

Developing an Instrument for Measuring Nurses' Quality-Safety Practice Competencies

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Abstract:

Improvement in health care delivery system requires a deliberate focus on constructing nurses' Quality-Safety Practice Competencies (QSPC) to enhancing their professional growth to provide high quality of patient care and maintain safety. Therefore, it is important to clearly define nurses' QSPC and its attributes (domains) to establish a foundation for an effective health care system. **Aim:** to develop an instrument for measuring Quality-Safety Practice Competencies for nurses. **Methods:** a methodological qualitative research design was applied at all hospitals that are affiliated to the Ministry of Health and Population (MOHP), at El-Beheira Governorate, Egypt (n= 20). **Subjects:** including two groups: (1) panel of experts (n=80), classified into two categories: a) academic experts (n=10) and b) professional experts (n=70); and (2) head nurses and their assistants (n= 350). **Tools:** two tools were developed, **tool one:** QSPC Instrument and **tool two:** pinionnaire sheet. **Results:** there was highly statistical significant positive correlation between total final version of the developed instrument for measuring QSPC and its attributes ($p \leq 0.01$). **Conclusion:** QSPC instrument has acceptable face validity; excellent content validity and reliability; and construct validity. **Recommendations:** conducting programs for nursing leaders in different health care organizations to enhance their QSPC; and educating them how to measure nurses' QSPC; measure QSPC for nurses and for newly hiring nurses continuously to evaluate their competencies to addressing the gap in nursing education and practice and find strategies to improve; use Quality-Safety Practice Competencies Instrument as a benchmarking tool to compare nurses' competencies between different departments or between different settings.

Keywords: *Instrument development, Nursing Competency, Nursing Practice & Quality-Safety.*

Introduction

Although the advancement of technology in health care system, numerous studies have shown that thousands of lives are go lost every year and large sums of money are squandered needlessly. (Bates & Singh, 2018; Vattipalli et al. 2021 & Rodziewicz et al., 2023) concluded that the bulk of medical errors are caused by systemic issues rather than subpar performance by individual providers. This consider a call for help to enforce medical professionals to look for innovative ways for enhancing quality and safety. Thus, the challenge became the development of modern nursing curricula that contribute to prepare new graduates to construct a culture of Quality-Safety Practice Competencies (QSPC), which will be extended in their clinical settings (Aul et al., 2021 & Hyun et al., 2022).

Many health care organizations are calling for QSPC, to pursuit defined standardized performance for academic education and services to effectively function as a link to provide successful health care services as: American Nurses Credentialing Center [ANCC] Magnet Recognition (2014); College of Nurses of Ontario [CNO] (2019); Accreditation Council for Graduate Medical Education [ACGME] (2022); Joint Commission on Accreditation of Health

Care [JCAHO] (2023). Consequently, it strive to use varying lexicons for developing an instrument for monitoring quality and safety in academic and practice settings (Lyle-Edrosolo & Waxman, 2016). The Massachusetts Department of Higher Education Nursing Initiative, (2016) identified a framework for building a competency partnership model to develop nursing practice and nursing education competencies. This model addressed ten nursing essential competencies, as follows: (patient-centered care; safety; leadership; communication; professionalism; systems-based practice; teamwork and collaboration; informatics and technology; quality improvement and evidenced-based practice). Furthermore, the Institute of Medicine [IOM], (2003) identified five competencies through (the Quality-Safety Education for Nurses (QSEN), namely: patient-centered care; teamwork and collaboration; evidence-based practice; quality improvement; and nursing informatics). Afterwards, the Institute of Medicine [IOM], (2005) expanded those competencies to include safety to be a sixth competencies, and The newly created competencies of QSEN served as a guide for nurse educators who were focusing to redesign outdated nursing education programs.

In this respect, the developed QSPC instrument is composed of ten attributes (domains) as follows: the first attribute (domain) is patient-centered care that provide a holistic care that considering patient preferences; involvement of patients, family and friends; providing emotional support; physical comfort; information and education; promoting easily access of patient care; care coordination; and lastly, continuity and transition of patient care (**Picker Institute, 2015 & Ortiz, 2018**).

The second attribute (domain) is safety that the World Health Organization [WHO], (2017) defined patient safety as: "the prevention and mitigation of hazardous conduct within the context of healthcare services , by means of the application of standards of patient care that have been proved to produce the best results for patients". The third attribute (domain) is communication that is consider critical to the provision of safe and effective patient care. The health services organizations strive to enhance communication skills between health care providers themselves and between their patients to strengthen and improve patient safety and quality (**Merlino, 2017 & Kapur, 2020**). Teamwork and collaboration is the fourth attribute (domain), which means a collaborative communication for developing effective decision-making with the intention of working together to achieve the shared goals, while honoring the distinctive talents and skills of each group or team member. (**Maborouk & Abdelaal, 2019; Gantayet-Mathur et al., 2022 & Monteiro, 2022**).

