Intensive Care Nurses' Self Reported versus Observed Mastery of Competencies at a University Teaching Hospitals - Cairo

Hanaa Ali Ahmed El-Feky

Assistant Professor of Critical Care and Emergency Nursing, Faculty of Nursing – Cairo   University

Abstract

Background: *In the era of competency-based education, there is an emerging need to revise both nursing education and practice especially in high complex settings such as intensive care units where nurses are confronted not only with unstable and complex patients' condition, but also the needed high level of competencies to provide resuscitative measures, comprehensive care, and prevent complications.* ***Aim of the study:*** *to examine intensive care nurses' self reported versus assessed level of competencies mastery at a University Hospital – Cairo.* ***Research questions****: 1-What is the level of self reported versus assessed intensive care nursing competencies mastery, at a University Hospital – Cairo?,* ***2-*** *What is the difference between self reported and assessed intensive care nurses' mastery of competencies at a University Hospital – Cairo?.* ***Research design:*** *A descriptive exploratory research design was employed to achieve the aim of the present study.* ***A sample*** *of convenience consisting of 93 intensive care nurses was enrolled in this study.* ***Setting:*** *The present study was carried out at four intensive care units affiliated to Cairo university teaching hospitals.* ***Two tools*** *were developed by the researcher and used to collect data: Intensive care nurses' self reported competencies checklist, and Intensive care nurses' competencies mastery observational checklist.* ***Results****: the total mean self reported mastery of nurses' competencies scores was 63.48$\pm$ SD=10.23 indicating a satisfactory level. However, the total mean assessment (observed) scores was 51.0 $\pm$12.6 indicating unsatisfactory level of practicing necessary skills to achieve competencies with high significant statistical difference between the two means (t-test = 38.7, P$\leq$0.00). Observation of nurses revealed no experience in demonstrating neurological (96.8%), cardiovascular (92.5%), respiratory (62.4%), and psychological assessment (63.4%). As well, most of assessed nurses reported and observed to have no experience regarding mechanical ventilation modes (87.1%), ventilators set up (80.6%), interpreting ECG (91.4%), detecting common dysrhythmias (94.6%), managing and scoring delirium (89.2%), recording observations (78.5%), managing seizures (74.5%), and assessing pain (67.7%). They also had no experiences in prioritizing, providing end of life care, and planning for care in percentages of 76.3%, 76.3%, and 74.2% respectively.* ***Conclusion:*** *The present study reflected high self reported competencies mastery level as compared to the observed. This may signal an urgent need for upgrading nurses' skills along with the needed knowledge, in the light of critical care nursing practice standards.* ***Recommendations:*** *Detailed assessment of nurses mastery of intensive care competencies using well structured – specific tasks checklists; Carrying out hands on continuous training based on nurses' preliminary assessment to include physical examination/ health assessment, essential life saving care procedures, and ongoing care; in addition to conducting refreshment courses about communication, working with a team, and maintaining self and patients safety.*

Key words: *Intensive care nurses, assessment, observation, self report, competencies, mastery.*

I. Introduction

Competency is the cornerstone of professional development. It is the capacity and ability to perform a specific task according to predefined standards in a manner that reflects desirable outcomes (Lakanmaa, Suominen, Ritmala-Castrén, Vahlberg, & Leino-Kilpi, 2015). Professionals use a variety of competencies developed in practice and across the contexts of workplace. The landmark of mastering competencies is performance which refers to what actually done and can be observed. It includes actions or behaviors that are goal directed and can be scaled (measured) in terms of each subject's proficiency. This requires integration between science and practice, and it depends on personal competence, in which theoretical, practical and ethical aspects are incorporated through experiences, intuition and reflection into practice (Meyer, Torunn Bjørk, & Eide, 2011).

There is a worldwide need for competent nurses (Flinkman, 2014). However, achieving competencies represents a major challenge, as nurses are working in complex systems where social and technological features are constantly changing. Competencies are developed through pre-service education, in-service training, hands-

on experience, and the assistance of mentors and preceptors (Cadorin, et al, 2012, In Notarnicola, et al., 2018). Competent intensive care nurses contribute to patients' safety through utilizing evidence based interventions. They have a significant impact on physiological and psychological patients' outcomes through reducing complications, errors, morbidity, mortality, and so overall costs of stay in the intensive care unit (Gallagher & Blegen, 2009; and Penoyer, 2010; In Lakanmaa, Suominen, Ritmala-Castrén, Vahlberg, & Leino-Kilpi, 2015).

Practicing intensive care nursing requires not only the ability and knowledge of clinical competencies, but also methods used to assess and apply these competencies (Cowan, Norman, & Coopamah, In Notarnicola, et al, 2018). Intensive care nurses contribute to patients' safety through carrying actions necessary to decrease complications, improve patient outcomes, and reduce overall costs (Robnett, In: Lakanmaa, Suominen, Ritmala-Castrén, Vahlberg, & Leino-Kilpi, 2015). They apply an extensive set of skills when observing patients' clinical condition. They base their observations on understanding of human needs and bio-physiological functions, and they use observation skills both in clinical assessment and technical monitoring to recognize changes in the clinical condition (Alastalo, Salminen, Jeon, Vahlberg, & Leino-Kilpi, 2019).

Periodic assessment therefore is a requirement to ensure that nurses meet the practice necessary criteria and provide care according to standards. Nurses assessment for mastery of competencies must be carried out to monitor and ensure the ability to perform high risk, and critical healthcare activities such as tasks, procedures, treatments; using equipment; emergency response and lifesaving interventions; patient assessment; and communication with patient and/or family (Robnett, In, Lakanmaa, Suominen, Ritmala-Castrén,Vahlberg, & Leino-Kilpi, 2015).

Competency-related assessment data may be derived from interviews, patients' satisfaction surveys, performance evaluations, and other needs assessments methods such as self assessment, knowledge tests, peer evaluation, observation (mentor, supervisor), objective structured clinical examination (OSCE), or portfolios. The best way to perform competence evaluation is to combine different evaluation methods such as self assessment and, or knowledge test (O'Leary, 2012, and Fulbrook, Albarran, Baktoft, & Sidebottom, 2012). Feedback gained from competency assessments can help in identifying gaps in knowledge and skills, and so guide in setting appropriate educational or remedial programs to meet identified needs or gaps and to improve overall performance (Fahy, 2011, In Notarnicola, et al., 2018). Therefore, the aim of this study was to examine intensive care nurses' self reported versus assessed level of mastering competencies, at a University Hospital – Cairo.

Significance of the study

Intensive care nursing practice is confronted with many factors that affect its utility, quality, and effectiveness. Hence, there is a great need for competent health care providers who have the ability to provide comprehensive and evidence based nursing actions that could positively be reflected on intensive care patients' outcomes (Lakanmaa, Suominen, Perttil, Puukka, & Leino-Kilpi, 2012). Competence is a complex task with many challenges; inspite of representing a determinant of performance, a key component of nursing education and practice, these competencies were reported to be not routinely measured across the breadth of workplace tasks until a performance problem becomes apparent (Flinkman, Leino-Kilpi, Numminen, Jeon, Kuokkanen, & Meretoja, 2016; and Franklin & Melville, 2015).Thus, there is a need for frequent assessment and monitoring especially for high-risk and less frequently performed competencies to ensure that nurses are still able to perform the needed tasks. Such assessment could highlight the efficacy of nursing care and specify the need to design training and/or continuing education interventions for improving providers' performance (Williams, Fulbrook, Kleinpell, & Alberto, 2015).

