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Relationship between Nurse's Knowledge Regarding Evidence Based Practice for Weaning Patient from Mechanical Ventilation and their Health outcomes

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Abstract

Background: Weaning is the process of going from ventilator dependence to spontaneous breathing. Its complications can be avoided by nursing care. **Aim:** This study aimed to determine relationship between nurses' knowledge of evidence –based practice and patients' health outcomes as regards weaning patients from mechanical ventilation in the intensive care units at El-mahala and Benha Hospitals. **Setting:** the study was carried out at El-Mahalla chest hospital and Benha University hospital in the intensive care units. **Subjects:** All available nurses (40 nurses from El-Mahalla chest hospital and 40 from Benha University hospital) were included in the study. A purposive sample comprised 80 adult alert patients who were assigned for nurses caring them, 40 patients from El-Mahalla chest hospital and 40 from Benha. **Tools** were developed through reviewing of related recent literature. **tool 1:** A Structured questionnaire included two parts, **part I:** Socidemo-graphic characteristics for nurses and patients' interview Schedule. **Part II:** Nurses' Knowledge assessment. **Tool 2:** Nurses' practice observational checklist related to actual nursing care for weaning patients. **Tool 3:** Patients' Health Outcomes included, general and Respiratory assessment as ABGs, swallowing reflex, respiratory pattern, breathing sound as well as cough and secretion. **Result and conclusion:** The findings of the current study concluded that the nurse's knowledge as regards MV weaning was adequate and satisfactory by all nurses in El-mahala Hospital and the majority in Benha Hospital. On the other hand, the majority of studied nurses had unsatisfactory practice in both hospitals El-Mahalla and Benha. These findings may be attributed to that the nurses didn't integrate their knowledge into practice in providing adequate nursing care concerning weaning patients from MV. Concerning patients' health outcome, there were significant relations between patients' sleep, mental status, mobility, and breathing sounds and nurses' knowledge and practice in both hospitals. In addition, the nurses' practice in El-Mahalla hospital has a significant relation with the patients' respiratory and heart rates. Also, there was a significant relation between patients' swallowing reflex, respiratory pattern, and the nurses' knowledge in Benha. **Recommendations:** Further research should focus on developing and implementing strategies designed to decrease the incidence of extubation, weaning failure and complications based on their predictors.

Key words: Nursing Knowledge, weaning, evidence –based practice, Health outcomes

Introduction

Mechanical ventilation (MV) is defined as a technique through which gas is moved toward and from the lungs through an external device connected directly to the client (Kumar, 2016). Since, MV is the most commonly used treatment modality in intensive care units; it serves only to provide assistance for breathing and does not cure the cause. In general, mechanical ventilation is used to correct blood gases, reduce the work of breathing through relieved the distress of dyspnea, improves oxygenation and CO₂ clearance (Shadhan, 2015). It is used with bradypnea or apnea, respiratory arrest, acute lung injury and respiratory distress syndrome (Cairo et al., 2016).

Ventilators have a variety of parameters considered as one of most aspects of the usage of mechanical ventilation (MV) which include tidal volume, respiratory rate, Positive End-Expiratory Pressure, flow Rate, Inspiratory Time; Expiratory Time Relationship and fraction of Inspired Oxygen (Aitken and Chaboyer, 2016). Therefore, patients who receive MV require a complex and well-organized level of care (Zamzama et al., 2015). Weaning of MV is the process of liberation from or



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discontinuation of mechanical ventilator support when patient assumes a greater portion of his ventilation. Time spent in the weaning process represents 40–50% of the total duration of mechanical ventilation (**Robert et al., 2014**).

The patient who is ready to be weaned from mechanical ventilation should have several indicators and criteria. These include, objective criteria as improvement of illness, the patient is oxygenated adequately, no significant respiratory acidosis $\text{PH} \geq 7.30$, able to initiate an inspiratory effort, and hemodynamically stable, without cardiovascular complications (i.e. heart rate (HR) ≤ 100 beats/min, systolic blood pressure. 90–150 mmHg, respiratory rate (RR) ≤ 25 breaths/min, temperature < 38), haemoglobin level > 10 mmHg and alertness as well as, adequate nutritional state, absence of secretion and adequate cough (**Ferrer and Pelosi, 2012**). In addition to oxygen saturation (Sa, O_2) $> 90\%$, $\text{PaO}_2 > 60\%$ $\text{PaCO}_2 < 40\%$ (**Hasan, 2010 and Chiumello, 2017**). Once the decision is made to start the weaning process, the method of weaning will then be determined.

Different methods, Continuous Positive Airway Pressure (CPAP) is the most common, Pressure support ventilation (PSV) is also used and the both involve gradual decrease of ventilator support. They are used while patient is still connected to the ventilator. Synchronized intermittent mandatory ventilation (SIMV) and T. piece are also used as weaning method (**Lee, 2017**). On the other hand, there is much evidence that weaning tends to be delayed in extubating a patient who has successfully passed a weaning test, exposing the patient to unnecessary discomfort and pressure sore that increases the cost of care, whereas difficult weaning may require tracheostomy and an increased risk of nosocomial pneumonia. Conversely, it may also increase morbidity and mortality due to complications associated with prolonged mechanical ventilation (**Terrence et al., 2017**).

Effective strategies combine several interventions to achieve successful weaning through assessment of readiness to wean. Use of weaning protocol in association with spontaneous breathing trials is likely to reduce the requirement for mechanical ventilator support in active manner (**Ward and Fulbrook, 2016**). It is important to use comprehensive evidence-based review of literature on ventilator discontinuation.

Studies reported that, the American Collage of Chest Physicians, the Society of Critical Care Medicine and the American Association of Respiratory Care, created evidence-based guidelines that include the following: 1- frequent assessment to determine if ventilator support is still needed or not, 2- patient who still needs mechanical ventilation should be assessed frequently to determine the factors of dependency, 3- provide comfort and muscles unloading for these patients, 4- patients who require prolonged ventilator support beyond the intensive care unit should go to specialized facilities that can provide more gradual support reduction strategies. Then, weaning can effectively be carried out (**MacIntyre, 2005 and Burns and Grove, 2010**).

Since, intensive care unit nurses spend a large part of their working hours at ICU, they must assume responsibility for such assessment. They should be attentive to any signs of confusion or agitation in the



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patient, and that they employ all the tools available for identifying such states, the weaning process is based on clinical decision making, which means that the ICU nurses have important vital role (Tingsvik et al., 2015).

Evidence-based nursing (EBN) is one of approach that may enable nurses to manage the explosion of new literature and technology and ultimately may result in improved patients' health outcomes by successful weaning (Karkada, 2015). The goal of EBN is to improve the health and safety of patients while also providing care in a cost-effective manner to improve their health outcomes (Melnik and Fineout, 2015). To properly implement EBN, the knowledge and practice of the nurse should be assessed and improved (Melnik and Fineout, 2011, Levin, 2011, and Melnyk and Fineout, 2015).

Moreover, professional nurses' knowledge and practice regarding weaning from Mechanical ventilation is a vital importance to ensure a safe passage of the patient from intubation to weaning and discontinuation of MV (Hansen and Severinsson, 2007). The role of professional nurse is to assess readiness testing to wean daily and determine client tolerance to wean and prepare patient to wean, monitor patient's psychological and physiological response that include subjective and objective data as breath sounds, respiratory pattern, heart rate, respiratory rate, oxygen saturation, amount and type of secretions and energy level , monitor vital signs, monitor arterial blood gases (ABGs), signs of respiratory distress and encourage deep breathing and coughing and oral suction (Hinski, 2014 and Leslie and Rick, 2011). Additionally, hydration, nutrition and sleep should be promoted and limit visitors to provide rest and comfort and finally report and document about date and time of weaning and method of weaning (Ackley and Ladwig, 2013).

Significance of the study

All adult patients who received MV at EL-Mahalla Chest Hospital ICU between July 2013 and June 2014 were prospectively recruited. Out of the 412 patients admitted to the ICU, 130 patients received MV, either invasive MV. (40%), non-invasive MV (50.7%) and 9.2% of the patients showed non-invasive failure and needed invasive ventilation. Survival among mechanically ventilated patients depended on the baseline characteristics at the start of MV, as well as on the development of complications and the management protocols in the ICU (Zamzama et al., 2015).

The transition to ventilator liberation is often complex, requiring skilled assessment and planning by a multidisciplinary team. Each patient responds differently to the process and it becomes even more problematic when there is lack of continuity among medical staff and no consensus on weaning technique (Woody, 2013). Evidenced based practice (EBP) guidelines have been developed to reduce variation in weaning, provide quality of care and patients' satisfaction. Nurse led weaning has been shown to reduce weaning time, and therefore, it was important to identify whether nurses have sufficient knowledge and skills to implement EBP regarding weaning which may improve the patients' health outcomes (Jacquie, 2014). **This study aimed to** Determine the relationship between nurses' knowledge of EBP (Knowledge and practice) and patients' health outcomes in the intensive care units.

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Subjects and Methods

Aim of the study:

This study aimed to:

- 1- Assess the nurses' knowledge of evidence –based practice as regard weaning and extubation of patients with mechanical ventilation at Benha and El-mahala Hospitals.
- 2- Determine the relationship between nurses' knowledge of EBP (Knowledge and practice) and patients' health outcomes post weaning in the intensive care units at at Benha and El-mahala Hospitals.

