Designing and Validating Standards of Nursing Practice in Radiology Department of El-Manial University Hospital

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Abstract: The standards of practice describe a competent level of radiology nursing care as determined by the critical thinking module known as the nursing process. The aim of this study was to design standards of nursing practice in radiology department at El Manial University Hospital, Cairo University. This cross-sectional descriptive operational study was conducted at the radiology department of El-Manial University Hospital. It involved 40 staff nurses, and a jury group of 24 nursing and medical faculty members and nursing administrators in the field of radiology. The data collection tools included an opinionnaire sheet for staff nurses, an opinionnaire form for validation, an observation checklist for staff nurses' performance, and structure inventory checklist for the settings. The study findings revealed majority agreement of nurses upon the importance of structure and process criteria of the standard, and 100.0% agreement upon applicability. Almost jury group members agreed upon the face and content validity of the proposed standard. Staff nurses' performance was generally low before dissemination of the standard, but showed statistically significant improvements after standards dissemination ($p<0.001$). The study settings were deficient regarding availability of mission or vision, or performance appraisal. In conclusion, a standard for nursing care in radiology department was developed and face and content validated. Its applicability was shown through observation of nurses' performance, and settings structure. It is recommended to apply the developed standards in the study settings, with training staff nurses in its implementation. Quality improvement programs should be available in the radiology department to improve the quality of care provided.

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Introduction

Radiology, formerly called roentgenology, is the branch or specialty of medicine that deals with the study and application of imaging technology like X-ray and radiation to diagnosing and treating disease (1). The Radiology Department has inpatient and outpatient services. The inpatient is a 24-hour imaging service as prescribed by physicians, to assist in the diagnosis of disease or injury. Meanwhile, radiology provides complete outpatient diagnostic and therapeutic imaging procedures (2).

Radiology is increasingly playing a major role in the early management of emergency patients to identify patients who require immediate intervention, hospital monitoring or early discharge. Evolving and more sophisticated technologies may aid in the diagnosis and management of diseases and trauma in ways that were previously not possible. Along with such developments, it is critical that radiology staffing needs and services are optimized to meet ever-increasing demands (3).

Imaging nurses influence patient care in a variety of settings and nursing roles. Imaging nurses are involved in the assessment, care planning, and direct care of patients before, during, and after diagnostic and therapeutic imaging procedures. Imaging nurses promote high quality patient care in those environments. Each imaging nurse is charged with providing safe patient care according to the standards of nursing practice (4).

A quality imaging service will consistently perform the right procedure at the right time for the right patient, refusing requests for inappropriate examinations; the imaging report will be timely and accurate; and the patient will receive optimal personal care (5).

Standards of care are one way for an individual, or a group (department) or the entire healthcare facility to objectively measure how well they are doing in terms of quality and performance. Measurement capability is generally built into professional standards of care (6). Quality of care is the degree to which health services for individual and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge (7).

Professions, including the healthcare professions, have standards of practice. Standards of practice establish minimum practice guidelines and expectations. They reflect the standard in terms of what

should be done and how it should be done. They establish and document what is considered acceptable practice within the profession (8).

Knowledge of standards of care and standards of professional practice assist the nurse in identifying and setting goals for professional growth within radiology and imaging nursing practice (9,10 4, 2). Moreover, the ***Joint Commission*** (11) as set forth standards of care which include performance evaluation, establishment of policies and procedures for nurses, oversight authority in providing patient care, and improvement of patient outcomes.

The Association for Radiologic and Imaging Nursing believes that quality care for all patients is a primary responsibility of nurses. The imaging nurse can only be evaluated by another registered nurse who holds a leadership role. This nurse leader has the ability to determine if the imaging nurse's performance meets the standards of nursing care. The imaging nurse can not be under the supervision or be evaluated by a technical staff member in any imaging environment. Such situations may create a conflict in the delivery of quality patient care (11).

Additionally, standards set out the legal and professional basis for nursing practice. They help to identify for nurses, the public, government, and other stakeholders the desired and achievable level of performance expected of nurses in their practice, against which actual performance can be measured 12).

Therefore absence of standard was associated with many work problems such as role ambiguity, overlapping of responsibilities, and lack of qualified staff. These would lead to role conflict that jeopardizes the provision of quality nursing services in the department of radiology. Therefore, this study is an attempt to develop and validate this standard, which is deemed necessary for the study settings.

Aim of this study

The aim of this study was to design and validate standard of nursing practice in radiology department through:

- Investigating the performance of the nurses working in the radiology department
- Designing standard of nursing practice in radiology department based on national and international sources
- Assessing the validity of the proposed standard based on experts' viewpoints
- Assessing the opinions of the nurses working in radiology department toward the developed standard.
- Assessing applicability of the developed standard.

