intensive nursing care by experts n_{A1} - n_{A4}, presents the validation results for Intervention II.

Table 4 Validation of the activities/practices of Intervention I named Infection Control, code 6540, in acute anaesthesiology and intensive nursing care by experts n_{A1} - n_{A4}

Aktivity/NIC$_{37}$	I1	I2	I3	**I4**
	I5	I6	I7	I8	I9
	I10	I11	I12	I13	I14
	I15	I16	I17	I18	**I19**
	I20	I21	I22	I23	I24
	I25	I26	I27	I28	I29
	I30	I31	I32	I33	I34
	I35	I36	I37		
n_{A1}=SR/ Educators	0,59	0,87	0,84	0,93
	0,9	0,89	0,77	0,87	0,84
	0,86	0,82	0,89	0,63	0,88
	0,8	0,91	0,81	0,83	**0,96**
	0,91	0,92	0,91	**0,94**	0,92
	0,82	0,81	0,81	0,79	0,85
	0,73	0,84	0,78	0,88	0,85
	0,83	0,71	0,28		
n_{A2}=CR/Educators	0,56	**0,92**	**0,89**	**0,89**
	0,88	0,86	0,64	0,84	0,81
	0,8	0,69	**0,89**	0,69	0,77
	0,69	0,75	0,59	0,73	**0,89**
	0,81	0,88	0,83	0,84	0,8
	0,66	0,52	0,55	0,61	0,59
	0,5	0,67	0,61	0,78	0,7
	0,59	0,59	0		
n_{A3}=SR/ Nurses	0,68	0,96	0,81	**0,98**
	0,93	0,96	0,9	0,94	0,84
	0,91	0,95	0,97	0,8	0,94
	0,92	0,93	0,9	0,86	0,96
	0,88	0,93	0,9	0,96	0,87
	0,83	0,68	0,74	0,73	0,75
	0,71	0,93	0,87	0,88	0,76
	0,73	0,73	0,15		
n_{A4}=CR/ Nurses	0,54	0,88	0,89	0,91
	0,91	**0,92**	0,76	0,91	0,8
	0,88	0,91	0,91	0,74	0,91
	0,71	0,86	0,76	0,8	0,93
	0,84	0,91	0,89	0,91	0,87
	0,72	0,69	0,78	0,84	0,86

0,79	0,89	0,79	0,83	0,85
0,83	0,79	0,24		
Total (n_A1 – n_A4)	0,61	0,92	0,85	**0,95**
0,92	0,94	0,83	0,92	0,82
0,89	0,93	0,94	0,77	0,93
0,82	0,89	0,83	0,83	**0,95**
0,86	0,92	0,9	0,94	0,87
0,78	0,68	0,76	0,78	0,8
0,75	0,91	0,83	0,85	0,8
0,78	0,76	0,2		

The subset of Slovak educators n_{A1}=47 marked all items as significant. The most significant items were No. 19 and 23 (VS=0.96; 0.94). Slovak experts/educators marked items *Maintain an optimal aseptic environment during bedside insertion of central lines* VS 0.96 and *Ensure aseptic handling of all IV lines* with VS 0.94 as the most significant. The subset of Czech educators n_{A2}=16 marked 23 items as significant, the most significant item being No. 2 (VS=0.92). Czech experts/educators scored the item *Clean the environment appropriately after each patient use* as the most significant – VS 0.92 and four items reached the same significance VS 0.89: *Ensure aseptic handling of all IV lines; Wash hands before and after each patient care activity*; *Change patient care equipment per agency; Isolate persons exposed to communicable disease.* The subset of Slovak nurses n_{A3}=34 labelled all items as significant. The most substantial one being No. 4 (VS=0.98). The sunset of Czech nurses n_{A4}=35 considered all items as substantial. The most significant was No.6 (VS=0.92). The total set of experts marked all activities/practices as significant. For Intervention I, activities/practices included within items No. 4 and 19 *Isolate persons exposed to communicable disease; Maintain an optimal aseptic environment during bedside insertion of central lines* were marked as the most substantial. According to the total set of experts, none of the activities/practices were excluded.

Table 5 Validation of the activities/practices of Intervention II named *Infection Protection,* code 6550, in acute anaesthesiology and intensive nursing care by experts n_{A1} - n_{A4}