The fifth attribute (domain) is knowledge-based practice, which means that nurses possess knowledge, which were obtained through their preparation and continuous learning relevant to their professional practice (**Olema et al., 2021 & Hordern, 2022**). System-Based Practice (SBP), is the sixth attribute (domain) that indicates in order to deliver the best possible care, healthcare professionals must show that they are aware of and attentive to the broader context of the health care system. (**Castillo et al., 2020 & Accreditation Council for Graduate Medical Education [ACGME], 2022**).

The seventh attribute (domain) is Evidence-Based Practice (EBP), is potent method for tackling issues that helps health care professionals to take clinical decisions so that the most recent research and best practices are swiftly and effectively implemented into patient care (**Chien, 2019 & Luciano et al., 2019**). The eighth attribute (domain) is quality improvement that refers to the uses of competent nurse of statistical data for monitoring the results of care processes, and using perfection methods to track, design and test changes to constantly improve the outcome for both patients and organization. (**Drew & Pandit, 2020 & Jazieh, 2020**).

Nursing documentation, is the ninth attribute (domain) that enhance nurses to assume the professional accountabilities and responsibilities; on the other side, to investigating and uniformly reporting adverse events and near misses for improving safety and quality for nursing practice (**Dowie, 2021; Bunting & de Klerk, 2022**). Finally, the tenth attribute (domain) is nursing informatics and technology, the competent nurse being able to employ cutting-edge technology, as well as analyze, synthesize, and collaborate data to make crucial decisions that improve patient outcomes to cope with high speed of technological changes and meet marketing demand (**Kossman & Scheidenhelm, 2008 & Stacey, 2022**).

Significance of the study

According to **Zauderer, (2022)** study's, which revealed that 41% of American citizens have claimed to be the sufferer of a medical error; while, 10% of the patients in every hospital are part of a medication error. Furthermore, **Jeffrey & Avery, (2021)** reported that more than 90 % of medical error can be preventable through promote a robust culture of developing nursing practice competencies. Consequently, this study introduces an instrument to measure nurses' QSPC and validate their level of competency to discover their weakness areas of practices and develop the best strategies to improve. In addition, it considers an assessment and benchmarking tool that used to evaluate nurses' QSPC to make sure that an organization is delivering the desired nursing care services and having competitive advantage for raising the community confidence in health care services, increasing customer satisfaction, improve marketing, reputation, nationally and internationally. Moreover, it can be used by all nursing administrative levels; health care policy makers and quality and safety committees to improve the QSPC for health care providers, "as it cannot be improving, what it cannot be measured".

Aim of this study

This study aimed to develop an instrument to measure nurses' quality-safety practice competencies.

Research hypotheses

- The developed instrument for measuring Nurses' Quality-Safety Practice Competencies is valid.
- The developed instrument for measuring Nurses' Quality-Safety Practice Competencies is reliable.

Materials and Methods

Research Design:

Methodological, qualitative research design was utilized to conduct this study.

Setting

This study was conducted at all hospitals that are affiliated to the Ministry of Health and Population (MOHP), at El-Beheira Governorate (n=20), are named as follows: Kafr EL-Dawar General Hospital; Kafr EL-Dawar Central Hospital; Kafr EL-Dawar Fever Hospital; Damanhour Fever Hospital; Damanhour Chest Hospital; Damanhour Ophthalmology Hospital; Hamdy El-Tabakh hospital (Abu Hommus Central Hospital, previously); Rashid Central Hospital; Edfina Central Hospital; Idku Central Hospital; Itai El Baroud General Hospital; Kom Hamada Central Hospital; Housh Eissaa Central Hospital; Abu AL-Matamir Central Hospital; El Rahmaneya Central Hospital; El Delengat Central Hospital; El Mahmoudeya Central Hospital; Badr Central Hospital; Shubrakhit Central Hospital; and El Noubareya Central Hospital. El-Beheira Governorate is one of the largest in Egypt, encompassing 6,676,858 habitants (Egypt: **Administrative Division [Governorates and Districts], 2021**).

Subjects

The subjects of the study were divided into two groups, as follows:

Panel of experts:

They were divided into two subgroups:

- a- **Academic Experts group** (n=10): they included academic staff members from the related field of the study.
- b- **Clinical Professional Experts group** (n=70): they included directors of nursing services and their assistants (n=40), directors of quality and safety committees (n=20), at the previously mentioned settings; and also, the director of nursing **administration** at El-Beheira Directorate of Health Affairs and their assistants (n=3); quality and safety committees at El-Beheira Directorate of Health Affairs (n=5) and two members from El-Beheira Nursing Syndicate (n=2).

Study subjects (clinical professional staff):

A systematic random sample, the estimated sample size (n = 350) at confidence level 95% and precision rate at 0.05 by using Thompson equation (Thompson, 2012). Since the total number of head nurses and their assistants, and members of quality and safety team committees' members, who were working in the previously mentioned settings, are (n=1890). Thus a list of all members of a population was made for each hospital, and randomly generate a number for each element. Since each element has an equal chance of being selected in the study.

Since the population size (N) and the required sample size (n), the calculation was done as follows: Divide the size of the population (N) by the required sample size (n) to get the index number (k). Then every k^{th}

element was chosen from the population list to create the required sample.

Index Number (k) = N/ n

For example, if population number is (N= 42) and the required sample size is (n=7), the **Index Number (k)** = 42/ 7= 6, then the selected numbers are: number (6, 12, 18, 24, 30, 36, 42).