Study Methods:

Design

A cross-sectional descriptive study design was used for achieving the study aim.

Study setting

The study was conducted at the radiology department of El-Manial University Hospital, affiliated to Cairo University. The department building consists of three floors; the first one contains two units of magnetic resonance imaging (MRI); the second has two computerized tomography (CT) units; in the third there are five units: one there is one unit of angiography, one unit of mammography, one unit of Dual Energy X-ray Absorpometry (DEXA), in addition to an ultrasound unit equipped with six ultrasound machines. The department provides diagnostic radiological investigations that include computerized tomography (CT), magnetic resonance imaging (MRI), Angiography, Ultrasound, and Mammography in addition to other conventional diagnostics.

Sample

Two groups of subjects were included in the study, namely staff nurses and jury group.

- Staff nurses group: the total number of staff nurses included in the study sample was 40. These nurses were either nursing diploma (27) or nursing baccalaureate graduates (13). They were representing all available nurses in the study setting at the time of the study with the only inclusion criterion of having at least one year in the field of work.

- Jury group: This group served as jury to assess the content and face validity of the proposed standard. The group included three categories of jury:

- Nursing faculty members from administration and medical-surgical nursing departments at the Faculties of Nursing at Ain Shams and Cairo Universities. Their number was eight.
- Medical faculty members from the radiology department at El-Manial University Hospital and Faculty of medicine in Cairo University. Their number was eight.
- Head nurses representing nursing managers in the field of radiology nursing. They were recruited from the radiology departments in Nasser Institute, Cairo Scan Radiology Center, and Cairo-University Hospital. Their number was eight head nurses.

Tools of data collection

Four types of data collection tools were used in this study. These included an opinionnaire sheet for validating the proposed standards, an opinionnaire sheet for staff nurses, an observation checklist to assess staff nurses' performance, and a structure inventory checklist for assessment of the settings.

Jury opinionnaire sheet: This tool was designed by the researcher for testing the validity of the

proposed standard through jury group opinions. It consisted of the following three parts:

- Part 1: for personal data such as category, job position, and years of experience.
- Part 2: This was designed to assess the face validity of the proposed standard. It included questions about the format appropriateness, clarity, understandability, measurability, and achievability. It also tested the relevance of the format to the title and content.
- Part 3: This part was intended to assess the content validity of the proposed standard. It included the same criteria as those in the staff nurses' opinionnaire form regarding structure and process of nursing practice in radiology department. The response to each item was either agree or disagree, with a space for any comments.

Scoring: For each item the responses "agree" and "disagree" respectively scored 1 and 0. The scores of the items were summed-up and the total divided by the number of the items, giving a mean score. These scores were converted into a percent score, and means and standard deviations were computed. The jury opinion was considered as agreeing with importance if the percent score was 75% or more and disagreeing if less.

Staff nurses' opinionnaire sheet: This tool was designed by the researcher to solicit staff nurses' opinions regarding the importance and applicability of the proposed standard. It was proposed after reviewing pertinent literature related to standards of nursing practice for patients undergoing radiology examinations ***ARNA-American Radiological Nurses Association and American Nurses Association (9) ; Caprich(13); USAID-United State Agency International Development (14); Kirschner (15); RCN-Royal College of Nursing*** (16). The form consisted of three parts:

- Part1: This entailed personal data such as age, qualification, job position, years of experience, workplace, and attendance of training courses in radiology and administration.
- Part 2: This part was designed for assessing the items of the initial list of the proposed structure standard of radiology department. It includes 35 criteria as following:

Vision and mission: e.g. presence of written vision and mission in accordance with hospital vision and mission.

Policies and procedures: e.g. the department has clear written consistent with vision and mission.

Human resources: e.g. appropriate human resources including nurses with qualification meeting job needs.

Organizational structure: e.g. the organizational chart is clear, determines responsibilities and authorities in the department.

Job descriptions: e.g. the department has job descriptions which are clear, compatible with nursing specialties.

Procedural protocols: e.g. the department has protocols for angiogram, CT, MRI.

Other resources: e.g. the department has adequate physical and financial resources for quality care.

Work environment and safety: e.g. there are radiation safety protocols, warning signs are posted on X-ray rooms.

Infection control: e.g. the department has written guidelines for infection control, known to all nursing personnel.

Performance appraisal system: e.g. the department has a clear performance appraisal system based on job descriptions.

- Part 3: This was proposed for the purpose of assessing staff nurses' opinions regarding the importance and applicability of criteria of nursing practice in radiology department. It includes 71 criteria under the main heading that identify body system for nursing practice in radiology department as following:

  Nursing assessment
  Nursing diagnosis
  Nursing planning
  Nursing interventions:
  Intervention nursing care pre, during, and after Procedure
  Intervention in case of use of dye
  Integrating ethical provisions in all areas of Practice
  Evaluation.