In Egypt, many studies were carried out to assess critical care and emergency nurses' knowledge and practices regarding many aspects of interventions, diagnostic, and management modalities. These studies revealed unsatisfactory knowledge, practices / performance, and so lack of competence as well. This raised the researcher's interest to examine the level of nurses' competency from their own point of view as well as their direct supervisors /head nurses who are in daily close contact with involved nurses and aware of their capabilities, performance and training needs. Obtained data are expected to help the researcher to identify what intensive care nurses know and can do regarding management of acutely and critically ill patients. Comparison between self reported and assessed competencies mastery can help in identifying data gap, and so, areas of strength, weaknesses, needs, and suggest a plan of actions to meet the complex nursing care of critically ill patients. Hopefully, obtained data could consequently help in improving the quality of acutely and critically ill patients' management.

Aim of the study:

To examine intensive care nurses' self reported versus observed competencies mastery at a University Teaching Hospital – Cairo.

Research questions:

1-What is the level of self reported versus observed intensive care nursing competencies mastery, at a University Teaching Hospital – Cairo?

2-What is the difference between self reported and observed intensive care nurses' mastery of competencies at a University Teaching Hospital – Cairo?

II. Subjects and Method

Research design:

A descriptive exploratory research design was employed to achieve the aim of the current study.

Sample:

A sample of convenience consisting of 93 intensive care nurses was enrolled in this study.

Setting:

The present study was carried out at four intensive care units affiliated to Cairo university teaching hospitals.

Tools of data collection

Two tools were developed by the researcher after extensive literature review, and based on Thomas, et al., (2017); and used to collect data of this study. These tools are: Intensive care nurses' self reported competencies checklist (tool no.1), and Intensive care nurses' competencies observational checklist (tool no. 2).

1-Intensive care nurses competencies self assessment checklist (tool no.1). It is a self assessment tool. It covered two main parts: a- nurses demographic characteristics such as age, years of experience, and attended educational programs; and b- nurses' competencies self assessment and reporting which consisted of eight (8) main competence domains or generic competencies: **Scientific foundation; independent practice; leadership; quality; technology & information literacy; policy; health care delivery; and ethics**. Each domain has its **core competencies** and **skills required** to achieve these competencies.

1.b.1- **Scientific foundation domain**: it included **three main core competencies:** Integrate knowledge from the humanities and sciences in nursing practice; use health assessment skills to differentiate between normal, variations from normal and abnormal findings; and critically analyze patients' assessment data and evidences. Assessment of nurses' accomplishment of this domain involved their documentation of the ability to perform body systems' assessment (respiratory, cardiovascular, neurological, Gastrointestinal, Renal function, and Skin).

1.b.2- Independent practice domain: it included three **main core competencies**: practice independently to provide health care services within scope of practice; demonstrate accountability for professional practice; and provides a full spectrum of health care services to include health protection, anticipatory guidance, counseling, disease management, palliative, and end-of-life care. It involved **assessment data for** nursing skills directed towards care of body systems (respiratory, cardiovascular, neurological, gastrointestinal & metabolic, and renal), in addition to physical care.

As regards **respiratory system care and skills**; it involved managing high flow humidified oxygen, auscultating chest sounds, ventilator set up, monitoring, and assisting in intubation, providing manual ventilation, caring for mechanically ventilated patients, performing endotracheal, tracheostomy, and nasopharyngeal suctioning, obtaining arterial blood gases sample, assisting in chest drain insertion, and removal. **Cardiovascular care and skills** covered hemodynamic monitoring, setting up and assisting with arterial line and central venous line insertion, interpreting central venous pressure results, performing invasive lines dressings, removing central venous catheter, connecting to ECG monitoring, Interpreting 12 leads electrocardiograph (ECG) record, interpreting life threatening arrhythmias, administering high alert drugs (Inotropes, Vasopressors, & anti-arrhythmic agents), assessing radial, popliteal, and pedal pulses, performing vein puncture, inserting peripheral cannula**,** administering IV drug through central venous line, peripheral cannula, administering blood products (Blood, Fresh Frozen Plasma, Albumin Platelets), administering crystalloids, and colloids; managing and setting up syringe and infusion pumps**.**

Nurses' self assessment regarding **neurological care and skills** included managing seizures**,** assessing pain, administering analgesia via oral, intravenous, and gastric routes**, m**anaging and scoring delirium. **Gastrointestinal and metabolic skills** covered inserting nasogastric (NG) tube, providing enteral tube feeding, using feeding pumps, administering medications via NG tube, administering total parenteral nutrition via central venous line or peripheral line, monitoring blood glucose, managing sliding scale insulin, **and** administering enemas, suppositories**.** In relation **to renal system care and skills,** the tool involved monitoring fluid balance, recording blood results, inserting urinary catheter insertion, and performing urinary catheter care.

1.b.3- Health Delivery domain: It included two core competencies: using broad based nursing skills, and minimizing risk to patients. It involves nurses' self assessment **for providing essential** oral, eye, skin care in addition to safe moving, handling, and providing end of life care.

1.b.4 - Quality domain; it included **one core competence:** use best available evidence to continuously improve quality of clinical practice; and it involved assessment data for evaluating the outcome of care.

1.b.5 - Technology and Information Literacy domain included **two core competencies:** Integrate technologies to provide quality health care; and use technology systems that capture data for the evaluation of nursing care. It covered assessing nurses for using electronic resources, using technologies to monitor and evaluate clinical problems such as vital signs, blood glucose, and body weight.

1.b.6- Leadership domain included **two core competencies**: demonstrating leadership that uses critical and reflective thinking, and communicating practice knowledge effectively, both orally and in writing. It involved **assessment data for w**orking effectively with a team, and documenting patients' observation, **p**sychological status, dietary requirements and fluid Balance.

1.b.7- **Policy domain** covered **one core competence**: advocate for policies for safe and healthy practice environment. It involved assessment of nurses' actions regarding admitting and discharging patients, and utilizing infection control measures.

1.b.8- Ethics domain included **four core competencies:** integrate ethical principles in decision making; consider ethical and legal aspects when providing care; create a climate of patient - centered care; and advocate for ethical policies that promote access, equity, quality, and cost. Nurses' assessment items included: applying ethical principles in care delivery; maintaining patients' privacy, dignity, and confidentiality.

2- Intensive care nurses' competencies observational checklist (tool no. 2). It was used by the direct nursing supervisor who was on daily contact with nurses involved in this study. This tool had the same components of tool (1). It consisted of the same eight (8) main competence domains: **Scientific foundation; independent practice; leadership; quality; technology & information literacy; policy; health care delivery; and ethics**. Each domain has its **core competencies** and **skills** required to achieve these competencies.

Number of questions in each domain in the assessment checklists.

Domain	No. of questions
1- **Scientific Foundation**	7
2- **Independent Practice**	
2.1- **Respiratory**	12
2.2- **Cardiovascular**	29
2.3- **Neurologic**	6
2.4 – **GIT**	6
2.5 – **Renal**	5
3 -**Health Delivery**	8
4- **Quality**	2
5- **Technology**	1
6- **Leadership**	2
7- **Policy**	3
8- **Ethics**	4
Total	**85**

Scoring system:

The following is the scoring system for both self assessed / reported and observed competencies assessment checklists
The checklists have two main categories for evaluation: No experience; and competent. Zero score was allocated for no experience items and one score was allocated for each competent "well known and done" action, giving a total score of 85, classified as follows:

    Unsatisfactory level: scores less than 65% (<55.25 marks)
        Satisfactory level: scores from 65% - 75% (55.25 – 63.75 marks)
        Good level: scores more than or equal 75% ($\geq$ 63.75 marks)

Tools Validity and reliability

Content validity of the data collection tools was reviewed by a panel of five experts in critical care and emergency nursing specialty who revealed that the tools are suitable to measure critical care nurses competencies, and so help to achieve the purpose of this study. As well, the developed tools' reliability was estimated through using SPSS, which revealed a Cronbach's Alpha of "0.915", indicating reliability of the developed tools.