Research Questions:

To achieve this aim, one research question was formulated:

What is the relationship between nurses' knowledge regarding evidence based practice among patients undergoing Mechanical ventilator and their health outcomes in the intensive care Units at Benha and El-mahala Hospitals?

Research design:

A descriptive correlational design was utilized for the current study; such design fits the nature of the current study.

Study setting:

The study was carried out at El-Mahalla chest and Benha university hospitals in the intensive care units (ICU).

Subjects:

a- Nurses:

All available nurses (40 nurse from El-Mahalla chest hospital and 40 from Benha University hospital at the ICU) were included in the study and assigned for caring the patients undergoing Mechanical Ventilation; based on inclusion criteria for nurses and accepted to participate in the study.

b- Patients:

A purposive sample comprised of 80 patients from both sex was taken, 40 patients from El-Mahalla chest hospital and 40 from Benha University hospital at the Intensive Care Units and undergoing the MV who were assigned for nurses that caring them.

Inclusion criteria:

a- Nurses

- 1- This nurses' experience shouldn't be less than two years and had bachural degree.

b- Patients

- 1- Adult alert patient
- 2- Diabetic control
- 3- Heart stable parameters (Heart rate, Blood pressure)

*Patients' record in this unit was surveyed to select the patient for the study.

Tools of data collection:

Tool 1: A structure Questionnaire: It was developed by the researchers through review of related literature (Chiumello, 2017, Goldsworthy and Graham, 2013, Cairo, 2015, Chang, 2013 and Marthe et al., 2013) and included two parts:

Part I a- For nurses: Socio-demographic data sheet which included five items: age, sex, qualification, years of work experience in the ICU and previous educational session for MV.

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b-For patients: Patients' Socio-demographic data included: age, sex, education, setting and marital status.

Part II: Nurses' Knowledge Assessment Questionnaire: It aimed to assess nurses' knowledge related to care given to such group of weaning patients undergoing mechanical ventilation. For items related to knowledge, two point of responses were used as correct answer = 1 and incorrect answer = zero. Each question was answered on a 2-point rating scale with end points (From 0 to 1). The total score of the questionnaire was **30** marks. It comprised 5 sub items as follows: **(Appendix I)**

- Knowledge about mechanical ventilation (5) Score
- weaning from MV (9) Score
- Indicators of weaning (9) Score
- Alarms of MV (3) Score
- Complications that happened after weaning (4) Score

* Nurses' knowledge was considered satisfactory if the total percent score was 60% or more of total scores and unsatisfactory if less than 60%.

Tool 2: Nurses' practice Observational Checklist related to actual nursing care for weaning patients:

It aimed to assess nurses' practice related to care of weaning which is given to such group of patients' undergoing MV. It was developed by the researcher thorough review of literature (**Cairo 2015, Chang 2013 and Goldsworthy and Graham, 2013**). Three point Likert scale of responses was used as completely correctly done =2, incompletely done = 1, and not done or incorrectly done= 0. The total score of the nurses' practice observational checklist was **88** marks: It was divided into 5 subscales as follows:

a - **Patients' assessment (18 Scores)** included the following:

- Vital signs,
- Level of consciousness,
- ABGs,
- FiO₂,
- Tidal volume,
- Minute ventilation
- Secretion,
- Cough reflex and
- Breathing sounds.

b - **Preparation of the patient for weaning (38 Scores)** that included the following: explain procedure to the patient, wash hands, wear sterile gloves, prepare equipment, place patient in semi Fowler's position, wear face shield, suction endotracheal tube, suction oropharyngeal airway, loosen tube, ask patient to take deep breath, deflate the cuff completely, pull the tube out in the direction of the curve, ask the patient to cough, disconnect patient, reassess patient's cardiopulmonary status, discard disposable equipment, remove gloves, wash hands and document the procedure in patient's record.

c - **Ensuring successful weaning (16 Scores)** included the following: Monitor the following every 20:30 minutes after weaning: respiratory rate, heart rate, blood pressure, O₂ saturation, level of consciousness, breath sound, and teach patient deep breathing exercises.

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d -Ensuring good hydration (8 Scores) included the following: Encourage warm fluids, give fluids gradually, encourage small oral meals and check intake and output chart.

e- Maintaining emotional state (8 Scores) included the following: Stay long time with patient, keep privacy, orienting patient with the time of the day and restrict visitors expect loved persons.

* Nurses' practice was considered satisfactory if the total percent score was 75% or more of total scores and unsatisfactory if less than 75 %.

Tool 3: Mechanical Ventilation Patients' Health Outcomes:

This tool was developed through review of the related recent literature. It aimed to assess the predictor of successful weaning or extubation parameters, it included **Clinical data base that comprised of two main parts:**

Part I-General assessment: It included Hemoglobin, Hematocrit, Albumin, serum electrolytes (Ca²⁺, Mg and K) as well as vital signs, balanced intake and output, pain, sleep, bowel movement and mental status. (Balanced intake and output from patient's record).

**The underlying parameters have two normal ranges, the first one in weaned patient and the second one in normal person.*

General assessment:	In weaned patients.	In normal persons.
Hematocrit	> 25%	in men = 30% :54% in female =38% :47% (Linton, 2014),
Hemoglobin level	> 10g/dl	in men = 14:16g/dl in female = 12:16g/dl (Anne and Silvestri, 2018),
Albumin	> 2.5g/dl	Normal value 3.5:5.0 g/dl (Ganda, 2013)
Serum Electrolytes		
Ca ²⁺		
Mg	8.5:10.5mg/dl	Normal range = 8.5-10.5 mg/dl (Avioli, and Krane, 2013),
K	1.7:2.4 mEq/L	Normal range 1.6-2.6 mEq/L (Anne, 2012),
	3: 4.5 mEq/L	Normal range 3.5-5.0 mEq/L (Ignatavicius, and Workman, 2015)

Vital signs:	In weaned pt.	In normal person
Temperature	< 38 c	36.5: 37.5c
Heart rate	≤100 b/m	60:100 b/m
Systolic	<150 mmhg	<120 mmhg
Diastolic	<90 mmhg	<80 mmhg
		(Anne et al., 2015)

Part II- Respiratory assessment: It included:

- Respiratory rate <25 c /m normal range from 14:20 c/m **(Anne et al., 2015),**
- Respiratory pattern (normal, shallow, deep, rapid, or dyspnea)
- Adequate swallowing reflexes
- ABGs.: (PH, PaCO₂, and PaO₂),
- Breathing sound (normal, wheezing or crepitation).
- Presence of cough dry or productive cough and secretions.

**The 5th Annual & 2nd International Scientific Conference of The Faculty of Nursing Benha University
In Collaboration with Najran University & Lebanese Nursing Student Association (LNSA)**

**The underlying parameters have two normal ranges, the first one in weaned patient and the second one in normal person (Urden et al., 2017)*

ABGs parameters	In weaned patients	In normal persons
PH	7.30 :7.45	Normal value 7.35:7.45,
PaCO ₂	<40%	Normal value 35:45%,
PaO ₂	>60%	Normal value 80: 100%.

Methods

1-Administrative design

- An official letter was forwarded from the Dean of the Faculty of Nursing, requesting a permission to conduct the study.
- A written approval was obtained from the director of the Main University hospitals of Benha and El-Mahalla and from Head of the Departments to carry out the study.

Legal aspects for ethical consideration:

- 1- An official approval was obtained from the administrator of each study setting.
- 2- A clear explanation of the nature, aims and expected outcomes of the study was clarified.
- 3- Informed consent from both of nurses and patients to apply this study was secured.
- 4-The researcher assured maintaining anonymity and privacy of the subjects.
- 5- Confidentiality of data was secured.
- 6-The study subjects were allowed to participate or refuse the participation in the study at any time.

2-Tools development:

The study tools were developed by the researchers after extensive reviewing of the relevant literature.

Pilot Study

- Pilot study was conducted on 10 % of nurses (studied sample) to test the clarity and applicability of the **tool 1(part I- II)**. Modifications were done based on the findings. The nurses involved in the pilot study were excluded from the study.

Content Validity and Reliability

Tools were tested for content and constructed validity (**tool 1, 2**) by 5 experts in medical-surgical nursing teaching staff from the Faculty of Nursing, Benha University, and in intensive care units' staff from both Benha and El-Mahalla hospitals. Modifications were done accordingly, and then the tools were designed in its final format and test-retest of reliability for **tool 1-2** was done by cronbach's alpha 0.80.

3- Data collection

All available nurses and patients agreed to participate in the study. The aim of the study and the component of the tools were explained to the nurses and the patients at the beginning of data collection. The data were collected from the nurses by individual interviews in the ICU using self-administration technique regarding their knowledge (**tool 1 part I- II**). Each interview took a time of about 20 min. The researcher was observing the nurse's practice regarding the patients' weaning using observational checklist (**tool 2**). Patients' health outcomes were assessed and observed through individual patients' record in the ICU using (**tool 3**). The time spent for the data collection from December, 2017 till February, 2018.

Statistical analysis of the results

Data were fed to the computer and analysed using IBM SPSS software package version 20.0 (Armonk, NY: IBM Corp) Qualitative data were described using number and percent. Quantitative data were described using range (minimum and maximum), mean, and standard deviation. Significance of the obtained results was judged at the 5% level using Chi-square, Fisher's Exact or Monte Carlo correction, Student t-test, F-test (ANOVA) and Pearson coefficient.

