

Effect of Educational Program on Critical Care Nurses' Knowledge and Awareness Regarding Intra-Abdominal Hypertension and Abdominal Compartment Syndrome

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Abstract: Background: Critical care nurses (CCNs) need to be well-informed and cautious in the care of patients that are consider high-risk for abdominal compartment syndrome (ACS). In addition, it is important for CCNs to recognize the factors that affect patients to intra abdominal hypertension (IAH) and ACS, and to be alert when assess patients to expect and deal with patients correctly. Aim: This paper was aimed to evaluate the effect of educational program on the critical care nurses' awareness and knowledge regarding IAH and ACS. Design and methods: Pre, post quasi experimental research design was used. A purposive sample of 54 nurses working in Surgical Critical Care Units (SCCUs) of Emergency Hospitals and the Main Mansoura University Hospital at Mansoura University Hospitals were incorporated in the study. All nurses were evaluated pre and post teach program for their knowledge. The study took approximately six months. Results: nurses' knowledge about IAP and ACS improved significantly after implementing teaching program ($p = <0.001$). Conclusion: Many patients in the ICU, are exaggerated by IAH and ACS, mostly where there is huge fluid resuscitation. An important initial step in prevent unpleasant health outcomes is before time detection of IAH. The method to achieve this is throughout create the alertness of IAH as an significant medical situation, based on continuous nursing teaching. Keywords: Abdominal Compartment Syndrome; Critical Care Nurses' Knowledge; Critical Care Nurses' Awareness; Intra-Abdominal Pressure, Massive Fluid Resuscitation.

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I. Introduction

Intra-abdominal hypertension (IAH) and abdominal compartment syndrome (ACS) are increasingly acknowledged as complications for critical care patients linked with multi-organ failure and death in critically ill patients, so, require exact diagnosis and timely management. Early recognition of this condition reduces complication and improves patient survival (Hunt, Frost, Hillman, Newton, & Davidson, 2014). Critical care nurses (CCNs) need knowledge for accurate intra-abdominal pressure (IAP) monitoring and recognition at risk patients for early detection in order to apply preventive measures (Hunt, Frost, Newton, Salamonson, & Davidson, 2017).

Intra-abdominal pressure is the "fixed status of pressure concealed within the abdominal cavity". A range of 5–7 mmHg is consider a ordinary pressure in critical care patients. IAH is consider to be a persistent pressure of >12 mmHg. ACS is consider to be a continued IAP > 20 mmHg, in spite of abdominal perfusion pressure (APP), with a new organ dysfunction or failure. The occurrence of IAH is reported to be among 30% and 60% of critical care patients and is allied with a broad variety of patient presentations and health interventions (Hunt, Frost, Newton, Salamonson, & Davidson, 2016 & Kirkpatrick et al., 2013). Abdominal surgery, trauma, massive fluid resuscitation, hypothermia, acidosis, anaemia, oliguria, high lactate and failure of the respiratory, renal or, liver function, all of these factors put in to the development of IAH and ACS in the ICUs (Blaser, Parm, Kitus, & Starkopf, 2011 & Kim, Prowle, Baldwin, Bellomo, 2012).

Even though the reality that CCNs are intended for measuring of IAP, there is incomplete research regarding CCNs' knowledge about IAH and ACS. Additionally, in spite of evidence based guidelines, there is incomplete uptake of recommendations. The presented evidence indicate that there are inadequate knowledge concerning IAH and ACS. These gaps can lead to a erroneous in diagnosis, management, and more death (Hunt, Frost, Newton, Salamonson, & Davidson, 2017 & Yer, Rastogi, Aneman, & D'Amours, 2014).