Pilot study

A pilot study was carried out on 10 (nearly 10% from total involved nurses) to test for clarity, simplicity, and applicability of the data collection tools. No major modifications were done and the pilot study subjects were included in the study.

Protection of Human Rights

The researcher obtained official permissions to carry out the present study from directors of Intensive Care Units at Cairo university teaching hospitals. As well, written informed consents were obtained from involved nurses, and their direct supervisors/ head nurses, after explaining the purpose, and benefits of the study. Participation was voluntary; each involved nurse has the right to withdraw from the study at any time without any rational. Confidentiality and anonymity of the involved nurses were assured through coding the data. Nurses were informed that data will not be reused in another research without their permission, and the obtained data will not be used in their evaluation.

Procedure

The present study was initiated by extensive literature review to specify the main domains, core competencies, and needed skills or activities required to achieve these competencies. Once data collection tools were constructed, the researcher obtained official agreements from the heads of intensive care units as well as head nurses / nursing supervisors. Then, the researcher carried out the pilot study to examine the data collection tools, and make sure of feasibility of the study. Then actual data collection started from February 2019 – May 2019 by visiting each intensive care unit in the morning shifts to meet the head nurses / the shift senior, and explain the purpose, nature and the importance of this study in establishing data base about mastery of intensive care nurses competencies, and requesting their assessment for involved nurses to confirm their mastery level. Then the researcher interviewed the ICU nurses and explained the purpose of the study and invited them to participate by filling out the data collection tool. Nurses who agreed to participate were asked to sign the informed consent. Then, the researcher made a list of nurses names, coded it and wrote the code name on the nurses self assessment tool as well as supervisors / head nurse assessment tool for each involved nurse. The researcher was available to clarify any ambiguity in the data collection tools, and emphasized that nurses mark the option competent when they know the theoretical background and practiced in when working with ICU patients. In certain cases, nurses requested time to read and fulfill the data collection tools, and to submit their data in the next shift. The researcher accepted this option because of the workload in the ICU. After filling out the data collection tools the researcher checked each one for any missing data. Then data coding was done in attempt to analyze these data.

Statistical Analysis

Data of the present study were coded, and analyzed using statistical package for the social science (SPSS) program, version 20. Descriptive (means, standard deviations (SD), or frequencies and percentages when appropriate), as well as inferential statistics (t-test) were used. The set level of significance was $p \leq 0.05$.

III. Results And Data Analysis
Table (1): Frequency Distribution of the Studied Sample as Regards Demographic Characteristics (N=93).

N & % Demographic Characteristics	N	%
Work setting		
Critical care units	70	75.3
Emergency care unit	23	24.7
Qualifications		
Bachelor	34	36.6
Nursing school	37	39.8

Technical institute	22	23.7
Attended training courses		
No	32	34.4
Yes	61	65.6
Attended courses (N= 61)		
Basic Life Support (BLS)	34	55.74
BLS and ACLS	22	36.1
First aid	1	1.64
Infection control & BLS	4	6.56
Years of experience (Mean +SD) :	3.72 + 2.14	

Table (1) shows that 75.3% of the studied sample were working in the critical care units, and the rest (24.7%) were working in emergency ICU; more than nearly one third had secondary school nursing education, and Bachelor degree in nursing in percentages of 39.8% and 36.6% respectively. It is also noticed that 65.6% of the studied sample attended training courses. The most frequently attended courses were basic life support by 55.74% of the group who attended the training.

Part (1): The level of self reported versus observed intensive care nursing competencies mastery (Answering the first research question).

Figure (1): Percentage Distribution of Self Reported versus Observed Mastery Level of Intensive Care Nurses' Competencies (N =93).
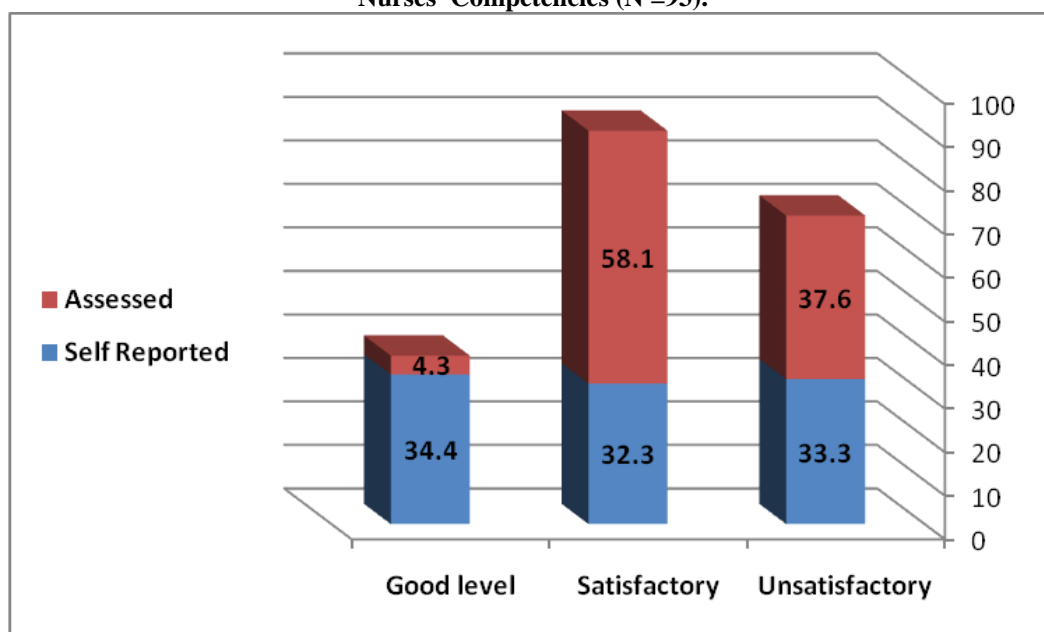

Figure (1) shows that self reported nurses' mastery of competencies was rated as good, satisfactory and unsatisfactory in percentages 34.4%, of 33.3%, 32.3% respectively with a total mean assessment scores of 63.48+ SD=10.23 indicating a satisfactory level. However, assessment of nurses competencies (by supervisors) revealed a satisfactory level among 58.1%, and unsatisfactory level among 37.6%, with a total mean assessment score of 51.0 +12.6 indicating unsatisfactory level. High significant statistical difference was found between the two means (t-test = 38.7, P$\leq$0.00).

Part (2): Difference between self reported and observed intensive care nurses' domains of competencies (Answering the second research question).

Table (2): Comparison between Intensive Care Nurses' Self Reported versus Observed Competencies Regarding Scientific Foundation Domain: Demonstrating and Recording Body Systems Assessment and Observation (N= 93).