Scoring: For the importance, each item had 3 levels of answers: "agree", "uncertain", and "disagree." These were respectively scored 2, 1, and 0. The scores of the items were summed-up and the total divided by the number of the items, giving a mean score. These scores were converted into a percent score, and means and standard deviations were computed. The nurse opinion was considered as agreeing with importance if the percent score was 75% or more and disagreeing if less. This was based on mathematical calculation taking the midpoint between agree (2) and uncertain (1) as a cutoff point, i.e. 1.5. This represents 75% of the maximum score of 2. For the applicability, the scores were one for applicable, and zero for not applicable. The same procedure was followed as with importance.

- **Observation checklist**: This tool was designed by the researcher for assessment of staff nurses' performance of the criteria of the proposed

standard. The tool was used twice: once before dissemination of the standard, and the second time after its dissemination. It consisted of the following two parts:

- Part 1: for personal data such as department, age, sex, qualification, years of experience, and job position.
- Part 2: This part was intended to assess the actual staff nurses' performance of the process items of the proposed standard. It included the same criteria as those in the staff nurses' opinionnaire form regarding process of nursing practice in radiology department. Each criterion was checked during observation as either done or not done, or not applicable.

Scoring: The items "not done" and "done" were scored "0" and "1", respectively. For each part, the scores of the items were summed-up and the total divided by the number of the items, giving a mean score for the part. These scores were converted into a percent score, and means and standard deviations were computed. The performance was considered adequate if the percent score was 60% or more and inadequate if less than 60**%** ***Butsashvili et al,*** (17).

- **Structure inventory checklist**: This checklist was designed by the researcher for assessment of the structure criteria of the proposed standard in the study settings. The tool consisted of the following two parts:
  - Part 1: for personal data of the interviewee who helped in the observation of the setting. This included the department, age, sex, nursing qualification, job position, and years of experience.
  - Part 2: This part was intended to assess the structure criteria of proposed standard in the study settings. It included the same criteria as those in the staff nurses' opinionnaire form regarding structure elements of the radiology department. Each criterion was checked during observation as either present or absent or not applicable.

Pilot study

It was done on a sample of 10% from the sample. The results were used for finalization of the tools. Modifications included re-phrasing of certain items. The time needed for filling the forms was also estimated based on the pilot results.

Fieldwork

The actual fieldwork of the study started on the beginning of December 2010 and ended in June 2012. Fieldwork included two methods to collect the data needed for the development of the proposed nursing practice standards for the radiology department. These two methods were self-administration of the opinionnaire forms, and observation of the staff nurses' performance and of the structure of the settings.

Data collection started with eliciting staff nurses' opinions regarding the proposed standard importance and applicability. After securing official permissions, the researcher met with the staff nurses, explained the aim of the study to obtain their verbal informed consent for participation in the study. Upon acceptance, they were handled the forms and asked to fill them. The researcher was present all the time to answer any questions raised.

Then, the researcher started the observation process. This was done using the designed observation checklist, and before disseminating the proposed standard. Each staff nurse was observed during her routine work for all the criteria of the process standard. The aim of the observation was to assess the applicability of the standard. Each item in the checklist observed to be performed by the nurse was recorded as done. This was done in two shifts. The morning shift started from 8:30 till 13:30, and the afternoon shift started from 13:30 till 18:30. The average duration of the observation was four hours in each shift. This was done six days per week. Each nurse was observed until the checklist items were totally fulfilled. The duration of observation was about five months.

Upon ending with the staff nurses' opinionnaires and observation, testing of the validity of the proposed standard was done. The researcher met with the jury group members individually, explained the objectives of the study for each one, and asked them to express their opinions and suggestions regarding the proposed standard. They gave some comments on the clarity of some criteria of the constructed standard and its coverage of all aspects related to process and structure. According to the comments and recommendations of jury members, the standard was modified. Then the proposed standard was considered valid.

Then, assessment of staff nurses' performance was done again after disseminating the standard using the same observation checklist.

Standard development

Based on the validity and applicability data obtained from various study tools, the nursing practice standard was proposed. The researcher divided the proposed standard of nursing practice in radiology according to Donabedian's models into two parts, namely structure standards and process standards

Administrative design

To carry out the study at the selected settings, official letters were issued from the Faculty of Nursing, Damanhour University to get permission from the hospital administration, and the nursing director. The purpose of the study and its procedures were explained to them to get their consent and cooperation.

Ethical considerations

Oral informed consent was obtained from the participants included in the study sample. They were reassured about the confidentiality of the obtained information. They were informed about their rights to refuse participation or withdraw at any time. The study maneuvers could not entail any harm on participants.