Tools of the Study:

Two tools were utilized to conduct this study:

Tool (I): Quality-Safety Practice Competencies Instrument (QSPCI):

It was developed by the researcher based on thorough review of related literature to measure QSPC (Institute of Medicine [IOM] (2003, 2005); American Nurses Credentialing Center [ANCC] Magnet Recognition (2014); Massachusetts Department of Higher Education Nursing Initiative (2016); College of Nurses of Ontario [CNO] (2019); Accreditation Council for Graduate Medical Education [ACGME] (2022); Joint Commission on Accreditation of Health Care [JCAHO] (2023); Lyle Edrosolo & Waxman (2016); Weeks et al., (2017); Merlino (2017); Sherwood & Nickel (2017); Altmiller, & Dolansky (2017); Acton et al.(2017); Altmiller (2018); Atalla (2018); Fukada (2018); Bates & Singh (2018); Kossman & Scheidenhelm (2018); Ortiz (2018); Jazieh (2020); Castillo (2020); Dowie (2021); Olema et al. (2021); Aul et al (2021); Hyun, Tower & Turner (2022); Bunting & Klerk (2022); Stacey (2022); Monteiro (2022); Gantayet-Mathur, Chan & Kalluri (2022)). It included 70 items grouped into ten domains (attributes), as follows: (1) patient-centered care (8-item); (2) safety (21-item); (3) communication (4-item); (4) teamwork and collaboration (4-item); (5) knowledge-based practice (5-item); (6) system-based practice (6-item); (7) evidence-based practice (4-item); (8) quality improvement (6-item); (9) nursing documentation (7-item); and lastly, (10) informatics and technology (5-item). Responses were measured on 5-point Likert scale ranging from: (1) rarely to (5) always.

Tool (II): Opinionnaire Sheet

It was developed by the researcher to measure both content and face validity of the general form of the developed instrument, by the panel of experts, based on the following three forms (this sheet includes 3 parts)

- A. The first part consists of **Content validity**, which aimed to test contents validity of proposed instrument from view of experts' opinions for each item of the developed instrument. Responses were measured on 4-point ordinal rating scale ranged from 1 (irrelevant) to 4 (very relevant) (Lau et al., 2018; Kusi Amponsah et al., 2020).
- B. The second part consists of **face validity**, which aimed to test face validity of proposed instrument

through eliciting the panel of experts' opinions regarding the general form of the developed instrument. Their responses were measured dichotomously, as: (2) agree or (1) disagree (Lau et al., 2018; Kusi Amponsah et al., 2020).

- C. The third part is the demographic characteristics sheet which aimed to determine demographic characteristics of both participants as follows: (A) the panel of experts included questions related to: age, gender, position, educational qualifications, years of nursing experience, years of current position experience, and marital status; and (B) the study subjects contained data related to: age, gender, working units, educational qualifications, years of nursing experience, years of unit experience and marital status.

Methods

1. An approval to carry out this study was obtained from the responsible authorities after explanation of the purpose of the study.
2. Development of the instrument: According to Slavec and Drnovšek (2012), the process of instrument development included ten steps grouped into three phases that were executed as follows:

Phase I: Theoretical importance and existence of the construct:

- (1) **Content domain specification:** to clearly define the main content domains (attributes) for measuring Quality-Safety Practice Competencies (QSPC) for nurses were decided after extensive review of related literature.
- (2) **Items pool generation:** through individualized semi-structured face-to-face interviews, with ten assistants of directors of nursing services, assistants of directors of quality and safety committees who are working at ten hospitals, affiliated to El-Beheira MOHP. They were selected randomly based on their willingness to participate in the study, after explanation of its purpose. Afterwards, constant comparative analysis between these two steps was carried out to confirm that the domains (attributes) and its underlying items. The resulting product of this step was **the first version** of the developed instrument for measuring QSPC, which included 101 items grounded in 10 attributes.
- (3) **Content and face validity evaluation:** conducted by panel of experts (academic and professional) through the opinionnaire sheet. This step took a period of three months ranged from the beginning of October 2020 to the end of December 2020. Scale-Content Validity Index (S-CVI) and Item-Content Validity Index (I-CVI) values range from 0 to 1. If I-CVI was < 0.70 , the item was omitted (Lau et al., 2018; Kusi Amponsah et al., 2020).

Phase II: Representativeness and appropriateness of the data collection.

- (4) **Questionnaire development and evaluation:** 17 items out of 101 items were omitted as they got $I-CVI < 0.70$. The result of this step yielded **the second version** of the developed instrument for measuring QSPC, which comprised of 84 items grounded in the pre-mentioned ten attributes.
- (5) **Instrument translation:** the second version of the developed instrument was translated into Arabic language for the easiest use of study subjects; and tested by five experts from the field of the study, to test the translation and its feasibility.
- (6) **Pilot study:** was conducted on 10% from the study subjects ($n=35$), they were excluded from the study subjects, to test the applicability of the second version of the developed instrument and to determine the difficulties encountered during completion. Based on the result of the pilot study, some items were modified for clarity and easy to use it by the subjects. as follows: Quality improvement domain: merge item 64 with item 67 because they reflect the same meaning. Consequently, the instrument became 83 items instead of 84 items. Documentation domain: rearrangement of its items to have more valuable sequences to start with documentation regarding direct patient care items; then regarding indirect patient care items.
- (7) **Data collection:** to test the reliability and construct validity of the second version of the developed instrument for measuring QSPC, from the study subjects at the previously mentioned settings ($N=350$). it took about 30 minutes to be filled. This step took a period of five months ranged from the beginning of February 2021 to the end of June 2021.