Competencies Domain	Nurses' Self Reported				Nurses' observed Assessment				
	No experience		Competent		No experience		Competent		
1-Scientific Foundation	N	%	N	%	N	%	N	%	Chi square/ p
1.1-Respiratory	30	32.3	63	67.7	58	62.4	35	37.6	0.61 / 0.43 NS
1.2-Cardiovascular	34	36.6	59	63.4	86	92.5	7	7.5	4.36 / 0.037 *
1.3- Neurological	46	49.5	47	50.5	90	96.8	3	3.2	3.03 /0.041 *
1.4-Gastrointestinal	24	25.8	69	74.2	54	58.1	39	41.9	8.482 /0.004**
1.5-Psychological	25	26.9	68	73.1	59	63.4	34	36.6	6.231/ 0.013*
1.6-Renal assessment	0	0	93	100	5	5.4	88	94.6	0.64 / 0.42 NS
1.7-Skin assessment	3	3.2	90	96.8	16	17.2	77	82.8	0.64/ 0.42 NS

NS: No significant statistical difference   *: Significant at P≤ 0.05   ** Significant at P≤ 0.001

Table (2) shows that involved nurses revealed that they were competent in assessing renal function, skin, gastrointestinal tract, psychological status, respiratory and cardiovascular systems in percentages of 100%, 96.8%,74.2%,73.1%, 67.75& 63.4% respectively. Assessment of nurses by their direct supervisors / head nurses revealed their competence in renal and skin assessment in percentages of 94.6% & 82.8% respectively. However, most of them had no experience in neurological, cardiovascular, psychological, and respiratory systems assessment in percentages of 96.8%, 92.5%, 63.4%, & 62.4% respectively. Significant statistical differences were found between nurses self reported and observed competencies of cardiovascular, neurologic, gastrointestinal, and psychological assessment.

Table (3): Comparison between Intensive Care Nurses' Self Reported versus Assessed Competencies regarding Independent Practice Domain: 1- Respiratory Care Skills (N= 93).
NS: No significant statistical difference   *: Significant at P≤ 0.05   ** Significant at P≤ 0.001

Competence Domain	Nurses' Self Reported				Nurses' observed Assessment				
	No experience		Competent		No experience		Competent		
2- Independent Practice	N	%	N	%	N	%	N	%	Chi square / p
2.1- Respiratory care skills									
2.1.1-Manag high flow O_2	14	15.1	79	84.9	15	16.1	78	83.9	0.34 / 0.56 NS
2.1.2- Ventilator setup	20	21.5	73	78.5	75	80.6	18	19.4	6.11 / 0.013*
2.1.3- Assist in intubation	6	6.5	87	93.5	4	4.3	89	95.7	13.13/ 0.00**
2.1.4- Auscultate chest s.	50	53.8	43	46.2	87	83.9	15	16.1	5.28/ 0.02*
2.1.5- Provide ventilation	4	4.3	89	95.7	18	19.4	75	80.6	17.42 / 0.00**
2.1.6- Modes of ventilation	61	65.6	32	34.4	81	87.1	12	12.9	10.06/ 0.002**
2.1.7- Tracheostomy Care	19	20.4	74	79.6	39	41.9	54	58.1	1.12 / 0.21 NS
2.1.8- E TT suction	1	1.1	92	98.9	12	12.9	81	87.1	0.15 /0.69 NS
2.1.9- Nasopharyngeal Suction	0	0	93	100	7	7.5	73	78.5	0.13 /0.66 NS
2.1.10- ABG sampling	0	0	93	100	2	2.2	91	97.8	0.11 / 0.56 NS
2.1.11-Assist in chest drain Insertion	29	31.2	64	68.8	39	41.9	54	58.1	58.35 / 0.00**
2.1.12- Chest drain removal	37	39.8	56	60.2	43	46.2	50	53.8	57.8 / 0,00 **

Table (3) shows that nurses reveled their competence in nasopharyngeal suctioning, arterial blood sampling, endotracheal suctioning, providing manual ventilation, assisting in intubation, managing high flow oxygen, ventilators set up, tracheostomy care, assisting in insertion, and removal of chest drains in percentages of 100%, 100%, 98.9%, 95.7%, 93.5%, 84.9%, 79.6%, 78.5%, 68.8, & 60.2% respectively. However, more than half of nurses reported no experience in identifying modes of mechanical ventilation, and auscultating chest sounds in percentages of 65.6% and 53.8% respectively.

Assessed nurses' mastery of competencies revealed their competence in arterial sampling, assisting in intubation, endotracheal suctioning, providing manual ventilation, nasopharyngeal suctioning, tracheostomy care, assisting in chest tube insertion and removal in percentages of 97.8, **95.7,** 87.1, 80.6, 78.5, 58.1, **58.1,** and 53.8% respectively. However, most of assessed nurses had no experience in modes of mechanical ventilators, chest sounds auscultation, and ventilators set up in percentages of 87.1%, 83.9%, & 80.6% respectively.

Significant statistical differences were found between nurses self reported and observed skills regarding assisting in intubation, providing ventilation, identifying modes of ventilation, assisting on insertion and removal of chest drain.

Table (4): Comparison between Intensive Care Nurses' Self Reported versus Observed Competencies regarding Independent Practice Domain: 2- Cardiovascular Care Skills (N= 93).
NS: No significant statistical difference   ** Significant at P≤ 0.001

Competence Domain Assessment	Nurses' Self Reported				Nurses' observed Assessment				
	No experience		Competent		No experience		Competent		
	N	%	N	%	N	%	N	%	Chi square/ P.
2- Independent Practice									
2.2-Cardiovascular care skills									
2.2.1- Connect to ICU monitor	1	1.1	92	98.9	0	0	93	100	0.13 / 0.6 NS
2.2.2- Cardiovascular Assessment	61	65.6	32	34.4	87	83.9	15	16.1	21.6 /0,00**
2.2.3- Interpret ECG	85	91.4	8	8.6	92	98.9	1	1.1	0.11 /0.6 NS
2.2.4- Detect common Arrhythmias	88	94.6	5	5.4	89	95.7	4	4.3	10.7/0,001**
2.2.5-Basic&Advanced L. support	27	29.0	66	71.0	16	17.2	77	82.8	4.1 /0.04NS
2.2.6- Assist in A line insertion	27	29.0	66	71.0	30	32.3	63	67.7	25.3 /.00**
2.2.7- Assist in CV line insertion	25	26.9	68	73.1	6	6.5	87	93.5	0.14 / 0.7NS
2.2.8- Interpret CVP results	20	21.5	73	78.5	39	41.9	54	58.1	29./ 0.00**
2.1.9- Invasive line dressing	7	7.5	86	92.5	19	20.4	74	79.6	24.9 /0.00**
2.2.10- CV catheter removal	0	0	93	100	6	6.5	87	93.5	0.19 / 0.8 NS
2.2.11- Administer Inotropes	33	35.5	60	64.5	53	57.0	40	43	15.2/ 0.00**
2.2.12- Administer Vasopressors	40	43.0	53	57.0	60	64.5	33	35.5	17.2/ 0.00**
2.2.13- Administer anti arrhythmic	38	40.9	55	59.1	61	65.6	32	34.4	18.2/ 0.00**
2.2.14-Drug through CVP	17	18.3	76	81.7	33	35.5	60	64.5	37.8 / 0.00**
2.2.15- Drug through P. cannula	8	8.6	85	91.4	14	15.1	79	84.9	49.4 / 0.00**
2.2.16-Perform Venipuncture	1	1.1	92	98.9	1	1.1	92	98.9	0.11/ 0.92
2.2.17- Administer Blood	0	0	93	100	0	0	93	100	NS
2.2.18-Administer FF plasma	6	6.5	87	93.5	0	0	93	100	NS
2.2.19- Administer Platelets	0	0	93	100	0	0	93	100	NS
2.2.20- Administer crystalloids	0	0	93	100	0	0	93	100	NS
2.2.21- Administer Colloids	0	0	93	100	0	0	93	100	NS
2.2.22- Manage spying pump	0	0	93	100	0	0	93	100	NS
2.2.23-Manage infusion pump	0	0	93	100	0	0	93	100	NS
2.2.24- Administer sc medications	0	0	93	100	0	0	93	100	NS
2.2.25- Administer IM medications	0	0	93	100	0	0	93	100	NS
2.2.26- Administer TPN	0	0	93	100	0	0	93	100	NS
2.2.27-Assess popliteal pulses	41	44.1	52	55.9	39	41.9	54	58.1	29.4/ 0.00**
2.2.28-Assess Pedal pulses	24	25.8	69	74.2	36	38.7	57	61.3	51.2/0.00**
2.2.29-Assess Radial pulses	7	7.5	86	92.5	5	5.4	88	94.6	1.8/0.3NS