Statistical design

Data entry and statistical analysis were done using SPSS 14.0 statistical software package. Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables, and means and standard deviations for quantitative variables. Qualitative categorical variables were compared using chi-square test. Whenever the expected values in one or more of the cells in a 2x2 tables was less than 5, Fisher exact test was used instead. In larger than 2x2 cross-tables, no test could be applied whenever the expected value in 10% or more of the cells was less than 5. Statistical significance was considered at p-value <0.05.

Results

Part I. Validation of standards by jury group.

According to the general profile of the of jury group members, data in Table (1) showed that: two-thirds of them (66.7%) were nursing. The sample was equally distributed among professors, assistant professors, and nursing directors, 33.3% each. Their years of experience were mostly more the ten years (87.5%).

Table 1. Socio-demographic characteristics of jury group members (n=24)

	Frequency	Percent
Category:		
Nursing	16	66.7
Medical	8	33.3
Job position:		
Professor	8	33.3
Assistant professor	8	33.3
Nursing director	8	33.3
Experience (years):		
<10	3	12.5
10+	21	87.5
Range	5.0-39.0	
Mean±SD	18.8±8.3	

Regarding to the total agreement of jury groups upon the areas of the proposed standards was presented in table (2) It points to a unanimous agreement of both nursing and medical groups upon all areas, with only one exception in the nursing group, and three in the medical group. These were the areas of non-human resources in both groups, 93.8% and 87.5%, respectively, as well as work environment and safety (87.5%), and infection control (87.5%) in the medical group.

Part II. Nurses' opinion regarding importance and applicability of standards.

The personal characteristics of nurses in the opinionnaire sample showed at table (3), More than half of them (55.0%) were diploma nurses. The majority were more than 30 years old (82.5%), with more than ten years experience in nursing (85.0%) and in radiology (62.5%). About one third attended training courses in radiology (32.5%), and only two of them (5.0%) had training in management.

Table (4) summarizes nurses' opinions regarding the importance and applicability of total standards criteria. Their agreement upon importance ranged between 70.0% and 97.5%. The corresponding figures for applicability were 85.0% and 100.0%. A statistically significant difference was revealed between them importance and applicability of evaluation (p=0.01), where agreement upon applicability exceeded that upon importance. Overall, only two nurses had a total disagreement for importance, and one for applicability of the standards.

Part III. Applicability of standards through observation of nurses' performance.

Table (5) describes the socio-demographic characteristics of nurses in the observation sample before and after dissemination of the proposed standards. Their mean age was around 37 years. Their mean years of experience in radiology and in total nursing were about 13 and 16 years, respectively.

On other hand, Figure 1 illustrated total nurses' performance before and after dissemination of the standards. It points to very low percentages of adequate performance in all areas, especially regarding planning, which was adequately performed by only one nurse (2.5%). After dissemination of the standards, statistically significant improvements were demonstrated in all areas (p<0.001). The total adequate performance increased from 5.0% to 80.0%.

Part IV. Inspection of structure criteria of study settings

According to the socio demographic characteristics of nurses who were interviewed in site inspection, Table (6) showed that, they were mostly head nurses, 40 years age or older, females, with 20 or more experience years.

Table (7) describes the total presence of structure standards in the five study settings. It indicates that most of them had adequate structures related to human resources, procedures and standards, and work environment and safety. On the other hand, none of them had adequate mission or vision, or performance appraisal. Overall two of the five settings (40.0%) had total adequate structure.

Table 2 . Agreement of jury group upon total standards criteria

	Category				X^2 Test	p-value
	Nursing (n=16)		Medical (n=8)			
	No.	%	No.	%		
Vision	16	100.0	8	100.0	0.00	1.00
Policies and procedures	16	100.0	8	100.0	0.00	1.00
Human resources	16	100.0	8	100.0	0.00	1.00
Organizational structure	16	100.0	8	100.0	0.00	1.00
Job descriptions	16	100.0	8	100.0	0.00	1.00
Procedures protocols	16	100.0	8	100.0	0.00	1.00
Non-human resources	15	93.8	7	87.5	Fisher	1.00
Work environment and safety	16	100.0	7	87.5	Fisher	0.33
Infection control	16	100.0	7	87.5	Fisher	0.33
Performance appraisal	16	100.0	8	100.0	0.00	1.00
Total structure	16	100.0	8	100.0	0.00	1.00
Assessment	16	100.0	8	100.0	0.00	1.00
Diagnosis	16	100.0	8	100.0	0.00	1.00
Planning	16	100.0	8	100.0	0.00	1.00
Implementation	16	100.0	8	100.0	0.00	1.00
Evaluation	16	100.0	8	100.0	0.00	1.00
Total procedures	16	100.0	8	100.0	0.00	1.00
Total	16	100.0	8	100.0	0.00	1.00

Table 3. Socio-demographic characteristics of nurses in the opinionnaire sample (n=40)