Therefore, CCNs need to be familiar and cautious in the care of patients that are consider high-risk for ACS. In addition, it is very important for CCNs to know predisposing factors to IAH and ACS, and to be cautious while assess patients to forecast and handle them suitably (Maddison, Starkopf, & Blaser, 2016). Therefore, regular assessments of IAP and organ function allow CCNs to imagine and be arranged for appropriate intervention (Papavramidis, S., Marinis, A., Pliakos, I., Kesisoglou, I., & Papavramidou, 2011 & Zhang, Liu, Tang, Yang, Jiang, & Zhang, 2016).

critical care nurse is well located to observe and notice change in the patient hemodynamic and respiratory profiles and as such be alert of the changes in these profiles could be attributed to IAH. In a recent study **Hunt et al., (2016)** found that CCNs had poor knowledge of IAH and ACS, in particular the capability to notice those patients who be at risk of developing IAH such as the obese. While monitoring is important in determining the support required to decrease the occurrence of IAH in the critically ill, there is a hazard that this may simply grow to be task paying attention. Therefore, the considerations for CCNs practice are not only to propose that monitoring is a priority, but maybe the center of concentration wants to recognize those patients at danger and this can only come from building CCNs aware of some of the physiological changes that may be attributed to developing IAH.

Significant of Study

Critical care nurses take part in the inspection and finding of changes in the state of seriously ill patients in the ICU. But, through our experiential observation, and reviewing the health records in our CCUs showed that there is no recorded data for CCNs about ACS and IAH. ACS is misdiagnosed, treated improperly or even ignored. This situation boosts the potential for extensive increases in morbidity and death. Therefore, CCNs must have a good understanding of the definitions of IAH and ACS and their clinical significance in order to promptly recognize and properly manage these conditions as members of the ICU team. Therefore, educational hard work must be essential in rising knowledge and detection of ACS by CCNs. So, this study was conducted to evaluate the effect of educational program on the critical care nurses' awareness and knowledge concerning IAH and ACS.

Aim

The aim of this paper is to evaluate the effect of educational program on the critical care nurses' awareness and knowledge regarding IAH and ACS.

Research Questions

Mean knowledge scores of CCNs post program implementation will be higher than their pre program implementation. Mean awareness scores of CCNs post program implementation will be higher than their pre program implementation.

Methods

Design: Pre, post quasi experimental research design was used to carry out this study.

Setting: The study was conceded in the Surgical Critical Care Units (SCCUs) of Emergency Hospitals and the Main Mansoura University Hospital at Mansoura University Hospitals.

Subjects: A purposive sample of (54) nurses work in the above ICUs, providing direct patients care with various levels of knowledge and dissimilar ages, and have at least one year of experience, also approve to take part and complete teaching program were included as pre-teach group and post-teach group of the study. Nurse must gave approval preceding the performance of the study

Tools of data collection: Two tools were used to gather information relevant to this study.

Tool I: 'Nurses' Background Data Sheet'

This part was used to address personal data of the nurses. It was involved nurses' age, years of experience in ICU, educational level, attendance training program associated with care of IAH and ACS and nature of teaching programs.

Tool II: 'Nurses' Knowledge Questionnaire'

This tool was developed by the researchers after reviewing relevant literatures (Ejike, C., Newcombe, J., Baerg, J., Bahjri, K., & Mathur, 2010 ; Holodinsky, Roberts, Blaser, Starkopf, & Zygun 2013; Hunt, L., Frost, A., Newton, J., Salamonson, Y., & Davidson, 2016; Hunt, L., Frost, A., Newton, J., Salamonson, Y., & Davidson, 2017; Kirkpatrick, et al., 2013; Iyer, RastogiI, Aneman, & Amours, 2014; Wise, et al., 2015). To evaluate the nurses' knowledge pre and post the teaching program. Forty-two closed end questions were designed to explore nurses' knowledge about definitions, and grading of IAH, APP and ACS (10 questions), risk factors of IAP and ACS (15 questions), clinical signs (7 questions), and barrier to monitor IAP (10 questions).