Table (4) shows that that 100% of involved nurses reported their competence in connecting patients to routine ICU monitor, administering blood and blood products, managing syringe and infusion pumps. However, the great majority of nurses reported no experience in detecting common dysrhythmias, interpreting ECG, and demonstrating cardiovascular assessment, in percentages of 94.6%, 91.4%, 87.1%, and 65.6% respectively.

As regards observation of nurses' competencies, it revealed no experience in ECG interpretation, detecting common dysrhythmias, performing cardiovascular assessment, administering anti-arrhythmic drugs, vasopressors and inotropes.

Significant statistical differences were found in reported and observed competencies mastery regarding cardiovascular assessment, detecting arrhythmias, assisting in arterial line insertion, CVL insertion, interpreting CVP results, invasive dressing, administration of vasopressors, inotropes, anti-arrhythmic agents, and assessing peripheral pulses.

Table (5): Comparison between Intensive Care Nurses' Self Reported versus Observed Competencies regarding Independent Practice Domain: 3- Neurologic Care Skills (N= 93).

NS: No significant statistical difference   ** Significant at $P \leq 0.001$

Competence Domain	Nurses' Self Reported				Nurses' observed Assessment				
	No experience		Competent		No experience		Competent		
2- Independent Practice	N	%	N	%	N	%	N	%	Chi square/ p
2.3- Neurological care skills									
2.3.1-Perform neurologic asses.	78	83.9	15	16.1	93	100	0	0	1.73 / 0.2NS
2.3.2-Apply GCS	16	17.2	77	82.8	53	57	40	43	2.55/ 0.11 NS
2.3.3-Record observation	73	78.5	20	21.5	93	100	0	0	1.73 / 0.2NS
2.3.4-Manage Seizures	69	74.2	24	25.8	77	82.8	16	17.2	31.03 / 0.00**
2.3.5-Pain assessment	63	67.7	30	32.3	72	77.4	21	22.6	7.69/0.006**
2.3.6-Manage & score delirium	83	89.2	10	10.8	88	94.6	5	5.4	0.47 /0.49 NS

Table (5) shows that most of nurses indicated no experience in managing and scoring delirium, performing neurologic assessment, recording observations, managing seizures, and assessing pain in percentages of 89.2%, 83.9%, 78.5%, 74.5%, & 67.7% respectively. As indicated by supervisors, the great majority of nurses had no experience in performing neurologic assessment, recording observations, managing and scoring delirium, managing seizures, pain assessment, and applying Glasgow coma scale (GCS) in percentages of 100%, 100%, 94.6%, 82.8%, 77.4%, and 57% respectively. A significant statistical difference was found in competencies mastery reported by nurses and assessed by supervisors regarding managing seizures and assessing pain.

Table (6): Comparison between Intensive Care Nurses' Self Reported versus Observed Competencies regarding Independent Practice Domain: 4- GIT Care Skills (N= 93).

NS: No significant statistical difference   ** Significant at $P \leq 0.001$

Competence Domain	Nurses' Self Reported				Nurses' observed Assessment				
	No experience		Competent		No experience		Competent		
2- Independent Practice	N	%	N	%	N	%	N	%	Chi square/ p
2.4- GIT & Metabolic care									
2.4.1- Assess GIT function	53	57	40	43	44	47.3	49	52.7	1.5/0.2 NS
2.4.2- Dietary requirements	80	86.0	13	14.0	89	95.7	4	4.3	0.8/0.4 NS
2.4.3- Insert NGT	37	39.8	56	60.2	45	48.4	48	51.6	11.8/ 0.00**
2.4.4 - NGT Feeding	7	7.5	86	92.5	7	7.5	86	92.5	0.6/0.4NS
2.4.5- Administer medications through NGT	0	0	93	100	0	0	93	100	NS
2.4.6- Administer Enema	0	0	93	100	0	0	93	100	NS

Table (6) shows that, involved nurses reported their competence in administering medications through the nasogastric tube, administering enemas, providing feeding, and inserting nasogastric tube in percentages of 100%, 100%, 92.5%, and 60.2% respectively. However, most of nurses (86%) reported no experience in estimating dietary requirements, and in ability to assess the gastrointestinal tract (57%).

Nearly the same assessment findings were observed, and revealed competence of ICU nurses regarding administering medications through the nasogastric tube, administering enemas, providing feeding, and inserting nasogastric tube in percentages of 100%, 100%, 92.5%, and 51.6% respectively. A significant statistical difference was only found in reported and observed competencies mastery regarding nasogastric tube insertion.

Table (7): Comparison between Intensive Care Nurses' Self Reported versus Observed Competencies regarding Independent Practice Domain: 5- Renal System Care Skills (N= 93).
NS: No significant statistical difference   *: Significant at P≤ 0.05   ** Significant at P≤ 0.001

Competence Domain	Nurses' Self Reported				Nurses' observed Assessment				
	No experience		Competent		No experience		Competent		
2- Independent Practice	N	%	N	%	N	%	N	%	Chi square/ p
2.5- Renal system care skills									
2.5.1- Assess Renal function	1	1.1	92	98.8	5	5.4	88	94.6	0.14/ 0.7NS
2.5.2- Record findings	6	6.5	87	93.5	7	7.5	86	92.5	0.16/ 0.7NS
2.5.3- Monitor & record fluid Balance	6	6.5	87	93.5	2	2.2	91	97.8	0.12/ 0.6NS
2.5.4- Urinary catheterization	29	31.2	64	68.8	58	62.4	35	37.6	20.64/0.00**
2.5.5- Urinary catheter care	0	0	93	100	3	3.2	90	96.8	0.13/ 0.6NS

Table (7) shows no significant statistical differences in both of self reported and observed competences regarding renal system care skills, indicating mastery of competencies by most of the studied sample such as monitoring fluid and electrolytes balance, care of urinary catheter, assessing renal function, and recording assessment findings. The only significant statistical difference was in urinary catheterization as 68.8% of nurses reported their competence; however, observation revealed no experience among 62.4% of ICU nurses.