Phase III: Statistical analysis and statistical evidence of the construct:

- (8) **Reliability assessment:** was measured by the internal consistency reliability of the developed instrument using Cronbach's Alpha Coefficient test and the inter-rater reliability through Intraclass Correlation Coefficient Test (ICC) at confidence interval 95%.
- (9) **Construct validity assessment:** to determine if the attributes and its items of the developed instrument were conceptually and statistically related through measuring two main types of construct validity: convergent and divergent (discriminant) validity. Convergent validity was assessed using: a) Kaiser-Meyer-Olkin Test (KMO) which indicates that the sample was adequate (Kaiser, 1970; Cerny & Kaiser, 1977 ;

Stephanie, 2016) ; and b) Bartlett's Test of Sphericity (Zach, 2019), which stated that the instrument was significant at confidence interval 95% (P=.000). Second, divergent (discriminant) validity was measured using factor correlation matrix at confidence interval 95% (P=.000), which indicates highly significant correlations between attributes of the developed instrument and the overall instrument.

- (10) **Instrument refinement:** based on the result of the previous **two** steps (reliability and construct validity evaluation), 13 items out of 83 items were omitted. This step resulted in the **final version** of the developed instrument for measuring QSPC, which is composed of 70 items grounded in the pre-mentioned ten attributes as follows: (1) Patient-Centered Care (8-item); (2) Safety (21-item); (3) Communication (4-item); (4) Teamwork and Collaboration (4-item); (5) Knowledge-Based Practice (5-item); (6) System-Based Practice (6-item); (7) Evidence-Based Practice (4-item); (8) Quality Improvement (6-item); (9) Nursing Documentation (7-item); and lastly, (10) Informatics and Technology (5-item). Responses were measured on 5-point Likert scale ranging from: (1) rarely to (5) always. The score ranged from 70 to 350. The scoring system was classified into three categories, as follows: low QSPC: less than 50 % (less than 175); moderate QSPC: from 50 % to less than 70 % (175-244); and high QSPC: from 70 % to 100% (245-350).

Ethical Considerations

- An informed written consent from the study subjects was obtained after explanation of the aim of the study.
- The right to refuse to participate or withdraw from the study was assured during the study.
- Confidentiality and anonymity regarding data collection were maintained.

Statistical analysis

Data were statistically analyzed using Statistical Package of Social Science (SPSS) version 22.0. The following statistics were applied: (1) **Descriptive statistics:** in the form of frequencies, percentages, mean and standard deviation. (2) **Reliability of developed instrument:** was calculated through Cronbach's Alpha Coefficient Test and Intra-Class Correlation Coefficient. (3) **Validity of developed instrument:** was assessed through Kaiser-Meyer-Olkin test (KMO), Bartlett's test of Sphericity, and factor correlation matrix.

Results

Table (1): Personal Characteristics of the studied groups (n=430)

Demographic characteristics	Panel of experts (n= 80)		Study subjects (n= 350)	
	No.	%	No.	%
Experts groups				
Academic	10	12.5	Not applicable	
Professional	70	87.5	Not applicable	
Age				
25-	10	12.5	70	20.0
35 -	34	42.5	180	51.4
≥ 45	36	45.0	100	28.6
Mean ± SD	43.62±5.97		42.90±6.30	
Gender				
Male	22	27.5	17	4.9
Female	58	72.5	333	95.1
Educational qualifications				
Bachelor of Nursing Sciences	6	7.5	251	71.7
Diploma of Nursing Sciences	17	21.2	42	12.0
Master of Nursing Sciences	26	32.5	48	13.7
Doctorate of Nursing Sciences	18	22.5	9	2.6
Certified Professional in Health Care Quality (CPHQ)	13	16.3	----	-----
Working Units				
Medical	Not applicable		101	28.9
Surgical	Not applicable		110	31.5
Critical	Not applicable		115	32.8
Committees (Quality and Safety Teams).	Not applicable		24	6.8
Years of Nursing Experience:				
1 -	6	7.5	59	16.8
10 –	20	25.0	175	50.0
≥20	54	67.5	116	33.2
Mean ± SD	17.37±2.97		19.20±3.18	
Years of academic/ managerial/unit experience				
1 -	12	15.0	136	38.9
10 –	58	72.5	199	56.8
≥20	10	12.5	15	4.3
Mean ± SD	14.75±2.64		8.11±2.13	
Marital Status				
Married	73	91.2	338	96.6
Divorced	1	1.3	2	0.6
Widow	2	2.5	3	0.8
Single	4	5.0	7	2.0