Results

Table1: Distribution of the studied sample of nurses in El-Mahalla and Benha hospitals according to their personal characteristics.

Personal data	Hospital				Test of Sig.	P	Total (n = 80)	
	El-Mahalla (n = 40)		Benha (n = 40)				No.	%
	No.	%	No.	%				
<u>Age (years)</u>								
20 to 30 years	20	50.0	33	82.5	$\chi^2 = 9.448^*$	0.002*	53	66.3
>30 – 40 years	20	50.0	7	17.5			27	33.8
Mean \pm SD	30.18 \pm 3.31		28.33 \pm 5.08		t= 1.931	0.057	29.25 \pm 4.36	
<u>Qualification</u>								
Bachelor	33	82.5	34	85.0	$\chi^2 = 0.092$	0.762	67	83.8
Master	7	17.5	6	15.0			13	16.3
<u>Experience</u>								
2 - 5 years	21	52.5	33	82.5	$\chi^2 = 9.590^*$	0.008*	54	67.5
6 - 10 years	8	20.0	5	12.5			13	16.3
11 - 15 years	11	27.5	2	5.0			13	16.3
<u>Attended previous Program:</u>								
No	9	22.5	5	12.5	$\chi^2 = 1.385$	0.239	14	17.5
Yes	31	77.5	35	87.5			66	82.5
<u>Types of Program*</u>								
- Training program	35	87.5	26	65.0	$\chi^2 = 5.591^*$	0.018*	61	76.3
- Workshop	5	12.5	14	35.0			19	23.8

χ^2 , p: χ^2 and p values for **Chi square test** for comparing between the two groups

t, p: t and p values for **Student t-test** for comparing between the two groups

*: Statistically significant at $p \leq 0.05$

* The nurse may have more than source of information.

**The 5th Annual & 2nd International Scientific Conference of The Faculty of Nursing Benha University
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Table I illustrates distribution the nurses of the studied sample in El-mahalla and Benha hospitals according to their personal characteristics. It revealed that half of the nurses in El-Mahalla hospital were aged more than 30 - 40 years old (50%) and their experience was from 2-3 years (52%) but in Benha hospital, the majority of the nurses (82%) aged from 20-30 years old and their experience were from 2-3years (P= 0.002* and 0.008*) respectively. Concerning their qualification, the majority of them have bachelor degree in both El-Mahalla (82.5%) and Benha (85%) hospitals (P=0.762). Eighty-seven percent of the nurses in El-Mahalla university and nearly two- third (65%) in Benha attended training program (P=0.018*).

Table 2: shows mean Scores, Standard deviation and Significant Differences of nurses' knowledge regarding weaning of MV patient comparing between El-Mahalla and Benha hospitals. No = 80

Total score	Total Scores	Hospital		t	P	Total (n = 80)
		El-Mahalla (n = 40)	Benha (n = 40)			
Mechanical Ventilation						
Min. – Max	5	1.0 -5.0	2.0 – 5.0	0.589	0.558	1.0 – 5.0
Mean ± SD.		3.88 ± 0.97	4.0 ± 0.93			3.94 ± 0.95
M % S		77.50 ± 19.32	80.0 ± 18.67			78.75 ± 18.92
Weaning						
Min. – Max	9	5.0 – 9.0	4.0 – 9.0	0.282	0.779	4.0 – 9.0
Mean ± SD.		7.73 ± 1.11	7.80 ± 1.26			7.76 ± 1.18
M % S		85.83 ± 12.32	86.67 ± 14.05			86.25 ± 13.14
Indication for criteria of weaning						
Min. – Max	9	5.0 – 9.0	2.0 – 9.0	1.040	0.301	2.0 – 9.0
Mean ± SD.		8.23 ± 1.03	7.93 ± 1.51			8.08 ± 1.29
M % S		91.39 ± 11.39	88.06 ± 16.76			89.72 ± 14.34
Alarm as regarding MV						
Min. – Max	3	0.0 – 3.0	0.0 – 3.0	2.151*	0.035*	0.0 – 3.0
Mean ± SD.		1.55 ± 0.81	1.98 ± 0.95			1.76 ± 0.90
M % S		51.67 ± 27.16	65.83 ± 31.57			58.75 ± 30.12
Complication after weaning						
Min. – Max	4	1.0 – 4.0	0.0 – 4.0	0.117	0.907	0.0 – 4.0
Mean ± SD.		3.05 ± 0.85	3.08 ± 1.05			3.06 ± 0.95
M % S		76.25 ± 21.15	76.88 ± 26.18			76.56 ± 23.65
Total mean score						
Min. – Max	30	18.0 – 29.0	15.0 – 30.0	0.446	0.657	15.0 – 30.0
Mean ± SD.		24.43 ± 3.05	24.78 ± 3.92			24.60 ± 3.50
M % S		81.42 ± 10.18	82.58 ± 13.06			82.0 ± 11.65

t, p: t and p values for **Student t-test** for comparing between the two groups

*: Statistically significant at $p \leq 0.05$

**The 5th Annual & 2nd International Scientific Conference of The Faculty of Nursing Benha University
In Collaboration with Najran University & Lebanese Nursing Student Association (LNSA)**

Table 2 : represents mean Scores, Standard deviation and Significant Differences of nurses' knowledge between El-Mahalla and Benha hospitals regarding weaning of MV patient. It revealed that there was a significant difference in nurses' knowledge between El-Mahalla (1.55 ± 0.81) and Benha (1.98 ± 0.95) hospitals concerning " Alarm as regarding MV." ($P= 0.035^*$). In relation to nurses' scores of knowledge about MV., weaning, criteria of weaning, complications after weaning, there were insignificant differences between El-Mahalla and Benha hospitals ($P= 0.558, 0.779, 0.301,$ and 0.907), respectively.

Table 3: Mean scores, standard deviation and significant differences of nurses' practice regarding weaning patients from MV comparing between El-Mahalla and Benha hospitals. No= 80

Total score	Total Scores	Hospital		T	P	Total (n = 80)
		El-Mahalla (n = 40)	Benha (n = 40)			
Assessment Min. – Max Mean \pm SD. M % S	18	4.0 – 17.0 10.15 \pm 2.94 56.39 \pm 16.33	6.0 – 18.0 11.23 \pm 2.66 62.36 \pm 14.75	1.634	0.106	4.0 – 18.0 10.69 \pm 2.84 59.38 \pm 15.75
Prepare Patient to Wean Min. – Max Mean \pm SD. M % S	38	14.0 – 36.0 29.55 \pm 5.31 77.76 \pm 13.98	11.0 – 36.0 30.63 \pm 6.66 80.59 \pm 17.53	0.798	0.427	11.0 – 36.0 30.09 \pm 6.01 79.18 \pm 15.82
Ensure Successful Weaning by: Min. – Max Mean \pm SD. M % S	16	7.0 – 15.0 11.68 \pm 1.73 72.97 \pm 10.81	7.0 – 16.0 12.20 \pm 2.02 76.25 \pm 12.60	1.250	0.215	7.0 – 16.0 11.94 \pm 1.88 74.61 \pm 11.78
Ensure Good Hydration Min. – Max Mean \pm SD. M % S	8	3.0 – 8.0 5.70 \pm 1.29 71.25 \pm 16.06	3.0 – 8.0 6.03 \pm 1.31 75.31 \pm 16.38	1.120	0.266	3.0 – 8.0 5.86 \pm 1.30 73.28 \pm 16.25
Maintain Emotional State Min. – Max Mean \pm SD. M % S	8	0.0 – 8.0 3.75 \pm 1.71 46.88 \pm 21.32	1.0 – 8.0 5.18 \pm 2.09 64.69 \pm 26.08	3.344*	0.001*	0.0 – 8.0 4.46 \pm 2.02 55.78 \pm 25.31
Overall Min. – Max Mean \pm SD. M % S	88	35.0 – 77.0 60.52 \pm 10.12 70.38 \pm 11.77	31.0 – 82.0 62.20 \pm 11.06 72.33 \pm 12.87	1.836	0.070	31.0 – 82.0 61.36 \pm 10.57 71.35 \pm 12.29

t, p: t and p values for Student t-test for comparing between the two groups

*: Statistically significant at $p \leq 0.05$

Table 3 : illustrates Mean scores, Standard deviation and significant differences of nurses' practice regarding weaning of MV comparing between El-Mahalla and Benha hospitals. It revealed that, there was a significant difference ($P= 0.001^*$) between El-Mahalla and Benha Hospitals concerning " maintain emotional state." (3.75 ± 1.71) and (5.18 ± 2.09) respectively. In relation to nurses' knowledge scores of practice about assessment, prepare patient, ensure successful weaning, and ensure good hydration, there were insignificant differences between El-Mahalla and Benha hospitals ($P= 0.106, 0.427, 0.215$ and 0.266) respectively.