Table (8): Comparison between Intensive Care Nurses' Self Reported versus Observed Competencies regarding Health Care Delivery Competencies Domain Skills (N= 93).
NS: No significant statistical difference   *: Significant at P≤ 0.05   ** Significant at P≤ 0.001
As shown from table (8) both of nurses' self report and observation indicated competence in providing skin,

Competence Domain	Nurses' Self Reported				Nurses' observed Assessment				
	No experience		Competent		No experience		Competent		
	N	%	N	%	N	%	N	%	Chi square/ p
3 –Health care Delivery									
3.1- Plan for care	68	73.1	25	26.9	69	74.2	24	25.8	3.56/ 0.06 NS
3.2-Prioritize care	38	40.9	55	59.1	71	76.3	22	23.7	5.99/0.01*
3.3-Provide oral care	0	0	93	100	1	1.1	92	98.9	NS
3.4- Provide eye care	1	1.1	92	98.9	1	1.1	92	98.9	0.01/ 0.9NS
3.5- Maintain skin integrity	1	1.1	92	98.9	0	0	93	100	0.01/ 0.9NS
3.6- Use pressure relieve devices	1	1.1	92	98.9	1	1.1	92	98.9	0.4/ 0.66NS
3.7- Safe moving	1	1.1	92	98.9	4	4.3	89	95.7	0.21/ 0.7NS
3.8- Provide end of life care	32	34.4	61	65.6	71	76.3	22	23.7	11.4/0.00**

oral, and eye care and safely moving patients in percentages of 100 & 98.9; 98.9 & 98.9; 98.9 & 100%; and 89.9 & 95.7% respectively with no significant statistical difference.

Around three quarters (73.1%) of nurses reported no experiences planning patients care. As well, observation revealed that nurses had no experiences regarding prioritizing, providing end of life care, and planning for care in percentages of 76.3%, 76.3%, and 74.2% respectively.

Table (9): Comparison between Intensive Care Nurses' Self Reported versus Observed Competencies regarding Quality of care, Leadership, Ethics, Policy, and Technology Competencies Domains Skills (N= 93).

NS: No significant statistical difference   *: Significant at $P \leq 0.05$ ** Significant at $P \leq 0.001$

Competence Domains	Nurses' Self Reported			Nurses' observed Assessment				
	No experience		Competent		No experience		Competent	Chi square/P
4-Quality of care								
4.1-Evaluate provided care	16	17.2	77	82.8	61	65.6	32	34.4	2.1/0.15 NS
4.2-Psychological well being	9	9.7	84	90.3	4	4.3	89	95.7	1.12/0.3 NS
5- Leadership								
5.1-Work as a team leader	64	68.8	29	31.2	69	74.2	24	25.8	1.66/0.NS
5.2-Communicate effectively	8	8.6	85	91.4	22	23.7	71	76.3	2.7/0.1 NS
6-Ethics								
6.1-Maintain confidentiality	16	17.2	77	82.8	20	21.5	73	78.5	2.9/0.09 NS
6.2-Maintain code of conduct	2	2.2	91	97.8	14	15.1	79	84.9	1.95/0.2 NS
6.3-Health and safety	3	3.2	90	96.8	4	4.3	89	95.7	6.35/0.01*
6.4- Keep pt privacy	9	9.7	84	90.3	1	1.1	92	98.9	
7- Policy								
7.1-Admission and discharge	5	5.4	88	94.6	1	1.1	92	98.9	0.06/0.8 NS
7.2-Follow universal precautions	3	3.2	90	96.8	50	53.8	43	46.2	0.52/0.5 NS
7.3 – Incident report	54	58.1	39	41.9	83	89.2	10	10.8	0.3/0.6 NS
8- Technology								
8.1-Use electronic equipment	0	0	93	100	0	0	93	100	NS

As indicated from table (9) the great majority of the studied nurses reported their competence in using electronic equipment, maintaining code of conduct, following universal precautions, maintaining patients' health and safety, admitting and discharging procedures, ensuring patients' psychological wellbeing, keeping patients' privacy, maintaining confidentiality, and evaluating provided care, in percentages of 100%, 97.8%, 96.8%, 96.8%, 94.6%, 91.4%, 90.3% 82.8%, and 83.8% respectively. However, 68.8% of nurses reported no experience in practicing team leader role.

Observation and monitoring of nurses competencies revealed their competence in using technology, admission and discharge, keeping patients' privacy, maintaining health safety, psychological wellbeing, maintaining code of conduct, confidentiality, and communicate effectively in percentages of 100%, 98.9%, 98.9%, 95.7%, 84.9%, 78.5%, and 76.3% respectively. However, nurses had no experience in working as team leaders, and evaluating provided care in percentages of 74.2%, and 65.6% respectively. No significant statistical differences were found between self reported and observed competencies.

IV. Discussion

Critical care nursing practice is complex. It requires technical and scientific competencies, along with adoption of safe conduct. Therefore, the present study aimed to examine intensive care nurses' level of competencies mastery (self reported versus assessed) in attempt to identify areas of strengths, weaknesses, and so educational and practical needs, based on their self reported as well as observed skills assessments. To achieve this aim, two research questions were stated to identify the level of self reported versus assessed intensive care nursing competencies mastery, and the difference between self reported and observed competencies mastery.

Answering the first research question:

Competencies represent an important issue and one of many determinants in critical / intensive care nursing performance. Less competent nurses are less likely to provide quality nursing care (Lakanmaa et al., 2012, and Williams, Fulbrook, Kleinpell, & Alberto, 2015). This is of special concern especially where nurses in the present study reported varying levels of mastering competencies necessary to care for intensive care patients ranging from unsatisfactory to good levels with approximately equal percentages in each group (one

third of the nurses number); with a mean total scores reflecting satisfactory level. However, assessment and observation of nurses revealed satisfactory level of competencies among nearly two thirds, while the other one third had unsatisfactory level; with a total mean competencies assessment scores suggesting unsatisfactory level.

High significant statistical difference was found between the mean self reported and the mean assessment scores reflecting a gap between the two assessments, and suggesting over-estimation of nurses self capabilities and mastering of intensive care competencies which doesn't reflect the actual situation. In this regards, Cowan, Wilson-Barnett & Norman, In: Alastalo, Salminen, Jeon, Vahlberg, and Leino-Kilpi, (2019) revealed that inspite of being a feasible and appropriate method for providing intensive care nurses with an opportunity for critical self-reflection, self-assessment may be improperly used. As well, over estimation of nurses' competency level (from the researcher's point of view) may be due to worry about their annual evaluation.

Answering the second research question: the difference between self reported and observed competencies

Assessment, examination and observation are intrinsic and important elements of nursing care. Critical care nurses need to apply extensive set of skills when observing patients' clinical condition. They have to base their observations on understanding of human needs, bio-physiological functions, and use their observation skills both in clinical assessment and technical monitoring to recognize changes in the clinical condition (Alastalo et al., 2017, In Alastalo, Salminen, Jeon,Vahlberg, & Leino-Kilpi, 2019). Intensive care nurses in the present study were examined for mastering or fulfillment of eight generic competencies and the needed skills to achieve these competencies. As regards **the first generic competence "Scientific Foundation",** nurses were assessed for mastering the skills of health assessment and observation of different body systems. Assessment and observation are intrinsic elements of critical care nursing. They are necessary for ensuring patients safety, and they provide a concrete insight into intensive care nurses competence (Kvande et al., 2016; Jones & Johnstone, 2017, Milhomme et al., 2018, and Lakanmaa, Suominen, Perttil, Puukka & Leino-Kilpi,2012). Moreover, health assessment as indicated by Lesa & Dixon, In Alamri & Almazan (2018), is an integral part of the nursing care, and is an essential part of quality patients' care. Practicing and mastering health assessment requires a competency level based on previously taught knowledge and skills.