	Frequency	Percent
Age (years):		
<30	7	17.5
30+	33	82.5
Range	17.0-54.0	
Mean±SD	37.2±9.1	
Nursing qualification:		
Nursing school diploma	22	55.0
Specialty diploma	4	10.0
Technical institute diploma	1	2.5
Bachelor of nursing	13	32.5
Job position:		
Staff nurse	16	40.0
Radiology technician	22	55.0
Head nurse	2	5.0
Total experience (years):		
<10	6	15.0
10+	34	85.0
Range	1.0-30.0	
Mean±SD	16.5±7.6	
Experience in radiology (years):		
<10	15	37.5
10+	25	62.5
Range	0.0-30.0	
Mean±SD	12.8±7.8	
Attended training courses in:		
Radiology	13	32.5
Management	2	5.0

Table 4. Nurses' opinions regarding importance and applicability of total standards criteria

	Agree upon				X^2 Test	p-value
	Importance		Applicability			
	No.	%	No.	%		
Vision/mission	35	87.5	40	100.0	Fisher	0.055
Policies and procedures	36	90.0	40	100.0	Fisher	0.12
Human resources	36	90.0	34	85.0	0.46	0.50
Organizational structure	32	80.0	36	90.0	1.57	0.21
Job descriptions	39	97.5	38	95.0	Fisher	1.00
Procedures protocols	39	97.5	39	97.5	Fisher	1.00
Non-human resources	36	90.0	35	87.5	Fisher	1.00
Work environment and safety	36	90.0	36	90.0	Fisher	1.00
Infection control	38	95.0	40	100.0	Fisher	0.49
Performance appraisal	38	95.0	39	97.5	Fisher	1.00
Total structure	37	92.5	39	97.5	Fisher	0.62
Assessment	39	97.5	39	97.5	Fisher	1.00
Diagnosis	36	90.0	36	90.0	Fisher	1.00
Planning	36	90.0	37	92.5	Fisher	1.00
Implementation	39	97.5	39	97.5	Fisher	1.00
Evaluation	28	70.0	37	92.5	6.65	0.01*
Total procedures	38	95.0	38	95.0	Fisher	1.00
Total	38	95.0	39	97.5	Fisher	1.00

(*) Statistically significant at p<0.05

Table 5. Socio-demographic characteristics of nurses in the observation and applicability sample (n=40)

	Observation			
	Before (n=40)		After(n=40)	
	No.	%	No.	%
Department:				
MRI	8	20.0	8	20.0
CT	10	25.0	10	25.0
Radiology	19	47.5	17	42.5
Angiography	3	7.5	5	12.5
Age (years):				
<30	7	17.5	7	17.5
30+	33	82.5	33	82.5
Range	19.0-54.0		19.0-54.0	
Mean±SD	37.4±8.7		37.3±8.7	
Sex:				
Male	5	12.5	6	15.0
Female	35	87.5	34	85.0
Nursing qualification:				
Nursing school diploma	24	60.0	26	65.0
Specialty diploma	3	7.5	2	5.0
Bachelor of nursing	13	32.5	12	30.0
Experience in radiology (years):				
<10	14	35.0	15	37.5
10+	26	65.0	25	62.5
Range	1.0-30.0		1.0-30.0	
Mean±SD	13.1±7.7		12.9±7.8	
Total experience (years):				
<10	7	17.5	6	15.0
10+	33	82.5	34	85.0
Range	1.0-30.0		1.0-30.0	
Mean±SD	16.6±8.0		16.7±7.7	

Table 6. Socio-demographic characteristics of nurses in the site inspection interview sample (n=5)

	Frequency	Percent
Department:		
MRI	1	20.0
CT	1	20.0
Radiology	2	40.0
Angiography	1	20.0
Age (years):		
<40	1	20.0
40+	4	80.0
Sex:		
Female	5	100.0
Nursing qualification:		
Nursing school diploma	3	60.0
Bachelor of nursing	2	40.0
Experience in radiology (years):		
<20	2	40.0
20+	3	60.0
Experience in nursing (years):		
<20	1	20.0
20+	4	80.0
Job position:		
Head nurse	3	60.0
Radiology technician	2	40.0

Table7. Availability of total standards criteria in the study settings

	Departments					
	MRI	CT	Radiology (n=2)	Angiography	Total	
	No.	No.	No.	No.	No.	%
Vision/mission	0	0	0	0	0	0.0
Policies and procedures	1	1	0	0	2	40.0
Human resources	1	1	1	1	4	80.0
Organizational structure	0	1	0	0	1	20.0
Job descriptions	1	0	0	1	2	40.0
Procedures protocols	1	1	1	1	4	80.0
Non-human resources	1	0	1	1	3	60.0
Work environment and safety	1	1	1	1	4	80.0
Infection control	1	0	0	1	2	40.0
Performance appraisal	0	0	0	1	0	0.0
Total structure	1	1	0	0	2	40.0