Table (2): Agreement of panel of experts on the general form of the developed instrument for measuring Quality-Safety Practice Competencies (face validity) (n=80)

Opinionnaire items		Agree		Disagree	
		No.	%	No.	%
1	Does the instrument look like questionnaire for measuring nurses' quality-safety practice competencies?	80	100	0	0
2	Are the questions of demographic characteristic data sheet about the study subjects enough?	80	100	0	0
3	Does the questionnaire title denote the intended work (for	80	100	0	0

	measuring nurses' quality-safety practice competencies) ?				
4	Does the questionnaire format include the main representative attributes related to quality-safety practice competencies?	80	100	0	0
5	Does the questionnaire format include representative items under every attribute?	78	97.5	2	2.5
6	Is the number of items under every attribute suitable?	80	100	0	0
7	Is the proportion of items devoted to each attribute adequate in relation to all attributes?	76	95	4	5
8	Are the items statement (wording) clear and comprehensive?	80	100	0	0
9	Is the rating system with five Likert scale from (1) rarely to (5) always) correlated with the criteria of the developed instrument?	80	100	0	0

Table (3): Content validity scores for the omitted items of the developed QSPC instrument (first version)

The omitted items of QSPCI (first version)		Mean	SD	I-CVI
1- Patient –Centered Care				
1	Provides patient care effectively.	2.38	0.72	0.59
2	Respects culture diversity and promotes safe environmental culture.	2.42	0.33	0.60
3	Provides feedback to the patient and his/her family about implementation of interventions and treatments.	2.19	0.57	0.54
4	Has the ability to gaining patient satisfaction regarding the care given.	2.34	0.16	0.58
2- Safety				
Patient safety				
5	Reviews doctor's orders carefully before demonstrating any procedures for patients.	1.97	1.01	0.45
6	Administers of parenteral therapy and nasogastric feeding according the clinical guidelines.	2.01	0.98	0.44
7	Follows clinical guidelines and protocols in emergency cases.	1.77	1.76	0.31
3- Communication				
8	Maintains patient confidentiality in all forms of communication as patient records and any written documents	1.25	1.08	0.31
4- Teamwork and Collaboration				
9	Increases performance achievement in workgroup rather than individualized work performance.	1.74	0.98	0.33
5- Knowledge–Based Practice				
10	Applies current knowledge in the clinical practice.	2.19	0.87	0.34
6- Systems–Based Practice				
11	Participates in defining work unit inefficiencies that impact patient care such as: shortage in supplies, medications, equipment, and information.	2.05	1.08	0.51
12	Follows legislative framework, organizational rules and regulation for all labour relations procedures.	1.25	1.67	0.31
7- Quality Improvement				
13	Uses of quality indicators and measurement to evaluate the effect of changes in the delivery process.	2.16	0.76	0.34
8- Nursing Documentation				
14	Documents nursing observation regarding environmental and patient safety.	1.68	0.94	0.42
15	Documents the result of lab and radiology results	2.05	1.34	0.51
16	Follows the hospital policy of receiving and documenting "oral verbal" and "telephone" orders safely.	2.18	1.48	0.54
17	Uses different current electronic systems and programs in health care delivery services.	1.08	1.99	0.27

Omitted items (I- CVI< 0.70)

Table (4): The omitted items from the second version of the developed instrument for measuring QSPC based on internal consistency reliability evaluation.

The omitted items of QSPCI (second version)		Cronbach's alpha if item deleted
1- Patient-Centered Care		
9	Implements ethical issues in nursing care practice.	0.862*
10	Implements legal issues in nursing care practice.	0.899*
2- Safety		
a- Patient safety		
15	Protects the patient from any harm or drawbacks resulting from other incompetent health care disciplinarians'.	0.901*
17	Follows the medication storage policies.	0.861*
b- Occupational Safety		
33	Uses protective measures to protect him/herself from any environmental work hazards (as transmitted infectious diseases- radiation, inhalation toxic substances).	0.799*
35	Commits for receiving the required immunization.	0.806*
3- Communication		
38	Maintains open communication (upward and downward) with mutual respect and trust.	0.879*
4- Knowledge-Based Practice		
50	Asks additional knowledge, shares other disciplines, and asks their assistant when required.	0.803*
5- Systems-Based Practice		
53	Matches between nursing administrations departmental goals with the organizational goals.	0.886*
55	Follows community rules, ethical and legal issues carefully to avoid medical liabilities.	0.897*
6- Quality Improvement		
69	Helps for planning and implementation of utilities management plan, risk and crises management plan that the organization may be exposed to.	0.765*
7- Nursing Documentation		
74	Documents nursing observation, interventions and its outcomes according to clinical guide line and work unit policy.	0.886*
76	Documents all nursing tasks and daily working unit in the specialized departmental records.	0.867*

*Highlighted items are the omitted items ($I-CVI < 0.70$) Items No. are ordered as in the developed instrument.

Table (5): Total reliability analysis of the developed instrument for measuring QSPC (final version).