II. Methods

An ethical approval was obtained from the Research Ethics Committee of the Faculty of Nursing-Mansoura University. Permission to conduct the study was obtained from the responsible authorities of the study setting after providing an explanation of the aim of the study. Tools were developed by the researchers based on reviewing recent associated literatures. Tools were tested for validity and reliability by experts in the field of the study and essential modification were completed in view of that. A pilot study was carried out on 10% of the study sample in order to assess the feasibility and applicability of the tools. Based on finding of the pilot study, the essential modifications were complete consequently. An explanation in relation to the aim and nature of the study was discussed with the head nurse and with CCNs staff in the CCUs. Each study subject was interviewed individually by the researcher at ICU. Then a verbal consent from each study subject to participate in the study was obtained. An initial assessment was carried out for all CCNs about IAH and ACS using tool I & II and lasted for 30-35 minutes, throughout three shifts. Privacy and confidentiality of the collected data was assured.

Educational sessions about IAH and ACS were delivered throughout four weeks every week involved two sessions, and every session took about thirty to forty minutes. The sessions took place between morning and afternoon shift, or during morning shift after the routine care was done for the critically ill patients, and focused on objectives of the research study, introduction about intensive care patients, definitions of IAP, IAH and ACS, causes, preferred method for diagnosing IAH/ACS, clinical signs of ACS, patients at risk of IAH, and barriers to monitoring IAP. Using simple, brief and clear words; the researcher summarized each session at the end with CCNs staff and emphasizing the most important points included in each session.

- Data collection covered a period of 6 months started from the first of January 2018 to the end of June 2018.
- The critical care nurses knowledge concerning IAH and ACS were reevaluated immediately following intervention using tool II.

Overall aim of the program

At the end of this program, CCNs will be able to expand cultivate knowledge learned during these sessions, and provides standard of care in assessing patients predisposing to IAH and ACS for critically ill patients.

Ethical Considerations

An Ethical Committee official agreement was gained to implement the proposed study from Nursing Faculty, Mansoura University as well as the hospital director. Participants (first kin) were notified that their involvement in the research is elective and they have the privilege to acknowledge or decline to partake; each probable subject was informed about the rationale, process, benefits, and nature of the study. Moreover, participants were assured to seek to withdraw at any time with no rationale and exclusive of any effect on the health care that they received then written consents were obtained. Furthermore, protection of obtained data and information through coding was assured to achieve each participant confidentiality and anonymity.

III. Results

Table (1): Percentage distribution of studied nurses' personal background data (No. = 54) The majority of participants (n=54) were aged between 30 and 39 years, and had Technical Nursing Institute. All participants do not had any post graduate qualification in critical care, and not attending any teaching programs, workshops, and scientific conferences concerning patients with ACS.

Table (2): Distribution of studied nurses' regarding IAH and ACS awareness pre and post program implementation. Of those who answered the question, it was found that 96.30% and 94.45% of the study subjects were not aware of IAP measurement techniques and ACS definition in the pre implementation phase, while 87% and 92.6% of the study subjects were aware in the post implementation phase respectively. As regard to difference between IAH and ACS and the concept of APP = MAP-IAP, it was found that 92.6% of the study subjects were not aware, while 9.3% of the study subjects were familiar with elevated IAP on organ function in the pre implementation phase.

Table (3): Distribution of studied nurses' regarding IAH and ACS definition. It can be observed that, 87.0% and 85.1% of the study subjects gave incorrect answers regarding normal IAP and level of IAP defines IAH pre program implementation, as compared to 88.9% of the study subjects who have replied correctly in the post program implementation respectively. Concerning preferred method for diagnosing IAH/ACS, it can be observed that 7.4%, and 88.9% of the study subjects replied correctly in the pre and post program implementation respectively.

Table (4): Distribution of CCNs' knowledge regarding clinical signs of ACS. The more obvious manifestations of ACS such as, disorder gastrointestinal function, poor peripheral perfusion, and altered level of consciousness were identified by 35.2% and 29.6% respectively during pre program implementation. However,

75.9% and 66.7% of participants recognized that disorder gastrointestinal function and renal function respectively the more obvious detached manifestations of ACS post program implementation.

Figure (1): Distribution of barriers identified by CCNs' to monitoring IAP. It can be noted that, all of the study subjects did not measure IAP, mainly because they didn't know how to interpret its value, no equipment/staff to do it, and a lack of knowledge about measurement techniques in the pre implementation phase, as compared to 92.6%, 90.7% and 87.0% of the study subjects who had not any barrier regarding education related to IAP monitoring, confidence in undertaking assessment and measuring IAP in the post program implementation respectively.