**The 5th Annual & 2nd International Scientific Conference of The Faculty of Nursing Benha University
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Figure 1: illustrates Comparison between El-Mahalla and Benha Hospitals according to nurses' knowledge and practice for patients' weaning from MV (n = 80)

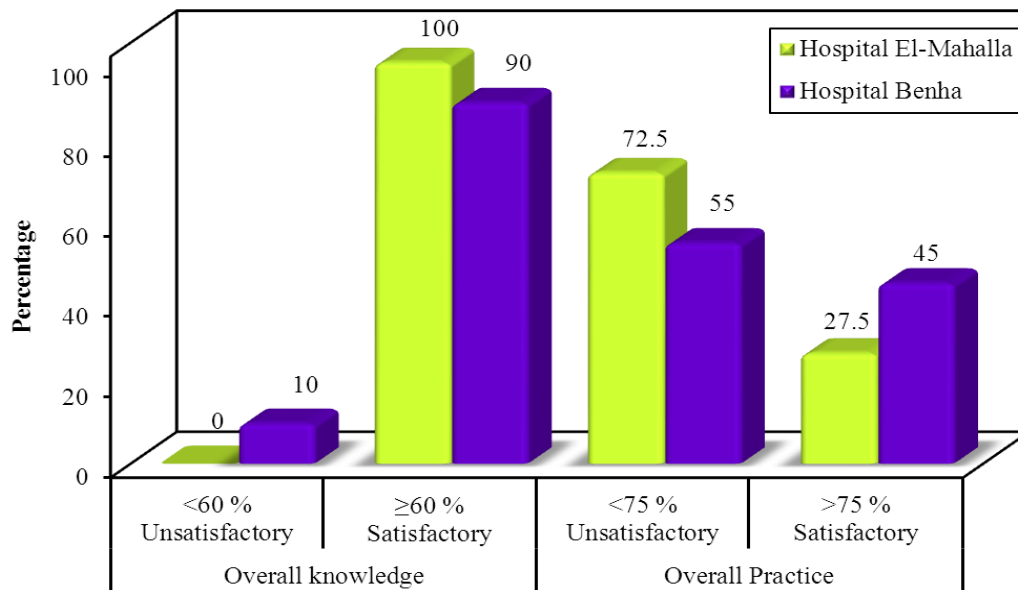


Figure 1: represented that, all nurses (100%) had satisfactory knowledge in El-Mahalla and 90% had satisfactory knowledge in Benha hospital ($FE p= 0.116$). In relation to nurses' practice, it was noticed there 72.5 % in El-Mahalla and 55.0% in Benha had unsatisfactory practice related to weaning from MV. that, they got <75%.

Figure 2 : Correlation between the nurses' knowledge and practice in El-Mahalla and Benha Hospitals. N=80

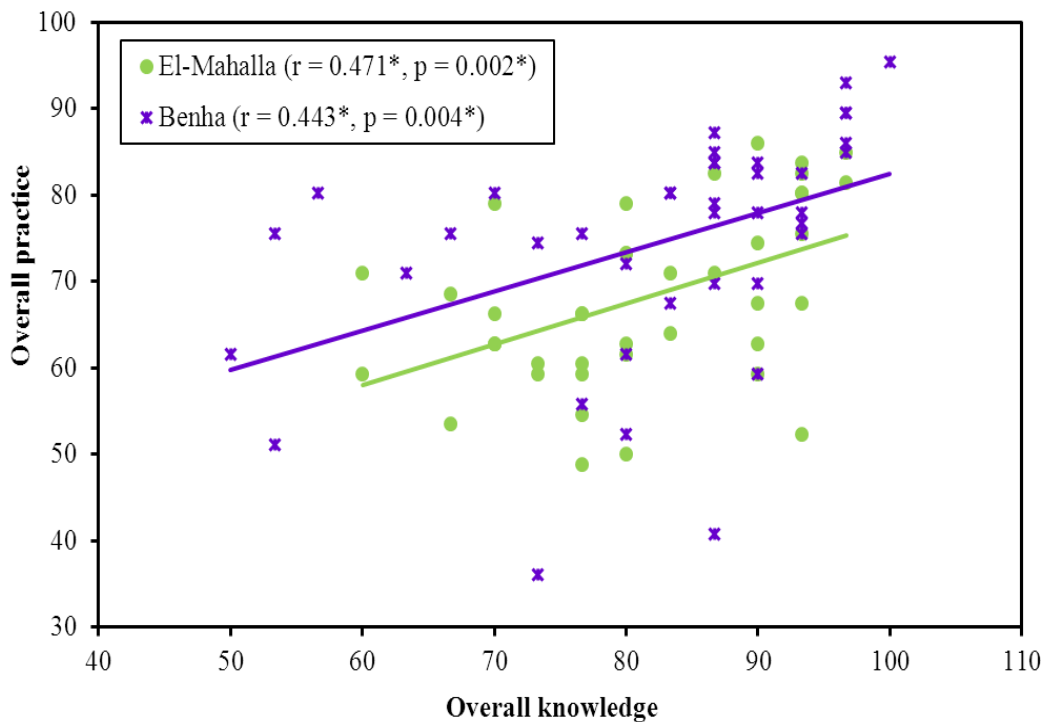


Figure 2 : revealed that; there was a significant relation between knowledge and practice in each hospital ($r= 0.471^* p= 0.002^*$) and ($r= 0.443^* p= 0.004^*$), respectively.

**The 5th Annual & 2nd International Scientific Conference of The Faculty of Nursing Benha University
In Collaboration with Najran University & Lebanese Nursing Student Association (LNSA)**

Table 4: Distribution of the studied sample of patients in El-Mahalla and Benha hospitals according to their personal characteristics. (N =80).

Personal data	Hospital				Test of sig.	P	Total (n = 80)	
	El-Mahalla (n = 40)		Benha (n = 40)				No.	%
	No.	%	No.	%				
Age (years)								
20- 30 years	1	2.5	0	0.0	$\chi^2=1.214$	MC p=1.000	1	1.3
31-40 years	3	7.5	4	10.0			7	8.8
41- 50 years	13	32.5	12	30.0			25	31.3
Above 50 years	23	57.5	24	60.0			47	58.8
Mean \pm SD.	53.75 \pm 11.92		53.58 \pm 10.79		t=0.069	0.945		
Sex								
Male	27	67.5	30	75.0	$\chi^2=0.549$	0.459	57	71.3
Female	13	32.5	10	25.0			23	28.8
Education								
Illiterate	11	27.5	9	22.5	$\chi^2=1.077$	0.783	20	25.0
Preparatory	16	40.0	16	40.0			32	40.0
Secondary	9	22.5	8	20.0			17	21.3
High	4	10.0	7	17.5			11	13.8
Marital Status								
Single	5	12.5	3	7.5	$\chi^2=2.512$	MC p=0.512	8	10.0
Married	27	67.5	29	72.5			56	70.0
Divorced	0	0.0	2	5.0			2	2.5
Widow	8	20.0	6	15.0			14	17.5
Setting								
Rural	29	72.5	20	50.0	$\chi^2=4.266^*$	0.039*	49	61.3
Urban	11	27.5	20	50.0			31	38.8

χ^2 , p: χ^2 and p values for Chi square test for comparing between the two groups

MC p: p value for Monte Carlo for Chi square test for comparing between the two groups

t, p: t and p values for Student t-test for comparing between the two groups*: Statistically significant at ≤ 0.05

Table 4 : illustrates the distribution of the studied sample of patients in El-Mahalla and Benha hospitals according to their personal characteristics. (n = 80). It shows that the majority of patients

**The 5th Annual & 2nd International Scientific Conference of The Faculty of Nursing Benha University
In Collaboration with Najran University & Lebanese Nursing Student Association (LNSA)**

were males, and married, and around two- thirds of them were aged more than 50 years old in El-Mahalla and Benha Hospitals (**P= 1.000**). Most of patients in El-Mahalla (**72.5%**) and **50%** in Benha live in rural areas (**p=0.039***).

Table (5a): Comparison between El-Mahalla and Benha hospitals according to the general condition of weaning MV patients (n = 80).

Variables	Hospital				χ^2	P	Total (n = 80)	
	El-Mahalla (n = 40)		Benha (n = 40)				No.	%
	No.	%	No.	%				
Haematocrit								
Less than 25%	14	35.0	8	20.0	2.257	0.133	22	27.5
More than 25%	26	65.0	32	80.0			58	72.5
HB.								
- Less than 10 mg/dl	12	30.0	5	12.5	11.787*	0.003*	17	21.3
- Equal 10 mg/dl	24	60.0	18	45.0			42	52.5
- More than 10mg/dl	4	10.0	17	42.5			21	26.3
Intake & output								
- Balanced	34	85.0	32	80.0	0.346	0.556	66	82.5
- Under normal	6	15.0	8	20.0			14	17.5
Albumin								
-Less than 2.5 g/dl	24	60.0	24	60.0	0.053	0.818	49	61.3
-More than 2.5 g/dl	16	40.0	16	40.0			31	38.8
Ca+								
- 8.5 :10.5 mg/dl	28	70.0	31	77.5	0.581	0.446	59	73.8
- Less than 8.5 mg/dl	12	30.0	9	22.5			21	26.3
Mg.								
-1.7 :2.4 mEq/L	32	80.0	32	80.0	0.00	1.000	64	80.0
-Less than 1.7 mg/dl	8	20.0	8	20.0			16	20.0
K.								
-3 :4.5 mEq/L	22	55.0	27	67.5	1.317	0.251	49	61.3
- Less than 3 mEq/L	18	45.0	13	32.5			31	38.8

χ^2 , p: χ^2 and p values for **Chi square test** for comparing between the two groups

*: Statistically significant at $p \leq 0.05$

Table 5a: represents the general condition of the weaning MV. patients comparing between El-Mahalla and Benha hospitals (n = 80). It showed that; two third (**65%**) of patients in El-Mahalla and 80% in Benha hospital had haematocrit more than 25%, but, it was insignificant. (**P= 0.133**). Regarding HB **60%** in El-Mahalla and **45%** in Benha had HB equal 10

**The 5th Annual & 2nd International Scientific Conference of The Faculty of Nursing Benha University
In Collaboration with Najran University & Lebanese Nursing Student Association (LNSA)**

mg/dl with significant difference ($p= 0.003^*$). Most of patients in El-Mahalla (85%) and in Benha (80%) hospitals had insignificant balance of intake& output ($P= 0.556$). Sixty percent of patients in both hospitals had less than 2.5 g/dl albumin, and 80% had 1.7:2.4 mg/dl Mg value, ($P=0.818$ and 1.00), respectively.