QSPCI Attributes (Domains) (final version)	No. of Items	Alpha Cronbach	Intraclass (Correlation ICC)
1- Patient-Centered Care	8	.889	.825
2- Safety	21	.901	.833
3- Communication	4	.879	.799
4- Teamwork and Collaboration	4	.816	.901
5- Knowledge-Based Practice	5	.803	.854
6- System-Based Practice	6	.897	.794
7- Evidence-Based Practice	4	.768	.786
8- Quality Improvement	6	.775	.811
9- Nursing Documentation	7	.886	.902
10- Informatics and Technology	5	.905	.868
Total (final version) QSPCI	70	.920	.913

* Significant at $P \leq 0.05$

Table (6): Construct validity (convergent validity) of the developed instrument for measuring QSPCI (final version).

QSPCI Attributes (Domains) (Final version)	Kaiser-Meyer-Olkin (KMO)	Bartlett's test of sphericity		
		χ^2	df	P
1. Patient-centered care	.703	120.456	8	.000
2. Safety	.699	205.361	9	.000
3. Communication	.799	305.631	13	.000
4. Teamwork and collaboration	.802	188.024	19	.000
5. Knowledge-based practice	.861	200.160	28	.000
6. System-based practice	.787	197.031	9	.000
7. Evidence-based practice	.901	306.044	35	.000
8. Quality improvement	.803	402.088	44	.000
9. Nursing documentation	.800	290.614	27	.000
10. Informatics and technology	.901	316.025	35	.000
Total QSPCI	.921	1048.035	145	.000

Table (7): Construct validity (divergent validity) of the developed instrument for measuring QSPCI (final version).

Domains		Domain 1	Domain 2	Domain 3	Domain 4	Domain 5	Domain 6	Domain 7	Domain 8	Domain 9	Domain 10	Total
1- Patient-centred care	r	1	.501	.499	.494	.514	.502	.416	.524	.437	.524	.701
	P		.000**	.000**	.000**	.000**	.000**	.000**	.000**	.000**	.000**	.000**
2- Safety	r		1	.516	.601	.501	.499	.557	.647	.549	.479	.634
	P			.000**	.000**	.000**	.000**	.000**	.000**	.000**	.000**	.000**
3- Communication	r			1	.476	.703	.533	.606	.624	.627	.551	.719
	P				.000**	.000**	.000**	.000**	.000**	.000**	.000**	.000**
4- Teamwork and Collaboration	r				1	.605	.399	.483	.446	.437	.516	.600
	P					.000**	.000**	.000**	.000**	.000**	.000**	.000**
5- Knowledge-Based Practice	r					1	.603	.640	.584	.564	.564	.768
	P						.000**	.000**	.000**	.000**	.000**	.000**
6- System-Based Practice	r						1	.480	.616	.644	.469	.862
	P							.000**	.000**	.000**	.000**	.000**
7- Evidence-Based Practice	r							1	.586	.578	.495	.771
	P								.000**	.000**	.000**	.000**
8- Quality Improvement	r								1	.647	.614	.686
	P									.000**	.000**	.000**
9- Nursing Documentation	r									1	.437	.804
	P										.000**	.000**
10- Informatics and Technology	r										1	.750
	P											.000**
Total QSPCI	r											1
	P											

r: Pearson correlation coefficient

**highly significant at P<0.01

Interpretation of r: Perfect (1); Strong (0.75-0.99); Intermediate (0.25- <.075); Weak (0.1- <0.25)

Table (1): Shows that the majority of the panel of experts (87.5%) were professional. Furthermore, the mean ±SD of experts 'age and study subjects was 43.62±5.97 and 42.90±6.30, respectively. Pertaining to gender, less than three quarters of experts (72.5%) were female, while the majority of study subjects

(95.1%) were female. As for educational qualifications, nearly one third of experts (32.5%) had Masters of Nursing Sciences; while, minority of them (7.5 %) were holding Bachelor degree of Nursing Sciences; compared to nearly less than three quarters of study subjects (71.7%), who were holding

Bachelor degree of Nursing Sciences. In relation to years of both nursing experience, and years of current position experience, the experts group were (17.37 ± 2.97 and 14.75 ± 2.64), consecutively; while years of both nursing experience and years of /unit experiences means, for the study subjects were (19.20 ± 3.18 and 8.11 ± 2.13), respectively. Concerning marital status, the majority of experts and study subjects were married (91.2% and 96.6%), respectively.

Table (2): Illustrates that all panel of experts both academic and professional experts agreed upon the face validity of the developed instrument; except the majority of them agreed for "Does the questionnaire format include representative items under every attribute?" and "Is the proportion of items devoted to each attribute adequate in relation to all attributes" (97.5%, 95%), respectively.

Table (3): Indicates that all instrument attributes and 84 items out of 101 items, had validity results ≥ 0.83 .

Table (4): Proves that 13 items were omitted from the second version of the developed instrument for measuring QSPC to enhance its internal consistency.

Table (5): Mentions that the final version of the developed QSPC instrument had excellent internal consistency ($\alpha = 0.920$); and excellent Intraclass Correlation (ICC = 0.913) at Confidence Interval 95%.

Table (6): Reveals that there was statistically significant interrelationship between each attribute' items at level of significance 95 % ($P = .000$).