Activity/NIC_34	II1	II2	II3	II4
II5	II6	II7	II8	II9
II10	II11	II12	II13	II14
II15	II16	II17	II18	II19
II20	II21	II22	II23	II24
II25	II26	II27	II28	II29
II30	II31	II32	II33	II34
n_{A1}=SR/ Educators	**0,91**	0,74	0,72	0,71
0,71	0,76	0,64	0,65	**0,91**
0,9	0,8	0,81	0,9	0,84
0,8	0,84	0,74	0,68	0,68
0,78	0,77	0,84	0,81	0,82
0,78	0,81	0,82	0,66	0,62
0,68	0,55	0,81	0,85	0,45
n_{A2}=CR/ Educators	0,78	0,64	0,47	0,48
0,47	0,48	0,5	0,42	0,78
0,78	0,66	0,67	0,83	0,75
0,72	0,72	0,61	0,61	0,63
0,61	0,69	0,86	**0,89**	0,61
0,55	0,7	0,61	0,42	0,38
0,44	0,44	0,73	0,77	0,25
n_{A3}=SR/ Nurses	0,84	0,78	0,75	0,71
0,69	0,76	0,68	0,63	0,93
0,95	0,82	0,79	0,87	0,82
0,74	0,76	0,71	0,63	0,74
0,79	0,77	0,86	0,85	0,51
0,5	0,67	0,66	0,57	0,53
0,53	0,45	0,78	0,78	0,56
n_{A4}=CR/ Nurses	0,91	0,77	0,61	0,75
0,72	0,76	0,57	0,6	0,91
0,94	0,83	0,83	0,93	0,88

0,86	0,86	0,81	0,71	0,81
0,8	0,74	0,86	0,88	0,72
0,68	0,81	0,81	0,63	0,53
0,58	0,56	0,8	0,78	0,53
Total (n_A1 – n_A4)		0,87	0,78	0,68
0,73	0,71	0,76	0,62	0,62
0,92	**0,95**	0,83	0,81	0,9
0,85	0,8	0,81	0,76	0,67
0,78	0,8	0,75	0,86	0,86
0,62	0,59	0,74	0,74	0,6
0,53	0,55	0,5	0,79	0,78
0,54				

The subset of Slovak educators n_{A1}=47 marked all items as significant. The most significant items were No. 1 and 9 (VS=0.91); the subset of Czech educators n_{A2}=16 marked 23 items as significant, the most significant item being No. 23 (VS=0.89). Eleven items (including one false item) were insignificant/excluded – No. 3, 4, 5, 6, 7, 8, 28, 29, 30, 31, and 34 (VS=0.5-0.25). The subset of Slovak nurses n_{A3}=34 marked all items as significant, except item No. 31 (VS=0.45); the most significant item was No. 10 (VS=94). The subset of Czech nurses n_{A4}=35 marked all items as significant, the most significant item being No. 10 (VS=94).

The total set of experts rated all activities/practices as significant. The most significant was item No. 10 (VS=0.95) of Intervention II: *Maintain isolation techniques, as appropriate.* According to the total set of experts of acute anaesthesiology and intensive nursing care none of activities/practices of Intervention II were excluded.

6 Discussion

The SENIC (Study on the Efficacy of Nosocomial Infection Control) showed the possibility of reducing infections by one-third through a combination of infection surveillance and infection control programmes (Hughes, 1988). There has been some reduction in the incidence of certain HAIs as a result of greater awareness and robust preventive measures taken in the hospital setting. The implementation of thorough infection surveillance and prevention practices has led to some success in the prevention of HAIs. According to the CDC, CLABSI rates decreased by 46% between 2008 and 2013 (Boev, Kiss, 2017).

In 2014, the CDC published a multi-state point survey on healthcare-associated infections that included 11,282 patients from 183 U.S. hospitals (Magill et al., 2014). According to this report, about 4% of hospitalized patients had at least one HAI. In absolute numbers, an estimated 648,000 hospitalized patients suffered from 721,800 infections in 2011 (Magill et al., 2014). The dominant infections (in descending order) include pneumonia (21.8%), surgical site infections (21.8%), gastrointestinal infections (17.1%), urinary tract infections or UTIs (12.9%), and primary bloodstream infections (9.9%), comprising catheter-associated bloodstream infections (Magill et al., 2014). Among the pathogens causing HAIs, C. difficile (12.1%) is the main pathogen followed closely by Staphylococcus aureus (10.7%), Klebsiella (9.9%) and Escherichia coli (9.3%) (Magill et al., 2014). Skin and surgical site infections are usually caused by Staphylococcus aureus, and sometimes they involve methicillin-resistant Staphylococcus aureus (MRSA).

Pavelova's 2021 study states: "We found that in minimizing acquisition and transmission of infectious agents, respondents collectively considered the most important intervention being *Maintain an optimal aseptic environment during bedside insertion* of central lines (95%) and the least important *Allocate appropriate square meters per patient* (61%). The difference was between the subset of Czech nurses/experts and the subset of Slovak nurses/experts for the activity/practice called *Teach patient and family about signs and symptoms of infection* (81%; 67%). Educators from Slovakia were significantly more likely to *Encourage fluid intake* (89%) than educators from the Czech Republic (50%). In the section on Prevention and early detection

of infection in at-risk patients, all respondents considered the item *Maintain isolation techniques* to be the most important intervention (95%). The item *Avoid contact between pet animals and immunocompromised hosts* showed the most significant difference between nurses (SK 68%; CR 57%). Among educators, the most significant difference was in *Limit the number of visitors* (SK 76%; CR 48%)" (Pavel, 2021). Prevention of infection development in the acute patient who is at risk of failure of basic life functions is one of the most important priorities in the work of the intensive care nurse (Pavel, 2021).