Table (5): Percentage distribution of patients at risk of IAH recognized by CCNs. Respondents believed that sepsis, peritonitis, and massive fluid were not at risk for IAH/ACS in their patient population during pre program implementation. While, abdominal surgery patients, major trauma, major burn, peritonitis and massive fluid resuscitation were at high risk for IAH in the post program implementation.

Table (1): Percentage distribution of studied nurses' personal background data (No. = 54)

| Variables | No. | % | Variables | No. | % |
|--|------------|---|------------------------------------|-----|------------------|
| Age group (years) | | Educational level | | | |
| 20 – 29 | 22 | 40.7 | BSc Nurses | 15 | 27.77 |
| 30 – 39 | 29 | 53.7 | Technical Nursing Institute | 39 | 72.22 |
| 40 – 49 | 3 | 5.6 | | | |
| Mean ±SD | 32.5 ± 5.5 | | | | |
| Years of working experience in ICU by year | | Attending training programs regarding the care of patients with ACS | | | |
| 5 – 9 | 19 | 35.1 | Yes | 0 | 0 |
| 10 – 14 | 11 | 20.3 | No | 54 | 100 ^o |
| 15 – 19 | 21 | 38.33 | Postgraduate qualification in ICUs | | |
| ≥ 20 | 3 | 5.5 | Yes | 0 | 0 |
| Mean ±SD | 5.5 ± 6.8 | | No | 54 | 100 ^o |

Table (2): Percentage distribution of studied nurses' regarding IAH and ACS awareness pre and post program implementation.

| IAH and ACS awareness | Pre | | Post | | (χ ²) P |
|--|---------------|--------------|---------------|--------------|---------------------|
| | Yes No (%) | No No (%) | Yes No (%) | No No (%) | |
| Are you aware of IAP measurement techniques? | 2(3.70) | 52 (96.30) | 47 (87.0) | 7 (13.0) | (5.8) .000** |
| Are you familiar with ACS? | 3(5.55) | 51 (94.45) | 50 (92.6) | 4 (7.4) | (6.3) .000** |
| Do you know difference between IAH and ACS? | 4 (7.4) | 50 (92.6) | 52 (96.3) | 2 (3.7) | (7.2) .000** |
| Are you familiar with the concept of APP = MAP-IAP? | 4 (7.4) | 50 (92.6) | 51 (94.4) | 3(5.6) | (7.1) .000** |
| Are you familiar with IAH or the effect of elevated IAP on organ function? | 5 (9.3) | 49 (90.7) | 50 (92.6) | 4 (7.4) | (0.78) .435* |

ACS= Abdominal Compartment Syndrome

APP= Abdominal Perfusion Pressure

** Highly statistical significant difference (P < 0.001)

IAP= Intra-Abdominal Pressure

IAH= Intra- Abdominal Hypertension

MAP= Main Arterial Pressure

Table (3): Percentage distribution of studied nurses' regarding IAH and ACS definition pre and post program implementation.

| IAH and ACS definition | Pre | | Post | | (χ ²) P |
|---|-------------------|---------------------|-------------------|---------------------|---------------------|
| | Correct No (%) | Incorrect No (%) | Correct No (%) | Incorrect No (%) | |
| What is 'normal' IAP? | 7(13.0) | 47 (87.0) | 48 (88.9) | 6 (11.1) | (5.8) .000** |
| What IAP level defines IAH? | 8(14.9) | 46 (85.1) | 48 (88.9) | 6 (11.1) | (2.3) .019** |
| What IAP level defines ACS? | 4 (7.4) | 50 (92.6) | 49 (90.7) | 5 (9.3) | (1.9) .046* |
| At what level of IAP organ dysfunction may occur? | 8(14.8) | 46 (85.1) | 50 (92.6) | 4 (7.4) | (4.6) .000** |
| What is your preferred method for diagnosing IAH/ACS? | 4 (7.4) | 50 (92.6) | 48 (88.9) | 6 (11.1) | (5.8) .000** |