Table (7): Illustrates that there was a highly significant positive correlation between the final version of the developed QSPC instrument and its attributes and between all attributes at $P\text{-value} \leq 0.01$.

Discussion

The rapid changes in health care system and advancement of technologies lead to more attention to quality and safety of hospital care. In this respect, the quality-safety nursing practice competencies attributes can be changed and adapted over the time (Zimlichman et al., 2021). As a result of, the present study objects to develop an instrument to measure nurses' quality-safety practice competencies.

Concerning face validity of the developed QSPC instrument, both academic and professional experts (all panel of experts) voiced that the new established instrument for measuring QSPC is a comprehensive. They approved that the adequacy of demographic characteristics data questions; relevancy of the intended work to the instrument title; the instrument attributes represent its items; the items statements are clear and comprehensive; and they also agreed on the relevancy of 5-point Likert scale with the criteria of the new developed instrument. Therefore, the developed instrument had satisfactory face validity

may be related to the effectiveness of the thorough review of related literature and analysis of the qualitative data. This is supported by Cabatan et al., (2020), and Kulsum & Suryadi ,(2021), who recorded, so as to develop any instrument, reliability and validity should be carried out by reviewing and refining the initial questionnaire items to verify the instrument face and content validity based on input from the experts, the preliminary tool items were revised and modified to make them more measurable. Furthermore, Atalla, (2018) mentioned that testing instrument intelligibility and relevancy must be carried out by panel of experts to evaluate its face validity. In addition, Fitzpatrick, (2018) concluded that the evaluation of face validity is an indispensable step in developing instrument in order to approve that the instrument is actually measures and significant to measure the intended work. Furthermore, Erickson et al., (2019) mentioned that the content validity, which is decided by a panel of experts, establishes if the included items appropriately represent the area of content addressed by the instrument's objective. The face validity establishes whether the instrument seems to measure what it claims to measure.

Regarding the Content Validity Index CVI, the Scale Content Validity Index (S-CVI) for measuring nurses' QSPC was measured 0.85 and the entirely instrument attributes has $CVI \geq 0.83$. As a result of, the newly developed instrument represent excellent CVI. According to, Rodrigues et al.,(2017) conveyed that the S-CVI is excellent if it measured more than or equal to 0.80. Concerning Items Content Validity Index (I-CVI) of the first version of the new established instrument, 17 items were deleted for the reason that their I-CVI were < 0.70 . While the prevalent items (84 droved out of 101) of the initial version of the instrument were ≥ 0.83 , were maintained in the second version of the instrument in order to they were considered relevant. This is supported by Kyriazos & Stalikas, (2018) who recorded that I-CVI ≥ 0.70 is considered relevant; while I-CVI is considered high,.; if I-CVI > 0.79 .

Relating to instrument internal consistency reliability, 13 items were subtracted from the second version of the new developed nurses' QSPC instrument to improve its internal consistency reliability of instrument domains. In this respect, Rodrigues et al., (2017) reported that if Alpha Coefficient of an instrument is ≥ 0.70 , the researcher considers deleting an item to increase this coefficient. The items of the instrument were deleted due to some of them asks about some details, which are involved under the umbrella of another items of the same domain that help to reduce the longest of the instrument. This is supported by Steyn (2017), who recorded that even though the researcher needs precise and thorough

information, the professional experts warn about the risk of respondent exhaustion and respondents disengaging or extricating as a result of completing lengthy surveys. Furthermore, some items were deleted due to its involvement with other professionals as medication storage, utilities and risk management planning and reporting environmental hazards. For a long period of time, the nurses were responsible for carrying out those activities; however, it is no longer the case, as hospitals are obligated to follow the Egyptian National Quality Standards that enforce all organizational members to do their work according to their own specific job descriptions.

This goes in harmony with **Wagner-Clarke (2022)**, who mentioned that when the given tasks closely match with the knowledge, skills, abilities and experience of the team members, the productivity is increased. This goes in the same line with **Hanaysha (2016)**, who mentioned that the advantage of assigning tasks to team members is that to foster a sense of proprietorship in each person and so, they experienced a sense of belonging to the organization. A consequence of this, the team members will be more inclined to dedicate themselves to the business and make ongoing improvements to the services they produce and provide

In terms of internal consistency reliability, the final version of the produced QSPCI has proven excellent internal consistency. Additionally, the safety and informatics and technology attributes (domains) have demonstrated excellent internal consistency. Likewise, there is good internal consistency for the entire remaining instrument (domains). This might be related to the consistency of (domains) and its items of the final version of the developed instrument. Additionally, it contains all domains and the key metrics that used to measure QSPC. This is compatible with **Gemayel et al., (2020)**, who recorded that the most often used method for evaluating internal consistency is the Cronbach's Alpha reliability coefficient. This is further reinforced by **Taber, (2018)**, who noted that Cronbach's Alpha(α) spans from 0.0 to 1.0, and assesses the level of consistency of an instrument's domains and its items. A value of 0.7 or more is seen as being sufficiently reliable. While a prospering-established instrument must provide a coefficient reliability value greater than 0.80.