Table (5 b) (Cont.): Comparison between El-Mahalla and Benha hospitals according to the general condition of weaning MV patients (n = 80).

Variables	Hospital				χ^2	P	Total (n = 80)	
	El-Mahalla (n = 40)		Benha (n = 40)				No.	%
	No.	%	No.	%				
Respiration rate								
Less than 16 c/m	8	20.0	2	5.00	4.383	0.112	10	12.5
16 - 20 c/m	20	50.0	26	65.0			46	57.5
More than 20 c/m	12	30.0	12	30.0			24	30.0
Temperature								
36.5 :37.5 c	33	82.5	32	80.0	0.082	0.775	65	81.3
>37.5 c	7	17.5	8	20.0			15	18.8
Blood Pressure								
<140/80 mmhg	23	57.5	26	65.0	0.474	0.491	49	61.3
>140/80	17	42.5	14	35.0			31	38.8
Heart rate								
Bradycardia	10	25.0	0	0.00	11.767*	0.003*	10	12.5
Normal	19	47.5	28	70.0			47	58.8
Tachycardia	11	27.5	12	30.0			23	28.8
Pain								
Mild	28	70.0	24	60.00	0.879	0.348	52	65.0
Moderate	12	30.0	16	40.0			28	35.0
Sleep								
Adequate	17	42.5	14	35.0	0.474	0.491	31	38.8
Inadequate	23	57.5	26	65.0			49	61.3
Bowel movement								
Nothing	15	37.5	14	35.0	0.141	MC p= 1.000	29	36.3
Constipation	21	52.5	22	55.0			43	53.8
Diarrhea	4	10.0	4	10.0			8	10.0
Mental status								
Conscious	34	85.0	30	75.0	1.250	0.264	64	80.0
Drowsy	6	15.0	10	25.0			16	20.0
Mobility								
In bed	30	75.0	30	75.0	3.187	MC p= 0.209	60	75.0
In chair	2	5.0	6	15.0			8	10.0

**The 5th Annual & 2nd International Scientific Conference of The Faculty of Nursing Benha University
In Collaboration with Najran University & Lebanese Nursing Student Association (LNSA)**

Out of bed	8	20.0	4	10.0			12	15.0
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χ^2 , p: χ^2 and p values for **Chi square test** for comparing between the two groups

^{MC}p : p value for **Monte Carlo** for Chi square test for comparing between the two groups: Statistically significant at $p \leq 0.05$

Table 5b: represents the general condition of weaned MV patients comparing between El-Mahalla and Benha hospitals (n = 80). It showed that the majority of patients in El-Mahalla and Benha hospitals were conscious (85% and 75%), and their body temperature (82.5% - 80%) was from 36.5:37.5 c (P= 0.264 and 0.775) respectively. Concerning mild pain, 70% and 60% of studied patients in El-Mahalla and Benha hospitals had no significant difference although 57.5 and 65% of patients had inadequate sleep (P= 0.348 and 0.491), respectively. There was significant difference between the two hospitals in heart rate (p= 0.003*).

Table (6): Comparison between El-Mahalla and Benha hospitals according to the respiratory condition of weaned MV Patients (n = 80).

Variables	Hospital				χ^2	P	Total (n = 80)	
	El-Mahalla (n = 40)		Benha (n = 40)				No.	%
	No.	%	No.	%				
Swallowing reflex								
Present	29	72.5	36	90.0	4.021*	0.045*	65	81.3
Absent	11	27.5	4	10.0			15	18.8
PH								
Less than 7.35	20	50.00	24	60.0	7.810*	0.020*	44	55.0
7.35 to 7.45	18	45.00	8	20.0			26	32.5
7.45 to 7.48	2	5.00	8	20.0			10	12.5
PO ₂								
70 to 85 %	16	40.0	14	35.0	0.213	0.644	30	37.5
Above 85%	24	60.0	26	65.0			50	62.5
PCO ₂								
Less than 40%	24	60.0	24	60.0	0.00	1.000	48	60.0
40% to 50%	16	40.0	16	40.0			32	40.0
Respiratory pattern								
Normal	14	20.0	12	30.0	1.115	$^{MC}p=$ 0.939	26	32.5
Shallow	4	10.0	4	10.0			8	10.0
Deep	4	10.0	6	15.0			10	12.5
Rapid	10	25.0	8	20.0			18	22.5
Dyspnea	8	20.0	10	25.0			18	22.5
Breathing sound								
Normal	20	50.0	26	65.0	2.783	0.249	46	57.5
Wheezing	8	20.0	8	20.0			16	20.0
Crepitation	12	30.0	6	15.0			18	22.5
Cough								
No	18	45.0	16	40.0	0.340	0.884	34	42.5
Dry	8	20.0	10	25.0			18	22.5
Productive	14	35.0	14	35.0			28	35.0
Colour of secretion								
Clear	11	27.5	13	32.5	1.119	$^{MC}p=0.600$	24	30.0
Turbid	3	7.5	1	2.5			4	50.0
Amount of secretion								
Minimal	11	27.5	13	32.5	1.119	$^{MC}p=0.600$	24	30.0
Maximal	3	7.5	1	2.5			4	50.0

χ^2 , p: χ^2 and p values for **Chi square test** for comparing between the two groups

**The 5th Annual & 2nd International Scientific Conference of The Faculty of Nursing Benha University
In Collaboration with Najran University & Lebanese Nursing Student Association (LNSA)**

^{MC}p: p value for Monte Carlo for Chi square test for comparing between the two groups

*: Statistically significant at $p \leq 0.05$

Table 6: represents the respiratory condition of the weaned MV patients comparing between El-Mahalla and Benha hospitals (n = 80). It showed that more than two-thirds of patients (72%) in El-Mahalla hospital and the majority (90%) in Benha had swallowing reflex with significant difference ($P= 0.045^*$). As regards pH, there was significant difference between El-Mahalla (50%) and Benha (60%) hospitals which it was less than 7.35 ($P= 0.020^*$) respectively. Sixty percent of patients in El-Mahalla and 65% in Benha had Po_2 above 85%; on the other hand, they had PCO_2 less than 24% and 40% of them were their PCO_2 from 40%- 50% respectively. Around one third of patients (35%) in both hospitals had productive cough with minimal secretion (27.5% and 32%) and dyspnea (20% and 25%) respectively.

Table (7 a): Mean score, standard deviation and significant relation between nurses 'knowledge and practice and patients' general health outcomes in El-Mahalla and Benha hospitals.

Variables	El-Mahalla (n = 40)		Benha (n = 40)	
	knowledge	practice	knowledge	Practice
Haematocrit				
Less than 25%	84.81 ± 5.80	71.19 ± 9.15	82.82 ± 9.41	72.90 ± 14.71
More than 25%	80.43 ± 11.01	67.25 ± 10.53	82.47 ± 14.66	75.37 ± 12.94
t(p)	1.585 (0.125)	1.014 (0.317)	0.079(0.938)	0.541(0.592)
HB.				
Less than 10 mg/dl	84.17 ± 5.84	71.66 ± 9.67	81.85 ± 10.94	71.32 ± 16.0
Equal 10 mg/dl	81.59 ± 11.58	68.27 ± 10.38	81.90 ± 13.85	72.92 ± 12.94
More than 10mg/dl	79.09 ± 10.01	65.33 ± 10.51	84.67 ± 14.16	80.93 ± 10.80
t(p)	0.569(0.571)	0.880(0.423)	0.162(0.851)	1.597 (0.216)
Intake & output				
Balanced	80.91 ± 10.52	68.08 ± 10.22	82.63 ± 13.89	74.81 ± 12.52
Under normal	83.81 ± 8.70	68.44 ± 11.26	82.38 ± 8.97	73.42 ± 18.16
t(p)	0.680(0.501)	0.084(0.934)	0.045(0.965)	0.245(0.808)
Albumin				
Less than 2.5 g/dl	82.22 ± 9.66	66.42 ± 10.42	81.07 ± 13.08	72.56 ± 13.28
More than 2.5 g/dl	80.21 ± 11.12	70.71 ± 9.75	85.11 ± 13.08	77.91 ± 13.37
t(p)	0.608 (0.547)	1.307 (0.199)	0.947 (0.350)	1.230 (0.226)
Ca				
8.5-10.5mg/dl	80.97 ± 10.41	67.40 ± 10.04	83.10 ± 13.93	73.80 ± 13.34
Less than 8.5 mg/dl	82.96 ± 9.78	70.67 ± 11.21	81.39 ± 11.23	76.36 ± 13.96
t(p)	0.513 (0.611)	0.838 (0.407)	0.374 (0.710)	0.549(0.586)
Mg				
1.7-2.4 mEq/L	80.98 ± 10.36	67.44 ± 9.95	82.78 ± 13.13	74.53 ± 12.02
Less than 1.7 mEq/L	83.89 ± 9.53	72.09 ± 12.06	82.0 ± 13.54	74.65 ± 17.69
t(p)	0.640(0.526)	1.025 (0.312)	0.161 (0.873)	0.023(0.982)
K				
3-4.5 mEq/L	80.53 ± 10.35	66.88 ± 10.59	79.31 ± 14.68	73.89 ± 12.25