ACS= Abdominal Compartment Syndrome

APP= Abdominal Perfusion Pressure

** Highly statistical significant difference (P < 0.001)

IAP= Intra-Abdominal Pressure

IAH= Intra- Abdominal Hypertension

Table (4): Percentage distribution of CCNs' knowledge regarding clinical signs of ACS pre and post program implementation.

| Clinical signs of ACS | Pre | | Post | | (χ^2) P |
|--------------------------------|----------|----------|----------|----------|---------------|
| | Present | Absent | Present | Absent | |
| | No (%) | No (%) | No (%) | No (%) | |
| Impaired GT function | 19(35.2) | 35(64.8) | 41(75.9) | 13(24.1) | (13.7) .000** |
| Altered level of consciousness | 16(29.6) | 38(70.4) | 14(25.9) | 40(74.1) | (.83) |
| Poor peripheral perfusion | 19(35.2) | 35(64.8) | 17(31.5) | 37(68.5) | (0.39) 0.69 |
| Acid-base disturbance | 8(14.8) | 46(85.2) | 20(37.0) | 34(63.0) | (4.6) .031** |
| Impaired cardiac function | 12(22.2) | 42(77.8) | 25(46.3) | 29(53.7) | (4.9) .026** |
| Impaired respiratory function | 7(13.0) | 47(87.0) | 29(53.7) | 25(46.3) | (13.7) .000** |
| Impaired renal function | 8(14.8) | 46(85.2) | 36(66.7) | 18(33.3) | (26) .000** |

** Highly statistical significant difference (P < 0.001)

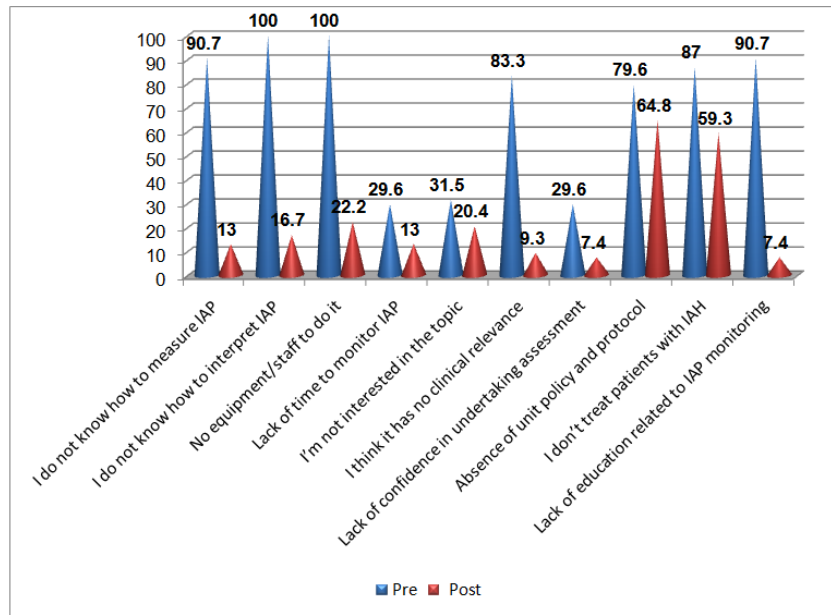


Figure (1): Bar chart for the distribution of barriers to monitoring IAP pre and post program implementation.