The created QSPCI final version also has excellent intraclass correlation. This might be connected to the consistency and compatibility of the components of each attributes (domain). Those attributes and its items are also applied by nurses with quality-safety practice competencies. According to **Halek et al. (2017) & Yusoff (2019)**, when values of Cronbach's

Alpha (α) closer to 1.0 denoting less measurement mistakes.

Moreover, there is highly statistically significant positive correlation between the total final version of the developed QSPCI and its attributes. There is also a highly significant positive correlation between all attributes of the developed instrument with each other. This may be related to the quality of analysis of the qualitative data and the effectiveness of the thorough review of related literature, that lead to the diversity of the attributes of the developed instrument for measuring QSPC. This result is compatible with **Snyder, (2019)**, who stated that the quality of literature review has cumulative effects on the constructs validity and reliability. This is parallel with **Lyle-Edrosolo & Waxman, (2016) and Sherwood & Nickel, (2017)**, who recorded that quality-safety competencies in education were measured through six attributes (domains); namely: patient-centered care; safety; teamwork and collaboration; evidence-based practice; quality improvement; and lastly, informatics and technology; and also, they confirmed that education and practice must collaborate as a partnership. This is reinforced by, **Weeks et al., (2017)**, who confirmed that nurses' clinical practice competencies include a wide variety of attributes that are essential to successfully fulfill their role and responsibilities as professional nurses.

Moreover, **Fukada, (2018)** mentioned that until now, the nursing competency concept still not fully developed, so there is continuously challenges persist in generating the definition and construction of nursing competencies. Therefore, it is needed to further investigate the concept of nursing competency from different aspect which, was elaborated in this present study; and yielded ten attributes to measure nurses' QSPC, namely: patient-centered care; safety; communication; teamwork and collaboration; systems-based practice; knowledge-based practice; evidence-based practice; quality improvement; nursing documentation; and lastly, informatics and technology.

Conclusion

The result of the present study concluded that the new developed instrument for measuring nurses' Quality-Safety Practice Competencies (QSPC) has acceptable face validity and excellent content validity and reliability; and construct validity.

Recommendations

At the end of the present study, it is recommended that:

Hospital administrators should:

- Apply QSPCI for nurses and for newly hiring nurses continuously to evaluate their competencies to addressing the gap and find strategies to improve.

- Use QSPCI as a benchmarking tool to compare nurses' competencies between different departments or between different settings.
- Provide different educational and training programs for nurses to enhance their competencies regarding QSPC and its attributes and also in different areas of practice to maintain safety and quality.
- Allocate organizational resources, (distribution of limited resources (capacity) among competing consumers, proper use of equipment and supplies, medications, services, proper use of time and energy, check the medical devices before using, review its maintenance schedule and reporting the defects when required).
- Create positive work environment through maintaining an open, clear communication, teamwork cooperation and collaboration, high quality network relationships and respecting the ones' unique roles that help nurses for more work engagement.
- Align nurses with the organizational strategic goals through, increasing their awareness by organizational mission, vision and goals; allowing them to share in change management plan for improvement and giving them sense responsibilities to increase nurses work performance and productivity.
- Enhance nurses' competencies to deal with information technology system and new technological health care devices.
- Encourage nurses' innovations and creativity through making brainstorming sessions to solve work related problems and issues for enhancing quality and safety.

Nurse managers should:

- Illustrates QSPC positive impacts to their subordinate and inform them about its attributes and provide nurses with continuous positive feedback about their performance.
- Measure QSPC continuously to compare the result against the standards and against the previously measure to identify the gap and take action to improve nurses' performance.
- Provide continuous in-service training program to improve nurses' skills and performance to enhancing their abilities to provide high quality of patient care and maintain safety.
- Provide effective new hiring orientation program to help nurses to identify the laws, regulation, organizational system, policies and all work standards to protect themselves from any medical liabilities.
- Maintain positive work climate based on respect, trust, open communication, teamwork and collaboration to motivate nurses to demonstrate

QSPC through encourage nurses' autonomy to reporting work problems that affect quality and safety practice and participate in decision-making, problem-solving for work related issues and innovate new ideas to improve workplace.

Staff nurses should:

- Work within their prescribed job description to meet work-related assignments.
- Demonstrate the attributes of QSPC in their daily practices through Communicate their work problems and needs with their nursing supervisors, try to participate in solving work-related problems, deliver ideas to improve their work conditions and take appropriate decisions related to patient care on the current best evidence and patients 'preferences/values.
- Use organizational resources effectively to meet the patients' needs to attain and sustain patient satisfaction as a quality requirement.
- Follow work standards, organizational policies, rules and regulations for maintaining safety for health care providers, patient and their families and engaging in quality improvement activities and in change management planning for improving work process and maintaining quality and safety practice.
- Perform self-reflection to evaluate their QSPC for continuous improvement through making self-assessment.
- Attending in-service training program to update their knowledge and find solutions to their existing clinical problems through their participation in Egyptian Knowledge Bank.

Future research studies:

- Apply nurses' Quality-Safety Practice Competencies Instrument (QSPCI) in different health care organizations.
- Impact of an educational training program about Quality-Safety Practice Competencies on patient safety and quality.
- Factors that positively and negatively impact nurses' Quality-Safety Practice Competencies.

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