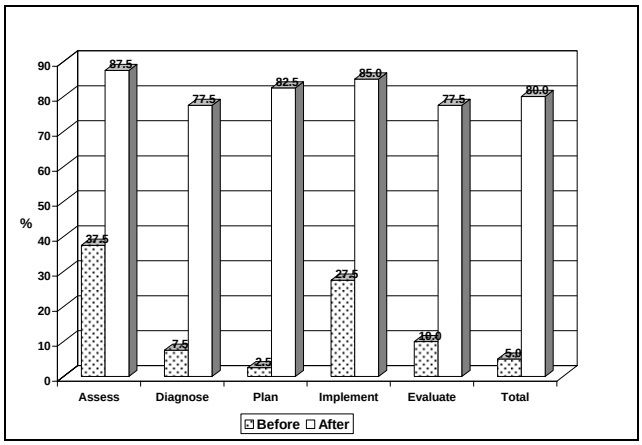

Figure1. Nurses' total performance before and after dissemination of standards

Discussion

In this study, the evidence supporting the content validity of proposed tool was based on literature review, clinical observation, and the judgment of the jury group. In the process of construction of standard, the viewpoints of jury were solicited to ensure validity, while jobholders' views were sought to assess the importance and applicability of these standards. According to the study findings, there was a majority agreement among jury group regarding proposed standards' face and content validity. This step is considered an important criterion for adoption of standards. Content validity is the degree to which the items adequately represent the universe of content of tasks and responsibilities. This ensures a match between target and developed standard (18, 19).

Concerning the validation of the checklist entailing structure items for radiology department, all jury members in the present study have agreed upon the importance of the presence of the vision, mission, and policy and procedures, and that they should be available to all members of the radiology department. Also the majority of nurses agreed upon the importance as well as the applicability of these same items. These findings imply that nurses in the study sample have good awareness of these components of the structure standard, and realize their importance. Also, they do not perceive any problems with their application as the results demonstrated higher percentages of agreement upon applicability compared to importance.

In agreement with these present study findings, ***El-Guindy*** (20) reported a unanimous consensus of jury group members upon the importance of having written policies for nursing personnel in the operation department, and upon their availability to all members. Similarly, in the study of ***Ahmed et al.*** (21) all jury group members agreed upon policies and procedures, and suggested that it should be collected in a policy manual accessible to nursing personnel; these policies and procedures must be regularly updated. The findings are also in congruence with ***El Hanafy*** (22) and ***Tantawy*** (23) who reported majority agreement of jury upon the importance of the availability of policies and procedures at emergency and intensive care units.

The present study finding showed that all the jury group members agreed upon the importance of organizational structure and job description items. They were also agreed upon by the majority of nurses regarding their importance and applicability. These components of the structure standard are essential as they define clearly the lines of commands and the roles of each member of the team, which would preclude any role ambiguities with consequent conflict. Due to the importance of these components, very high percentages of agreement were reported upon them in similar previous studies ***Sidani et al,*** (24); ***Ahmed et al.,*** (21); ***El Hanafy*** (22***)***. All these studies insisted that job description must be clear, available, and reviewed periodically.

Concerning structure standards related to safety and infection control, the present study results indicated that all jury group members and the majority of nurses agreed upon the importance and applicability of all items. These two components have a special importance in radiology department where serious hazardous exposures to ionizing radiation can occur. Also, the risk of nosocomial infection could be high, especially in invasive procedures. The findings reflect a high level of awareness among nurses regarding such hazards.

In agreement with these present study results, ***Ismail*** (25), ***Ahmed et al.*** (21) and ***El-Guindy*** (20) reported majority agreements among jury group members upon the necessity of written guidelines for infection control available in operating rooms and intensive care units, and that they should be known to all nursing personnel. Similarly, ***El-Hanafy*** (22) reported a unanimous agreement upon the presence of written guidelines for infection control that must be available in the immediate postoperative hepatic patient units.

Despite the high awareness about safety and infection control, ***Grant*** (26) reported that although the incidence of infection in intensive care unit is one of the highest in the hospital, facilities to prevent infection are often inadequate in these important areas. Therefore, ***Potter and Perry*** (27) emphasized that the nurse must follow general guidelines for controlling infection and use programs according to hospital policy. In addition, nurses should use barrier precautions to prevent the occurrence of infection for patients and for themselves.