Table (5): Percentage distribution of patients at risk of IAH recognized by CCNs pre and post program implementation.

| Patients at risk for IAH | Pre | | | Post | | | (χ^2) P |
|--------------------------------|------------|----------|-----------|------------|----------|-----------|---------------|
| | Not a Risk | Low Risk | High Risk | Not a Risk | Low Risk | High Risk | |
| | No (%) | No (%) | No (%) | No (%) | No (%) | No (%) | |
| Acute pancreatitis | 33(61.1) | 14(25.9) | 7(13.0) | 9(16.7) | 11(20.4) | 34(63.0) | (4.7) .000** |
| Suspected organ failure | 39(72.2) | 9(16.7) | 6(11.1) | 7(13.0) | 16(29.6) | 31(57.4) | (5.2) .000** |
| Laparotomy | 42(77.8) | 9(16.7) | 3(5.6) | 6(11.1) | 12(22.2) | 36(66.7) | (5.8) .000** |
| Obesity | 34(63.0) | 11(20.4) | 9(16.7) | 7(13.0) | 9(16.7) | 38(70.4) | (4.8) .000** |
| Prone positioning | 39(72.2) | 10(18.5) | 5(9.3) | 17(31.5) | 26(48.1) | 11(20.4) | (3.3) .001** |
| Mechanical ventilation | 31(57.4) | 16(29.6) | 7(13.0) | 10(18.5) | 18(33.3) | 26(48.1) | (3.7) .000** |
| Sepsis | 40(74.1) | 11(20.4) | 3(5.6) | 11(20.4) | 15(27.8) | 28(51.9) | (5.8) .000** |
| Liver dysfunction with ascites | 23(42.6) | 24(44.4) | 7(13.0) | 7(13.0) | 10(18.5) | 37(68.5) | (4.5) .000** |
| Peritonitis | 42(77.8) | 9(16.7) | 3(5.6) | 7(13.0) | 5(9.3) | 42(77.8) | (5.8) .000** |
| Major trauma | 34(63.0) | 13(24.1) | 7(13.0) | 3(5.6) | 6(11.1) | 45(83.3) | (5.8) .000** |
| Abdominal surgery | 32(59.3) | 16(29.6) | 6(11.1) | 1(1.9) | 6(11.1) | 47(87.0) | (6.01) .000** |
| Major burn | 30(55.6) | 15(27.8) | 9(16.7) | 2(3.7) | 9(16.7) | 43(79.6) | (5.4) .000** |
| Massive fluid resuscitation | 45(83.3) | 7(13.0) | 2(3.7) | 3(5.6) | 9(16.7) | 42(77.8) | (6.5) .000** |

** Highly statistical significant difference (P < 0.001)

IV. Discussion

Moreover, the a variety of text discuss IAH and ACS, there is inadequate research exact to the nursing care for patients with IAH or ACS (**Zhang, et al., 2015**). Patients with IAH or ACS will be mainly frequently encountered in ICU. In recent times, it has been anticipated to develop IAP and ACS monitoring beyond usual critical care areas to allow for recognition of the medical worsening in vulnerable patients so, get better patient outcomes (**Gallagher J., 2010**).

To the best of our knowledge, this study is one of the most to examine improvement in CCNs' knowledge regarding IAH and ACS. Our evaluation of the program in IAH and ACS knowledge demonstrate very large, positive changes in self-rated preparation to recognize IAH and ACS. This can be attributed to the hypothesis that mean knowledge scores of CCNs post IAH and ACS program implementation will be higher than their pre program implementation. This is in the line with (**Khalaf, Abozied, Ahmed, El-Hakeem & Abd El-Hafez, 2018**). Moreover, the current study revealed that, there was highly statistical significant difference following interventions concerning high risk patients, signs and symptoms of IAH, and barriers to monitor IAP.

Of concern is the low number of respondents who could properly define the ACS and IAH. This correlates with the low level of awareness of the ACS consensus definitions and guidelines (**Kirkpatrick, Roberts, De Waele, et al., 2013**). CCNs play an important role in constant observation and detection of subtle and active changes in the status of critically ill patients in the ICU. Therefore, a CCN must have a good understanding of the definitions of IAH and ACS and their clinical significance in order to promptly identify and properly manage these conditions as members of the ICU team.

Therefore, suitable preparation of CCNs is a critical part in providing quality care to patients. Nurses cannot practice what they do not be familiar with. Therefore, providing education on IAP and ACS to student nurses is very important, so that, they are ready to assess and manage the complexities concerned in the care of critically ill once they graduate.