Most of nurses in the present study revealed contradicting findings with those provided by their assessors regarding competencies mastery. Nurses indicated their competence in carrying out assessment of respiratory, cardiovascular, renal, and gastrointestinal systems, in addition to assessing psychological status and the skin. However, assessment of nurses' skills revealed no experience in observing and assessing psychological status, cardiovascular, respiratory, and neurological systems. Significant statistical differences were found between nurses' self reported and assessed competencies. These findings are in agreement with Alastalo, Salminen, Jeon,, Vahlberg, & Leino-Kilpi, (2019) who reported that nearly two thirds of critical care nurses assessed their skills in patients observation as excellent, one third as good, and nobody assessed their observation skills as poor. Having inconsistency between reported and assessed competencies (from the researcher's point of view) suggests that nurses limited ability to demonstrate health assessment of body system which could affect the quality of provided care.

The **second assessed generic competence was independent practice**. Nurses were assessed for skills necessary to provide care for body systems (respiratory, cardiovascular, neurologic, GIT, renal, and the skin for development of pressure ulcers). **As regards respiratory system care skills,** most of involved nurses revealed their competence in nasopharyngeal and endotracheal suctioning; arterial blood sampling, providing manual ventilation, assisting in intubation, managing high flow oxygen, managing ventilators set up, performing tracheostomy care, assisting in insertion, and removal of chest drains. Significant statistical differences were found between nurses' self reported and assessed / observed respiratory system skills' mastery indicating reduction in the percentages of nurses who were able to carry out the needed skills as compared to their own self assessment. These findings are in agreement with that of HadiAtiyah, Abdul-Wahhab, & AL-Fayyadh, (2016) who reported moderate level of knowledge among nurses regarding endotracheal tube suctioning and weaning from mechanical ventilation. As well, they reported a high level of knowledge regarding general information about ventilation, and ventilator setting.

However, findings of the present study regarding mastery of endotracheal and nasopharyngeal suctioning are not in agreement with that of EL Ladam, Moursy, and El Feky, (2016) who carried out a study to assess nurses performance regarding endotracheal suctioning and rvealed unsatisfactory performance (knowledge and practice). Inspite of indicating mastery of many respiratory care skills, nurses in the current study reported no experience in identifying the differences in modes of mechanical ventilation. These findings are matched with assessors' observations, where they reported that nurses had no experience regarding modes, set up of mechanical ventilators, and auscultating and interpreting chest sounds. Hence there is a great need for upgrading their respiratory system care skills.

Concerning cardiovascular system care related skills, the great majority of involved nurses reported their competence in connecting patients to routine ICU monitor, managing syringe and infusion pumps, and administering blood and blood products. However, they reported no experience in interpreting ECG rhythms, detecting common dysrhythmias, and demonstrating cardiovascular assessment. These findings were in agreement with that observed. Assessors also revealed that nurses had no experience in ECG interpretation, detecting common dysrhythmias, administering antiarrhythmisc drugs, vasopressors and inotropes. Significant statistical differences were found in reported and assessed competencies mastery. Findings of the present study are contradicted with that of Yaser, Tahboub, & Yılmaz (2019) who found high level of ECG knowledge and practice among involved nurses, and attributed this to attending training courses.

As regards nervous system/ neurologic care skills, most of nurses as well as assessors reported no experience in managing and scoring delirium, performing neurologic assessment, recording observations, managing seizures, assessing pain, and applying Glasgow coma scale (GCS). A significant statistical difference was found in competencies mastery reported by nurses and assessed by supervisors regarding managing seizures and assessing pain indicating increased percentages of nurses who had no experience as compared to self reported. Inspite of reflecting the actual nurses competencies mastery level, these findings from the researcher's point of view could highlight the urgent need for upgrading intensive care nurses' performance, especially because neurologic assessment along with other body systems' assessment are a must and required on daily basis while caring for critically ill patients.

As regards gastrointestinal system care skills, both nurses and their assessors revealed competencies in inserting nasogastric tube, providing feeding, administering medications through the nasogastric tube, and administering enemas. However, they reported no experience in estimating dietary requirements, and the ability to assess the gastrointestinal tract. A significant statistical difference was only found between self reported and observed competencies mastery regarding the ability to insert nasogastric tube by a number less than indicated by nurses.

Consequently, the present study revealed no significant statistical differences in both of self reported and assessed competences regarding renal system care skills, indicating mastery of competencies by most of the studied sample, such as monitoring fluid and electrolytes balance, care of urinary catheter, assessing renal function, and recording assessment findings. However, a significant statistical difference was found regarding urinary catheterization as more than two thirds of nurses revealed their competence while assessors revealed no experience among nearly two thirds of involved nurses.

The third assessed generic competence was **delivering health care**. Both of nurses and their assessors reported competence in providing skin, oral, and eye care and safely moving patients, with no significant statistical difference. However, around three quarters of nurses reported no experiences regarding planning patients care. Concerning nurses' assessment / observation, it revealed no experiences regarding prioritizing care, providing end of life care, and planning for patients care. Findings of thr present study are in agreement with that of Basal & Younis (2017) who indicated unsatisfactory nurses' knowledge and practice regarding end of life care and related this to lack of continuous nurses' education and training.

As regards **other generic competencies,** they were related to; **utilizing technology, adhering to ethical principles, policies, leadership, and maintaining quality of care.** The present study revealed no significant statistical differences between self reported and assessed competencies. The great majority of the studied nurses reported their competence in using electronic equipment, maintaining code of conduct, following universal precautions, maintaining patients' health and safety, following admission and discharge procedure, ensuring patients' psychological wellbeing, keeping patients' privacy, maintaining confidentiality, and evaluating the provided care. However, more than two thirds of nurses reported no experience in working with a team and acting as team leaders,

Assessment of nurses revealed competence in using technology, admission and discharge, keeping patients' privacy, maintaining health safety, psychological wellbeing, maintaining code of conduct, confidentiality, and communicating effectively. However, they reported no experience in working as team leaders, and evaluating the provided care among more than two thirds of nurses. In this regards O'Leary, (2012), revealed that competence concept is very multidimensional. It focuses on clinical practice, ethics, collaboration, leadership, education, and is strongly related to age, work experience, and frequency of using specific competencies. These findings are in agreement with the present study findings as total reported and assessed competencies scores were significantly related to years of experience of the studied nurses. As well, nurses competencies scores differed significantly in relation to work settings and attended training courses. However, unexpectedly, the level of nursing education didn't play a role in the present study, as no significant statistical relationship was found between competencies level and level of education.

So, nurses in the present study require directing efforts to meet the challenges of caring acutely and critically ill patients by achieving competencies necessary for independent practice, health care delivery of

intensive care nursing, ensuring quality care, utilizing technology, working within teams, maintaining patients' safety, and utilizing universal precautions.

V. Conclusion:

Based on findings of the present study, it can be concluded that less competent intensive care nurses are less likely to provide quality services. The present study also reflected high self-reported competencies level as compared to relatively observed competencies. This represents an urgent need for upgrading intensive care nurses' knowledge and skills in the light of critical care nursing practice standards.

VI. Recommendations:

- Detailed assessment of nurses' mastery of intensive care competencies using well structured – specific tasks checklists.
- Carrying out hands on continuous training based on nurses' preliminary assessment to include physical examination/ health assessment, essential life saving care procedures, and ongoing care.
- Conducting refreshment courses about communication, working with a team, and maintaining self and patients' safety.
- Replication of this study on a larger sample from different geographic regions in Arab Republic of Egypt.