The second part of the standards developed in the present study was concerned with process standards. These were based on the steps of the nursing process, which is a systematic, deliberate problem-solving approach to meet the healthcare and nursing needs of patients' assessment, diagnosis, planning, implementation, and evaluation of outcomes. In the specialty of nursing radiology, the ***ARNA-American Radiological Nurses Association and American Nurses Association*** (9) outlined the use of the nursing process for patients undergoing diagnostic and therapeutic imaging procedures as follows: collection of ongoing data, synthesis and analysis of data to determine outcomes, development of an age appropriate plan of care, implementation of the nursing plan, evaluation of the patient's responses

to plan, and reassessment and revision of the plan and goals as indicated.

The first step included in the process standard was that of nursing assessment. All jury group members in the present study have agreed upon all proposed items for radiology patients. Similarly, the majority of nurses agreed upon the importance and applicability of all items. The high agreement of both jury and nurses reflect the major importance of this step at the start of patient encounter. This has been emphasized by ***Phipps et al.*** (28) who mentioned that the nurse should perform a complete physical assessment of the patient, which would include collecting data about the onset of disease and its progress. As stressed by ***Ellis and Hartley*** (29), each nurse must demonstrate competencies that meet minimum criteria in the performance of taking efficient and complete physical assessment. This is vital to construct a database to formulate the nursing diagnosis (patient problem) and in order to delineate competent nursing actions.

Due to the importance of this step of the nursing process, the ***RCN-Royal College of Nursing*** (16) emphasized that the comprehensive pre-procedural care of patients requiring vascular and/or non-vascular interventional radiology is essential in the work of the radiology nurse. It involves assessing the physical and psychological wellbeing of the patient through pre-procedural interviewing. At this time, drug, medical, and social histories can be obtained. Most patients, despite their best efforts, have little understanding of the procedures they are about to undergo. Thus, experienced nurses are often in a position to assess the degree of knowledge and anxiety prior to the procedure, thereby allaying patient fears through explanation and reassurance.

The last item in assessment is getting the patient to sign a consent form. All jury group members in the present study agreed upon this step. Meanwhile, still about one-fourth of the nurses could not perceive the importance of this step. This could be explained by their lack of knowledge, as well as their traditional thinking that the patient should be passive in his/her treatment plan, and should cede all decisions to the healthcare provider. The finding is in congruence with ***El Hanafy*** (22) who showed that the lowest percentage of agreement was related to the consent form.

Another explanation of the relatively low agreement of nurses upon getting the consent signed by the patient could be that they might consider this step as one of the physician's responsibilities. In fact, the ***Court of Appeal of Louisiana*** (30) had a ruling that the physician has the legal responsibility to communicate with the patient about the benefits, risks, and alternatives of the proposed procedure, and to obtain the patient's informed consent before any intervention procedure.

The second step of the nursing process is nursing diagnosis. The present study has demonstrated that all the jury group members agreed upon all the proposed items of nursing diagnosis for the radiology patients. Also the majority of nurses agreed upon their importance and applicability, with higher agreement upon applicability. The findings are in congruence with ***El Hanafy*** (22) and ***Nasr El din*** (31) who has also demonstrated a majority agreement of jury group members regarding nursing diagnosis items.

Nevertheless, the actual observation of nurse in the present study was very low before dissemination of standards. These results are consistent with ***El Hanafy*** (22) who found that less than one third of the studied nurses made nursing diagnosis. On the same line, ***Mohammed*** (32) and ***Nasr El din*** (31) reported that most of the nurses did not formulate nursing diagnosis.

However, statistically significant improvements were demonstrated in the formulation of nursing diagnosis by nurses in the present study after dissemination of the standards. This shows that the lack of performance was due to lack of knowledge among study nurses. It also implies that that the standards are applicable, and that their implementation will lead to better performance since nurses realized the importance of setting a nursing diagnosis for better further nursing care for the patient. In this regard, ***Tatiana et al.*** (33) highlighted that nursing diagnosis allows defining the profile of needs of patients, thus making the global focus of nursing interventions easy. Similarly, ***Gordon (in: Mohammed*** (32) emphasized that in order to make continuous nursing assessment easier over the several shifts, language standardization in the form of clear nursing diagnosis is required.

The third step of the nursing process is planning. According to ***Flippo*** (34) patient's care plan is a very effective method of monitoring standards. The findings of the present study showed that all jury group members and the majority of the nurses agreed upon all criteria of the planning standards. This included both their importance and their applicability. These results are congruent with ***El-Guindy*** (20) study in which all the jury group members gave their agreement upon all items related to planning. They are also in consistence with ***El-Hanafy*** (22).

The fourth step of the nursing process is that of implementation of the nursing care plan. Its items included items similar to those listed by ***Catherine and Linton*** (35) which involve, but are not limited to, health teaching, direct client care, medical treatments,

medications, and dressing changes. These all aim to achieve established goals of care.