The experts confirmed the validity of almost all the listed activities of the selected NIC sets that can be used in internal medicine nursing for the nursing diagnosis Risk for Infection 00004 but did not consider them all to be of equal importance. The results of the international validation study provided insights for the development of clinical practice in internal medicine nursing, as well as for the development of a curriculum for future nurses and the possibility of objective validation of NIC nursing interventions in relation to the selected nursing diagnosis Risk for Infection. Nurses' self-assessment regarding their competence to perform these activities is also important in making nursing diagnoses and performing subsequent interventions from classification systems. Wake et al. (1994), conducted research that included data from six different countries (Belgium, Canada, Colombia, UK, France, and USA). Zelnik et al. (2010) supplemented it with data from the Czech and Slovak Republics and found that nurses from France (2.4), Colombia (2.5) and the UK (2.5) showed the lowest self-evaluation. Nurses from the USA (3.96), Czech Republic (3.3), Slovak Republic (3.2), Canada (3.19), and Belgium (3.14) had the highest self-assessment. The authors conclude that the highest self-assessment of the U.S. nurses may be related to the fact that NANDA originated in a North American setting. U.S. nurses reported that they had used nursing diagnoses 82% of the time during their studies and 100% of the time during their practice. This suggests a clear need to work with classification systems and the issue of nursing diagnoses and related interventions systematically during study and subsequently in clinical practice (Wake et al., 1994; Zelenik et al., 2010; Archalous, 2023).

For comparison, we present the results of foreign studies related to the application of the NIC classification system interventions. The authors Shin, Choi, and Lee (2021) list the top 30 NIC interventions most commonly used in nursing homes. The most frequently applied NIC intervention was *Medication Management*. It was applied to the majority of residents (56 of 57). The second most frequently applied NIC intervention was *Vital Signs Monitoring* for 55 residents. The third most frequently used one was *Environmental Management: Comfort*. This intervention was applied to 54 clients. The fourth most frequently applied NIC intervention was *Fall Prevention*, applied to 53 clients. *Surveillance: Safety* was the fifth most frequently used nursing intervention, applied to 52 clients. Authors Asghari, Archibald, Roshangar (2022) found top 10 nursing interventions in both a ward and ICU in relation to influencing COVID- 19 infection; these were *Admission Care* (7310), *Environmental Management* (6486), *Health Education* (5510), *Infection Protection* (6550), *Medication Administration* (2300), *Positioning* (0840), *Respiratory Monitoring* (3350), *Vital Signs Monitoring* (6680), *Nausea Management* (1450), and *Diarrhoea Management* (0460). Some of the nursing interventions such as *Admission Care* (7310), *Medication Administration*, and *Vital Signs Monitoring* (6680) are predictable because they are performed on all admitted patients regardless of their nursing diagnoses. Some other nursing interventions were related to common symptoms in COVID-19 positive patients and included *Respiratory Monitoring* (3350), *Nausea Management*, and *Diarrhoea Management* (0460). Nursing care and intervention effectiveness evaluation is done at some level in all hospitals, but because no common language is used to express them, it is not possible to aggregate research and data. The lack of use of standardized language to document interventions also reduces the sustainability of comparative and longitudinal studies of nursing interventions. The most commonly identified nursing interventions for COVID-19 identified in this study provide an evidence-based perspective on the scope of nurses' practice in the context of COVID-19 in hospitalized patients. This study also provides a starting point to consider the scope of practice in the Iranian nursing context and can help inform professional nursing education for students who will be tasked with successfully implementing these strategies in the future (Asghari, Archibald, & Roshangar, 2022).

7 Conclusion

The risk of hospital-acquired infections depends on the infection control practices of the facility, the immune status of the patient, and the prevalence of various pathogens within the community. Risk factors for HAIs include immunosuppression, advanced age, length of hospital stay, multiple underlying comorbidities, frequent visitors to medical facilities, mechanical ventilatory support, recent invasive procedures, built-in devices, and stay in the intensive care unit (Sydnor and Perl, 2011). Systematically validated interventions can be used not only there but also in community care.

The validation processes of NIC Nursing Diagnosis Risk for Infection 00004 interventions enable the quality of nursing care to be improved. The results of international studies provide new knowledge for the development of nursing clinical practice in nursing and allow comparison of nursing interventions and their activities between Czech-Slovak and international validation studies. The current ones strengthen the implementation of the results of research investigations into clinical nursing care, study programmes, and the development of curricula for future nurses and midwives, consequently expanding the possibilities of objective validation of NIC (Nursing Interventions Classification) nursing interventions in relation to selected nursing diagnoses. They contribute to the professionalization of care for clients and patients.

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