These results were similar to the results revealed by (**Ejike, Newcombe, Baerg, Bahjri, & Mathur, 2010**) who confirmed that most pediatric health care practitioners in their survey incorrectly defined ACS as an increase IAP via number alone. Moreover, these result were supported by in other researchers (**Newcombe et al, 2012 and Wise et al, 2015**).

On the contrary, **Wise R et al, 2015**, reported that most of subjects were familiar with IAH & ACS and nearly 70% were familiar with the equation of mean arterial pressure minus IAP equal to APP. Management of ACS may be ignored because of nurses who incapable to detect, interpret or even know the pathophysiology of ACS.

Moreover, the CCN' answer about clinical signs and risk factors of IAH & ACS improved significantly post-teaching program than pre-teaching. The current results were supported by **Khalaf, Abozied, Ahmed, El-Hakeem, & Abd El-Hafez, (2018)**. On contracting, the study done by **Zhang et al., 2016** found that the majority of studied subjects were constructing correctly the diagnosis and clinical signs of IAH/ACS on both clinical and IAP values.

Critical care nurses reported that, they did not know any information concerning measurement of IAP. While, the common of studied subjects had knowledge about measurement post program implementation. In addition to, increase mean \pm SD and there were highly statistically significant differences following interventions. This is because a heavy workload can interrupt the care that promotes patients' physical comfort. Many CCNs believe that a needed area of improvement for providing better patient care would be a decrease in the nurse's present workload to give more time to meet patient's needs.

Intra abdominal hypertension has a severe impact on organ function and prognosis. But the real IAH diagnosis rate was poor in this study. The missed diagnosis would raise the risk of growing into ACS. The CCN' supposed that reasons for a low diagnosis rate of some diseases may be weak awareness of the medical staff and no specific indications, lack of knowledge even diagnostic evidence exists, inaccurate examination methods; and complexity in diagnosis due to the complex recognition method or high costs. Scholars from Germany, Italy and other European countries have surveyed the knowledge level of IAH between medical workers, and the results are not satisfactory (**Otto, et al., 2009 & Biancofiore & Bindi, 2008**).

Although improving, at the time of this study there was a general lack of clinical awareness towards IAH and ACS. There was also a lack of clinical application of available knowledge about these subjects, particularly concerning diagnosing IAH/ ACS and monitoring IAP (**Kimball, et al., 2006**).

The current study figured out that, the overall level of knowledge of studied nurses was generally poor pre-teaching program and improved significantly post-teaching program. The teaching program focuses on definitions of IAP, IAH and ACS, causes, preferred method for diagnosing IAH/ACS, clinical signs of ACS, patients at risk of IAH, and barriers to monitoring IAP. This is in line with **Hunt et al, 2017 and Khalaf, Abozied, Ahmed, El-Hakeem & Abd El-Hafez, (2018)** they surveyed the nurses' knowledge and stated that the overall knowledge of them about IAH and ACS was inadequate. It is therefore significant for CCNs to gain, advanced clinical practice, skills, knowledge and awareness of the pathological signs, symptoms and

complications of IAH and ACS based on evidence-based guidelines, continues education and competency standards this leads to decrease incidence of ACS development and thus get better patient's outcome.

V. Conclusion

Knowledge provides an organized body of information that is realistic; it provides a foundation of accurate principles and concepts. Application of this knowledge develops and enhances nursing skills. Therefore, lack of knowledge is consistently recognized as an barrier to health care professionals as they struggle to monitor IAP. A nurse who appreciates her role in patient care will obtain the responsibility to supply her with necessary knowledge to improve her skills and put them to the best use. It will also allow her to evaluate individual situations, incorporate those experiences with the knowledge and provide quality health care.

However, many patients in the ICU, are affected by IAH and ACS, mainly wherever there is massive fluid resuscitation. An necessary primary step in preventing unpleasant health outcomes is early on detection of IAH. Findings from this study showed knowledge of CCNs' was generally low pre program implementation. But total satisfaction score of CCNs knowledge in relation to IAP and ACS were very satisfied post program implementation, and there were highly statistical significant differences.

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