References

[1]. Alamri, M.S., & Almazan, J. U., (2018). Barriers of physical assessment skills among nursing students in Arab Peninsula, International Journal of Health Sciences, Vol. 12, Issue 3 (May - June).
[2]. Alastalo, M., Salminen,L. Jeon,Y., Vahlberg T., & Leino-Kilpi, H.,(2019). Critical care nurses' self-assessed patient observation skills: a cross-sectional survey study , British Association of Critical Care Nurses.
[3]. Alastalo M, Salminen L, Lakanmaa R, & Leino-Kilpi H., (2017). Seeing beyond monitors - Critical care nurses' multiple skills in patient observation: Descriptive qualitative study. Intensive and Critical Care Nursing; 42: 80–87.
[4]. Basal1, A.S. A, & Younis G. A., (2017). Critical Care Nurses' Knowledge, Practice, Obstacles and Helpful Measures Towards Palliative Care for Critically Ill Patients; 6(4): 293-303 http://www.sciencepublishinggroup.com/j/ajns
[5]. Cadorin L, et al., (2012).Self-directed learning competence assessment within different healthcare professionals and amongst students in Italy. Nurse Educ Pract; 12(3): 153-8.
[6]. Camelo S.H.H.(2012). Professional competences of nurse to work in Intensive Care Units: an integrative review Rev. Latino-Am. Enfermagem, Jan.-Feb.; 20(1):192-200, www.eerp.usp.br/rlae
[7]. Cowan, D.T., Wilson-Barnett, J., &Norman, I.J., (2007). A European survey of general nurses' self-assessment of competence. Nurse Educ Today; 27(5): 452-8.
[8]. Cowan, D.T., Norman I, & Coopamah V.P. (2005). Competence in nursing practice: a controversial concept - a focused review of literature. Nurse Educ. Today; 25 (5): 355-62.
[9]. EL Ladam,M.N., Moursy,W.Y.M., & El Feky, H.A.A., (2016). Nurses knowledge and practices regarding endotracheal suctioning, at cairo university hospitals, Unpublished master thesis.
[10]. Fahy A. Evaluating clinical competence assessment. Nurs Stand (Royal College of Nursing: (1987). 2011; 25(50): 42-8.
[11]. Flinkman M, Leino-Kilpi H, Numminen O, Jeon Y, Kuokkanen L, & Meretoja R. (2016). Nurse Competence Scale: a systematic and psychometric review. Journal of Advanced Nursing; 73: 1035–1050.
[12]. Franklin, N., & Melville, P., (2015). Competency assessment tools: an exploration of the pedagogical issues facing competency assessment for nurses in the clinical environment. Collegian; 22: 25–31.
[13]. Fulbrook, P.J. Albarran, W., Baktoft, B. & B. Sidebottom, "A survey of European intensive care nurses' knowledge levels," International Journal of Nursing Studies, vol. 49, no. 2, pp. 191–200.
[14]. Flinkman M, Leino-Kilpi H, Numminen O, Jeon Y, Kuokkanen L, Meretoja R., (2016). Nurse Competence Scale: a systematic and psychometric review. Journal of Advanced Nursing; **73**: 1035–1050.
[15]. Gallagher, K. & Blegen, M. A., (2009). "Competence and certification of registered nurses and safety of patients in intensive care units," American Journal of Critical Care, vol. 18,
[16]. Girot EA. Assessment of competence in clinical practice: a review of the literature. Nurse Educ Today 1993; 13(2): 83-90.
[17]. HadiAtiyah H., Abdul-Wahhab M.M., & AL-Fayyadh S., (2016). Nurses Knowledge toward Essential Care for Adult Patients Undergoing Mechanical Ventilation at Critical Care Unit in Baghdad City, IOSR Journal of Nursing and Health Science, p- ISSN: 2320–1940 Volume 5, Issue 5 Ver. VI (Sep. - Oct. 2016), PP 72-76
[18]. Jones A, & Johnstone M. (2017). Inattentional blindness and failures to rescue the deteriorating patient in critical care, emergency and perioperative settings: four case scenarios. Australian Critical Care; 30: 219–223.
[19]. Kvande, M., Delmar, C., Lykkeslet, E., & Storli S., (2016). Assessing changes in a patient's condition – perspective of intensive care nurses. Nursing in Critical Care; 22: 99–104.
[20]. Lakanmaa, R., Suominen, T., Perttil, J., Puukka, P., & Leino-Kilpi, H., (2012). Competence requirements in intensive and critical care nursing – still in need of definition? A Delphi study. Intensive and Critical Care Nursing; 28: 329–336.
[21]. Lakanmaa, R.L., Suominen, T., Ritmala-Castrén M.,Vahlberg, T., & Leino-Kilpi H., (2015). Basic Competence of Intensive Care Unit Nurses: Cross-Sectional Survey Study Hindawi Publishing Corporation, Bio-Med Research International.
[22]. Leary, J. O., (2012). "Comparison of self-assessed competence and experience among critical care nurses," Journal of Nursing Management, vol. 20, no. 5, pp. 607–614,
[23]. Lesa, R., & Dixon A. (2007). Physical assessment: Implications for nurse educators and nursing practice. Int Nurs Rev; 54:166-72.
[24]. Meyer, K., Torunn Bjørk, I., & Eide H., (2011). Intensive care nurses' perceptions of their professional competence in the organ donor process: a national survey, Journal of Advanced Nursing, Blackwell Publishing Ltd
[25]. Milhomme, D., Gagnon, J., & Lechasseur, K., (2018). The clinical surveillance process as carried out by expert nurses in a critical care context: a theoretical explanation. Intensive and Critical Care Nursing; 44: 24–30.

[26]. Notarnicola, I., Stievano, A., De Jesus Barbarosa, M.R., Gambalunga, F.Iacorossi, L.C. Petrucci, A. Pulimeno, G. Rocco, Lancia, L.(2018). Nurse Competence Scale: psychometric assessment in the Italian context Ann Ig 2018; 30: 458-469

[27]. O'Leary J. (2012). Comparison of self-assessed competence and experience among critical care nurses. Journal of Nursing Management; 20: 607–614.

[28]. Person, J. J.,et al., (2004). "Nurse staffing and mortality for medicare patients with acute myocardial infarction," Medical Care, vol. 42, no. 1, pp. 4–12.

[29]. Penoyer, D. A., (2010). "Nurse staffing and patient outcomes in critical care: a concise review," Critical Care Medicine, vol. 38, no. 7, pp. 1521–1528,.

[30]. Robnett, M. K. (2006) "Critical care nursing: workforce issues and potential solutions," Critical Care Medicine, vol. 34, no. 3, pp. S25–S31,.

[31]. Thomas A., et al., (2017). Nurse Practitioner Core Competencies Content ; A delineation Update of suggested content specific to the NP core competencies 2014 , d May (2017), NP Core Competencies Content Work Group

[32]. Williams G, Fulbrook P, Kleinpell R, & Alberto L. (2015). Critical care nursing organizations and activities: a fourth worldwide review. International Nursing Review; 62: 453–461.

[33]. Wilson-Barnett, D, J, Norman, I., & Murrells, T., (2008). Measuring nursing Competence: development of a self-assessment tool for general nurses across Europe. International Journal of Nursing Studies; 45: 902–913.

[34]. Yaser O., Tahboub H., 1., & Yılmaz D., (2019), Nurses' Knowledge and Practices of Electrocardiogram Interpretation, Int Cardiovasc Res J.2019;**13**(3):80-84.