All jury group members in the present study agreed upon all the items of the proposed standards. Similarly, the majority of the nurses expressed their agreement upon the importance and applicability of these items. This is expected since this is the part of the nursing process that is mostly realized and known to nurses because they consider it as their main job. In this respect, the ***ARNA-American Radiological Nurses Association and American Nurses Association*** (9) indicated that the radiology nurse should focus on patient and patient's responses to radiological interventions or physiologic changes while in radiology department or under the care of the radiologist. The high consensus among jury group members is in congruence with ***El-Guindy*** (20) and ***El-Hanafy*** (22) findings. Also, the agreement of the great majority of the nurses upon most implementation items is in consistence with ***Mosa*** (36).

Despite their high agreement upon the importance and applicability of all implementation items, their performance of nursing interventions before of the standards was low. However, it was better when compared to the performance in the first three steps of the nursing process. This might be explained by that these direct patient care items constitute the daily work of nurses. The deficiency in their performance, however, could be related to lack of standards to be followed, as well as lack of facilities and supplies. This would lead to poor quality of care rendered to the patients as clarified by ***Thompson*** (37). Nurses' performance demonstrated statistically significant improvements after dissemination of the standards, which shows the importance and potential impact of its application.

Concerning nurses' performance in case of use of contrast media before dissemination of the standards, the present study findings showed it was high in some of the items, and low in others. This could be attributed to rules and regulations concerning nurse's role in administration of such materials, which should be clarified by standards. In this regard, ***Eliker et al*** (38) pointed out that a radiology nurse may administer intravenous contrast media under supervision of physician, and she/he must first assess the patients for risk factors predisposing them to adverse reactions. Furthermore, ***Fajardo and Roe*** (39) added that during and following the injection, the administering individual will remain with the patient to observe for possible reactions. Therefore, when the actual roles of the radiology nurse were made known through dissemination of the developed standards, their performance significantly improved.

One of the most important tasks and responsibilities of the radiology nurse is the monitoring of patients in interventional radiology departments after the use of contrasts or similar interventions. For all patients under angiography during the initial post procedural period, a skilled nurse should periodically monitor blood pressure, record vital signs, and maintain intravenous access for administration of fluids and medications as needed ***Spiese et al***, (40). This makes the radiology nurse a vital member of the interventional radiology team that should be available during all procedures. Due to the major importance of this role, the present study findings indicated high levels of adequate performance before dissemination of the developed standard, and this further improved after dissemination, but without statistically significant difference.

Integrating ethical provisions in areas of practice was one of the least adequately performed by nurses in the present study before dissemination of the developed standards. This indicates low awareness about patient rights. It could also be attributed to low empowerment among these nurses, which would hinder their ability to play the role of patient advocate as determined by the ***ARNA-American Radiological Nurses Association and American Nurses Association*** (9), which stressed the role of the radiology nurse in helping the patient to make decisions regarding own health. On the same line, the ***American Nurses Association [ANA]*** (41) indicated that the radiology nurses are the primary patient advocates in the radiology department; they should protect patient's privacy and dignity, and ensure focus on the patient. This has been observed among the present study nurses after dissemination of the standards.

The last step of the nursing process, nursing evaluation, was also agreed upon by all jury group members, and the majority of the nurses confirmed its importance and applicability. However, their agreement upon applicability was significantly higher than their agreement upon the importance of its items. This reflects that these nurses were not highly convinced with this step of the nursing process, which is in contradiction with ***Catherine and Linton*** (35) who mentioned that evaluation enables the nurse to determine what progress the patient has made in meeting the goals for care, and is a measure for determining outcomes of care. Thus, the performance of the present study nurses of the nursing evaluation items before dissemination of the developed standards was very low, but it significantly improved after dissemination of the standards.

Lastly, inspection of the study settings revealed that some of the structure standards were

present, while others were lacking in most of the settings. These were mainly related to mission, vision, and performance appraisal. The developed structure standards would amend this deficiency. However, other structure items related to direct patient as human and non-human resources must be made available to ensure that implementation of the developed standard would have a positive impact on radiology nurses' performance.

Conclusion

In the light of the study findings, it is concluded that the majority of staff nurses working in radiology department in El-Manial University Hospital agree upon the importance and applicability of the criteria of structure and process protocol, with applicability being higher than importance. However, their performance of these criteria is mostly inadequate. The proposed protocol has been face and content validated through majority agreement of nursing and medical jury group members. Dissemination of the protocols among staff nurses improved their performance, which points to its applicability. Additionally, the study settings have adequate structures that would guarantee the possibility of implementation of the protocol in these settings.

Recommendations

Based on the finding of the study, the following is recommended:

- The developed standards for nursing practice for patients in radiology department are recommended to be applied in the radiology department.
- The developed standards should be made known and available to all staff nurses working in the radiology department.
- The developed nursing practice standards should be explained in details for all nurses working in the radiology department, emphasizing its importance.
- The mission and vision of radiology department should be written and posted to be available for all staff members.

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