**The 5th Annual & 2nd International Scientific Conference of The Faculty of Nursing Benha University
In Collaboration with Najran University & Lebanese Nursing Student Association (LNSA)**

Less than 3 mEq/L	82.89 ± 10.07	70.23 ± 9.65	87.50 ± 8.39	75.58 ± 15.33
t(p)	0.704(0.486)	1.000 (0.324)	2.241*(0.031*)	0.388 (0.700)

t and p values for Student t-test F,p: F and p values for ANOVA test *: Statistically significant at $p \leq 0.05$

Table 7a : illustrates Mean Score, Standard deviation and Significant Relation between the nurses' knowledge and practice and patients' general health outcomes assessment in El-Mahalla and Benha hospitals. It revealed that; there was significant relation between the nurses' knowledge in Benha hospital and patients' general health outcomes in relation to K value only ($p=0.031^*$).

Table (7b) (Cont.): Mean Score, Standard deviation and a Significant Relation of overall nurses 'knowledge and practice and patients' general health outcomes in El-Mahalla and Benha hospitals. No=80

Variables	El-Mahalla (n = 40)		Benha (n = 40)	
	knowledge	Practice	Knowledge	Practice
Vital signs				
Respiration rate				
Less than16 c/m	82.0 ± 5.06	68.37 ± 7.82	84.67 ± 5.06	71.16 ± 9.13
16 to 20 c/m	83.48 ± 10.75	71.89 ± 9.61	84.20 ± 13.45	78.36 ± 12.44
More than20 c/m	77.22 ± 9.93	60.85 ± 8.86	78.61 ± 14.46	68.70 ± 14.96
F(p)	1.540 (0.228)	5.662*(0.007*)	0.786(0.463)	2.392 (0.105)
Temperature				
36.5 : 37.5 c	80.0 ± 9.43	67.22 ± 9.97	81.62 ± 13.59	73.78 ± 13.43
>37.5 c	87.08 ± 11.74	71.80 ± 11.24	87.14 ± 9.70	78.24 ± 13.67
t(p)	1.811 (0.078)	1.134 (0.264)	1.017 (0.316)	0.795(0.431)
Blood Pressure				
140 /80 mmhg	80.83 ± 9.29	66.81 ± 10.87	83.73 ± 12.26	73.77 ± 14.50
>140 /80 mmhg	82.29 ± 11.66	70.13 ± 9.23	80.67 ± 14.54	75.89 ± 11.70
t(p)	0.439(0.663)	1.003 (0.322)	0.714(0.479)	0.481(0.634)
Heart rate				
Bradycardia	82.0 ± 6.91	70.23 ± 6.66	75.33 ± 15.92	74.42 ± 2.60
Normal	83.48 ± 10.56	71.49 ± 9.87	85.83 ± 12.13	77.08 ± 13.75
Tachycardia	77.22 ± 9.93	60.85 ± 8.86	78.79 ± 12.59	69.13 ± 14.67
F(p)	1.540 (0.228)	5.325*(0.009*)	2.087 (0.138)	1.351 (0.271)
Pain				
Mild	83.21 ± 9.68	73.17 ± 8.38	88.46 ± 8.86	78.09 ± 14.10
Moderate	78.10 ± 10.60	58.80 ± 6.01	71.67 ± 12.79	68.02 ± 9.25
t(p)	1.541 (0.132)	5.663*(<0.001*)	4.379*(<0.001*)	2.399*(0.021*)
Sleep				
Adequate	87.50 ± 8.30	76.45 ± 7.60	90.89 ± 7.61	82.63 ± 9.03
Not adequate	77.36 ± 9.38	62.60 ± 7.78	77.60 ± 13.21	69.72 ± 13.38
t(p)	3.504*(0.001*)	5.569*(<0.001*)	4.036*(<0.001*)	3.305*(0.002*)
Bowel movement				
Nothing	81.96 ± 10.93	69.43 ± 10.72	82.78 ± 11.79	76.26 ± 12.54
Constipation	81.58 ± 10.02	68.48 ± 10.39	81.25 ± 14.37	72.92 ± 14.44
Diarrhea	78.33 ± 9.62	61.05 ± 5.41	90.0 ± 6.09	79.36 ± 9.84
F(p)	0.202(0.818)	1.107 (0.341)	0.762(0.474)	0.520(0.599)
Mental status				
Conscious	83.43 ± 9.30	69.12 ± 10.63	85.11 ± 11.99	79.42 ± 8.08
Drowsy	70.0 ± 7.30	62.60 ± 5.62	75.0 ± 13.81	60.0 ± 15.93

**The 5th Annual & 2nd International Scientific Conference of The Faculty of Nursing Benha University
In Collaboration with Najran University & Lebanese Nursing Student Association (LNSA)**

t(p)	3.346*(0.002*)	2.225*(0.045*)	2.224*(0.032*)	3.700*(0.004*)
Mobility				
In bed	79.0 ± 9.56	66.09 ± 9.53	80.0 ± 13.50	70.97 ± 13.19
In chair	80.83 ± 9.57	66.86 ± 11.80	83.33 ± 7.20	79.94 ± 5.40
Out of bed	93.89 ± 1.36	79.26 ± 5.95	95.0 ± 4.08	88.95 ± 5.03
F(p)	7.003*(0.003*)	5.021*(0.012*)	3.773*(0.032*)	6.141*(0.005*)

t and p values for Student t-test F,p: F and p values for ANOVA test*: Statistically significant at p ≤ 0.05

Table 7b : illustrates mean score, standard deviation and a significant relation between the nurses' knowledge and practice and patients' general health outcomes assessment in El-Mahalla and Benha hospitals. It was noticed that, there were significant relations between patients' sleep, mental status, mobility, with the nurses' knowledge and practice in El-Mahalla and Benha hospitals (**P=0.001* and 0.002***), (**P=0.002*, 0.032*, 0.045*, and 0.004***) and (**P=0.003*, 0.012, 0.032* and 0.005***) respectively. Also, there was a significant relation of patients' pain with the nurses' knowledge and practice in Benha hospital (**P<0.001* and 0.021***) and the nurses' practice in El-Mahalla hospital (**P<0.001***). In addition, it was found that the nurses' practice in El-Mahalla hospital had a significant relation with the patients' respiratory rate and heart rate (**P=0.007*, and 0.009***), respectively.

Table (8): Mean Score, Standard deviation and a significant relation between the nurses' knowledge and practice and the patients' respiratory health outcomes assessment in El-Mahalla and Benha hospitals. (N= 80)

Variables	El-Mahalla (n = 40)		Benha (n = 40)	
	knowledge	practice	knowledge	Practice
Swallowing reflux				
Present	81.90 ± 10.76	69.0 ± 10.06	80.22 ± 13.89	73.95 ± 12.76
Absent	78.0 ± 2.98	62.09 ± 10.61	89.67 ± 6.56	76.39 ± 15.76
t(p)	1.731 (0.097)	1.428 (0.161)	2.881*(0.007*)	0.494(0.624)
PH				
Less than 37.35	80.91 ± 10.94	69.29 ± 9.31	81.97 ± 15.04	74.31 ± 14.34
37,35 to 37.45	81.28 ± 9.96	64.94 ± 11.08	87.69 ± 5.67	74.78 ± 13.49
37.45 to 37.48	84.0 ± 8.63	71.40 ± 12.18	72.0 ± 12.38	75.12 ± 11.17
F(p)	0.182(0.835)	1.026 (0.368)	2.921 (0.066)	0.009 (0.991)
PO₂				
70 to 85 %	79.33 ± 9.53	66.74 ± 9.15	80.44 ± 14.79	74.42 ± 14.30
Above 85%	82.67 ± 10.54	68.98 ± 10.96	83.87 ± 12.04	74.65 ± 13.14
t(p)	1.003 (0.322)	0.662 (0.512)	0.798(0.430)	0.052(0.959)
PCO₂				
Less than 40%	83.75 ± 9.50	69.38 ± 11.0	83.61 ± 12.16	74.51 ± 13.39
40% to 50%	77.92 ± 10.46	66.28 ± 9.04	81.04 ± 14.59	74.64 ± 13.85
t(p)	1.828 (0.075)	0.935(0.356)	0.604(0.549)	0.028(0.978)
Respiratory pattern				
Normal	84.62 ± 8.66	67.44 ± 11.71	91.28 ± 4.82	78.71 ± 9.46
Shallow	84.17 ± 11.34	76.16 ± 9.03	79.17 ± 20.07	80.52 ± 7.0
Deep	86.67 ± 7.82	70.93 ± 12.71	81.33 ± 12.82	82.56 ± 6.52
Rapid	77.78 ± 12.02	68.73 ± 8.77	76.30 ± 16.70	67.70 ± 15.32
Dyspnea	76.30 ± 9.35	63.44 ± 7.47	78.52 ± 9.59	68.35 ± 16.87
F(p)	1.696 (0.173)	1.229 (0.316)	2.640*(0.050*)	2.299 (0.078)
Breathing sound				
Normal	85.51 ± 8.32	69.92 ± 12.07	86.96 ± 12.18	76.09 ± 13.73
Wheezing	76.25 ± 12.27	68.75 ± 7.23	71.25 ± 11.94	72.82 ± 7.76
Creptitation	75.56 ± 8.33	63.05 ± 5.29	81.48 ± 10.69	72.22 ± 16.99
F(p)	5.357*(0.009*)	1.508 (0.235)	5.283*(0.010*)	0.342(0.713)
Cough				
No	80.98 ± 10.56	67.41 ± 10.54	-	-
Dry	84.67 ± 8.69	70.93 ± 8.10	84.87 ± 11.68	79.16 ± 9.26
Productive	80.0	79.07	81.48 ± 81.48	72.35 ± 14.63
Test f sig.(p)	F=0.285(0.754)	F=0.832(0.443)	t=0.945(0.350)	t=1.112(0.272)

**The 5th Annual & 2nd International Scientific Conference of The Faculty of Nursing Benha University
In Collaboration with Najran University & Lebanese Nursing Student Association (LNSA)**

Colour of secretion				
Clear	85.15 ± 11.29	71.35 ± 11.40	80.77 ± 12.48	70.93 ± 16.51
Turbid	81.67 ± 14.01	70.06 ± 10.72	100.0	95.35
F(p)	0.498(0.626)	0.197(0.847)	1.484 (0.163)	1.425 (0.180)
Amount of secretion				
Minimal	85.15 ± 11.29	71.35 ± 11.40	80.77 ± 12.48	70.93 ± 16.51
Maximal	81.67 ± 14.01	70.06 ± 10.72	100.0	95.35
F(p)	0.498(0.626)	0.197(0.847)	1.484 (0.163)	1.425 (0.180)

t, p: t and p values for Student t-test F,p: F and p values for ANOVA test*: Statistically significant at $p \leq 0.05$

Table 8 : illustrates Mean Score, Standard deviation and a significant relation between the nurses' knowledge and practice and the patients' respiratory health outcomes assessment in El-Mahalla and Benha hospitals. (N= 80). It revealed that, there was significant relation between patients' swallowing reflex, respiratory pattern, and the nurses' knowledge in Benha ($p= 0.007^*$, and 0.050^*) respectively. Also, there was significant relation between the patients' breathing sound and the nurses' knowledge in El-Mahalla and Benha hospitals ($P= 0.009^*$ and 0.010^*).

Discussion

Because the responsibility of critical care nurses in collaboration with physician, the critical care nurse should be able to determine when the patient is liable to be weaned from MV by using EBNP to improve the patients' health outcome (Alan et al., 2013). The present study aimed to explore the relationship between the nurses' knowledge of EBP in regard to weaning from mechanically ventilated patients and their health outcomes.

From personal characteristics of the nurses were included in the study setting, it was found that about half of nurses in El-Mahalla were aged from 20-30 years old and more than two-thirds in Benha were aged more than 30 - 40 years old. These findings are in line with a study carried out by Ali (2013) who revealed that three-quarters of nurses were aged from 20- 30 years old and about 35% were more than 30 years old. Also, the nurses' experience in both Hospitals was from 2 - 5 years. This finding is inconsistent with Pradhan and Shrestha (2017) who found in their study that the majority of nurses had experience less than 2 years. This disagrees with Wongrostrai, et al. (2016) who found that the majority of nurses' experience was from 6- 10 years.

In relation to nurses' gender, it was found that all of nurses were females in both hospitals. This finding agrees with Wongrostrai, et al. (2016). According to their level of education, most of nurses had bachelor degree and a minority had master degree in both hospitals. This finding is consistent with another study carried out by Wongrostrai, et al., (2016). Also, it was noticed that the majority of them attended programs for mechanical ventilation and extubation, and this result isn't in line with Pradhan and Shrestha (2017) who had explored the nurses' knowledge needs regarding weaning criteria; only 24.6% of nurses were trained on mechanical ventilation.

Regarding the nurses' knowledge, the present study illustrated in El-Mahalla and Benha Hospitals that the highest mean knowledge score of nurses was regarding criteria of weaning and the least mean knowledge score was regarding MV alarms, however, there was a significant



**The 5th Annual & 2nd International Scientific Conference of The Faculty of Nursing Benha University
In Collaboration with Najran University & Lebanese Nursing Student Association (LNSA)**

difference of nurses' knowledge between El-Mahalla and Benha hospitals concerning" Alarm as regard MV. Concerning weaning criteria, the majority of nurses answered correctly in both hospitals. It may be attributed that the majority of studied nurses follow hospital routine nursing care for weaning patient from MV and they attended to educational Hospital program, but they didn't follow the entire standardized nursing care plan. This finding disagrees with a study carried out by **Pradhan and Shrestha (2017)** who reported that the level of nurses' knowledge regarding "weaning criteria" represented less than 50% in their study.

In relation to the least score in the nurses' knowledge concerning "alarm of MV", it may be attributed to that is one of the physicians' duties not of nursing responsibility, however, the majority of studied nurses had bachelor degree in both hospitals. Since, the nurses spend a large part of their working hours at ICU; they must therefore assume this responsibility for MV alarm. **Wiegand (2013)** ensured that low pressure alarm caused by disconnecting of patient, curt leak or change resistance and high pressure caused by increasing secretion, patient biting on the tube, increased resistance coughing or gagging, patient fighting ventilator (vent asynchrony) or condensed (water) in tubing.

Generally, the nurse's knowledge was adequate, but the majority of them had unsatisfactory level of practice. It may be contributed to that the nurses didn't integrate their knowledge into practice in providing adequate nursing care to critically ill patients concerning weaning patients from MV. Obviously in the current study, there was a significant relation between knowledge and practice of the subjects' nurses regarding patients' weaning from MV in both hospitals and this contrasted with **Ali (2013)** who found in her study that there wasn't any significant difference between knowledge and practice.

Regarding nurses' practice for weaning of MV patient in both hospitals, preparing patient to wean from MV, they got the highest mean score in both hospitals. On the other hand, the lowest score was in maintaining emotional state for patient after extubation in El-Mahalla hospital, however, assessment of patient before weaning from MV was in Benha hospital. This may be attributed to lack of practice as a result of lack of training, lack of hospital facilities and shortage of nurses and time. In relation to maintaining emotional state, it was found that most of nurses neglected the psychological and emotional care of mechanically ventilated patients and didn't stay with the patients or limited visitors. This was congruent with **Elliott, et al. (2010)** who stated that the professionals can raise their patient care to another level by acting on understanding of psychological health to empower them. **Edwards and Sabato (2009) and Polit and Beck (2012)** reported that, it's important to prepare patient before weaning to ensure safe and successful extubation so in the case of patient not prepared enough that may lead to weaning failure and a lot of complication as patient's retardation.

Regarding study subjects of patients, it was found that most of them were aged more than 50 years old; this is in similarity with **Giakoumidakis, et al. (2011)** in his study. According to patient's sex, the present study revealed that most of patients were male in both hospitals and this agrees with **Giakoumidakis, et al. (2011)** who found in their study that most of patients were male,



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**The 5th Annual & 2nd International Scientific Conference of The Faculty of Nursing Benha University
In Collaboration with Najran University & Lebanese Nursing Student Association (LNSA)**

on the other hand, this disagrees with **Giménez, et al. (2016)** reported that most patients were females in their study. In relation to their education, the present study showed that most of patients had preparatory school in both hospitals; as they were from rural areas (72% and 50%), respectively.

The current study focused on the weaned patients' health outcome to ensure successful weaning, that two aspects were assessed in the study, general parameters and the second concerned respiratory parameters. **Concerning, general assessment**, the present study showed that two -thirds of patients in El-Mahalla and most in Benha had haematocrit more than 25% and this agrees with **Wyckoff and Houghton (2009)** who reported that the patient should be extubated when haematocrit becomes more than 25% to ensure successful weaning. In relation to haemoglobin, few patients in El-Mahalla and more than one- third in Benha had haemoglobin more than 10 mg /dl and less than forty patients in both hospitals had albumin more than 2.5 g/dl. This wasn't related to any relations with nurses' knowledge and practice in both hospitals. This finding contrast with **Des and Burton (2013)** who focused on that the weaning patient should be assessed for normal HB and albumin level. **Rosenoer, et al. (2014)** ensure that the normal haemoglobin level in male equal 14-18 g/dl and in female equal 12-16 g/dl and **Rosenoer, et al. (2014)** reported that normal albumin ranges from 3.5-4.5 g /d l for weaning patient.

As regards serum electrolytes (ca+, mg, k) the majority of patients in both hospitals had normal ca+, mg, and k in both hospitals, and this in line with **Brown et al. (2017)** who reported that normal electrolytes are important for weaning that may influence muscles function so, calcium, magnesium and potassium should be monitored. The current study agrees with **Hammash (2010)** who found that potassium value in her study ranged from 3- 6.2 mEq/L. **Robert et al. (2014)** revealed that normal potassium level equals 3- 3.5 mEq/L. There was no relation between electrolytes and nurses' practice in El-Mahalla hospital and in Benha hospital; otherwise there was a relation between electrolytes and nurses' knowledge in Benha only.

Concerning intake (I) & output (O), it was found in the current study that the majority of patients in both hospitals had balanced I & O despite there was no relation between I &O and nurses' knowledge, and practice in both hospitals. This may be attributed to that the majority of nurses ensured good hydration by give them warm fluids. Weaning success depends on the balanced I and **Wiegand (2013) and Stein (2013)** reported that successful weaning of patients from mechanical ventilation has been associated with improved nutritional and hydration status.

Concerning respiratory parameters, fifty of the study subjects of patients in El-Mahalla and more than two-thirds in Benha had normal respiratory rate from 16- 20 c/m and this contrast with **Shehata, et al. (2012)** who reported in his study that patients' respiratory rate ranged from 22- 31 c/m. during weaning. **Hillegass (2012)** reported that patients should be able to generate spontaneous breathing at respiratory rate 12- 20 b/m to promote successful weaning.

The present study showed that the majority of patients had normal temperature from 36.5- 37.5°C. This may be due to that the majority of nurses assessed the vital signs correctly in both hospitals. This agrees with **Hohnson and Taylor (2012)** who reported that the body temperature for weaned patient



**The 5th Annual & 2nd International Scientific Conference of The Faculty of Nursing Benha University
In Collaboration with Najran University & Lebanese Nursing Student Association (LNSA)**

ranges from 36-37.3°C in normal person. Body temperature should be frequently assessed for weaning patients to ensure absence of infection as reported by **Paz and West (2013)**. Concerning heart rate and blood pressure, most of our patients had normal heart rate (60- 100 b/ m) and blood pressure < 140/ 80 mmhg. This was in the same line with **White (2012)** who stated that the weaned patient should be hemodynamically stable. Hemodynamic instability is one of the contributing factors leading to longer mechanical ventilation (**Andreoli et al. 2010**).

The present study also showed that most of patients in both hospitals had mild pain, this may be due to significant relation between nurses' knowledge, and practice and pain in Benha and in practice only in El-Mahalla that leads to applying measures to decrease feeling of pain for patient after weaning, giving them warm fluids to decrease laryngeal pain, promote sleep by limiting visitors, continuous measuring ABG and continuous monitoring of patient for any signs of distress. On the other hand, patients in both hospitals had inadequate sleep. This may be due to inability of subjects' nurses to provide privacy and limit visitors. This contrasts with **Ackley, et al. (2014)** who stated that weaned patients should have adequate sleep pattern and normal state of consciousness.

Regarding consciousness level, that the majority of our patients were conscious in both hospitals and there was relation between nurse' knowledge and practice, although the nurses didn't assess conscious level correctly in both hospitals. **Walker and Colledge (2013)** revealed that conscious level must be adequate to protect weaned patients' airway, comply with physiotherapy and cough.

It was found in the current study that most of patients had no cough and little secretion and this agrees with **Basil, et al. (2011)** who reported that the patient should have cough and ability to manage secretions and there was no relation between cough and nurses' knowledge or practice in both hospitals. Regarding swallow reflux, the present study showed that the 72% of patients in El-Mahalla and the most in Benha were had swallowing reflex; and there was relation between swallowing reflex with nurses' knowledge at Benha hospital.

Concerning respiratory patients' outcome assessment, most of patients had PH less than 7.35 , this disagrees with **Shehata, et al. (2012)** who stated that PH of weaned patients ranged from 7.41- 7.49. This may be attributed that more than one third of nurses in both hospitals had inadequate knowledge about ABG especially normal PH value. As regards PaO₂ and PaCO₂, it was found that most of patients had PaO₂ from 85 -95% and PaCO₂ from 35%- 40% and this disagrees with **Shehata, et al. (2012)** who reported that most of patients had PaO₂ above 69.2% and PaCO₂ ranged from 52: 58%. **Cameran, et al. (2014)** illustrated that normal PaO₂ ranged from 80-100 % & normal range of PaCO₂ 35- 45%. This might be attributed to frequent assessment of ABGs, and PaO₂ that reflect normal conscious state and normal respiratory pattern. However, no relation was found between the patients' ABGs and nurses' knowledge or practice in both hospitals. As regards to respiratory pattern, patients in El-Mahalla and 25% in Benha experienced dyspnea after weaning. **Thomas, et al. (2011)** revealed that rapid, shallow breathing developed almost immediately after discontinuation of

**The 5th Annual & 2nd International Scientific Conference of The Faculty of Nursing Benha University
In Collaboration with Najran University & Lebanese Nursing Student Association (LNSA)**

ventilation. Obviously, there are no relations between respiratory pattern and nurses' knowledge & practice in El-Mahalla and practice in Benha.

Conclusion

Based upon the results of this study, we concluded that nurse's knowledge as regards mechanical ventilation and weaning was adequate and satisfactory by all entirely nurses in El-Mahalla Hospital and the majority of the nurses in Benha Hospital. On the other hand, the majority of studied nurses had unsatisfactory practice in both hospitals El-Mahalla and Benha. These findings may be attributed to that the nurses didn't integrate their knowledge into practice in providing adequate nursing care to critically ill patients concerning weaning patients from MV. Obviously in this current study's results, there was a significant relation between knowledge and practice of the subjects' nurses regarding patients' weaning from MV. in both hospitals.

Concerning the relation of nurses' knowledge and practice with patients' health outcome, it was founded that, there were significant relations between patients' sleep, mental status, mobility, with the nurses' knowledge and practice in El-Mahalla and Benha hospital. Also, there was a significant relation of patients' pain with the nurses' knowledge and practice in Benha hospital and only with the nurses' practice in El-Mahalla hospital. In addition, the nurses' practice in El-Mahalla hospital has a significant relation with the patients' respiratory and heart rates. Also, there was a significant relation between patients' swallowing reflex, respiratory pattern, and the nurses' knowledge in Benha. Finally, a relation between the patients' breathing sound and the nurses' knowledge in El-Mahalla and Benha was also found. Weaning from MV can be complex and requires use of combined skills and experts of multidisciplinary approach.

Recommendation:

Upon the completion on the study, it can be recommended that:

- Nurses working in the critical care unit and dealing with mechanical ventilated patients should update their knowledge and practice through attending in-service training program and workshop periodically and regularly to improve standard of nursing care given to mechanically ventilated patients.
- Establish guidelines and standard of care for early weaning patients from MV to provide acceptable level of care and decrease cost effectiveness and complications.

Further research should focus on:

- Implementing strategies designed to decrease the incidence of extubation failure and long term complications during ICU stay.
- Develop standards for early weaning of patient based on its predictors.
- Further studies should focus on assessment of problems facing critical care nurses and the effectiveness of their care on the patients' outcomes.



**The 5th Annual & 2nd International Scientific Conference of The Faculty of Nursing Benha University
In Collaboration with Najran University & Lebanese Nursing Student Association (LNSA)**

References

- Ackley, B. J., and Ladwig, G. B. (20, Jan, 2013):** Nursing diagnosis handbook, an evidence-based guide to planning care 10th ed, Elsevier, p 878.
- Ackley, B. J., Ladwig, G. B., and Makic, M. B. F (2014):** nursing diagnosis handbook on evidence – based guide to planning care, chapter dysfunctional ventilatory weaning response, 11th ed, Elsevier, p 924.
- Aitken L. and Chaboyer W. (Jan 4, 2016):** Acccn's critical care nursing, 1st ed, Elsevier, p 487.
- Alan RA. David RB. Lain KM. and Janathan T. (Aug 8, 2013):** smith & Aitken head's textbook of anesthesia, 6th ed, Elsevier, p 904.
- Ali, N. S. (Nov 5, 2013):** Critical Care Nurses' knowledge and compliance with ventilator associated pneumonia bundle at Cairo university hospitals. Critical Care, 4(15).
- Andreoli, T. E., Fitz, J. G., Benjamin, I., Griggs, R. C., et al., (Apr 6, 2010):** Andreoli and Carpenter's Cecil Essentials of Medicine E-Book, chapter 23 essentials in critical care medicine, 8th ed, Elsevier, p 261.
- Anne GP., Patricia AP. and Wendy O. (Jan 8, 2015):** Nursing intervention and clinical skills e- book, chapter 6, 6th ed., Elsevier, P 100.
- Anne L. Silvestri and Silvestri A. (Jan 12, 2018):** Saunders comprehensive review for NCLEX-PN, 7th ed, Elsevier, p 68.
- Avioli, L. V., and Krane, S. M. (Sep 11, 2013):** Metabolic bone disease (Vol. 2), chapter hypo parathyroidism, 1st ed, Academic Press, p 243.
- Basil FM, David KM. and Martin S. (2011):** Core Topics in Neuroanaesthesia and Neurointensive Care, chapter 24 spinal cord injury, 1st ed., Cambridge University Press, P 378.
- Brown, D., Edwards, H., Seaton, L., and Buckley, T. (2017):** Lewis's Medical-surgical Nursing: Assessment and Management of Clinical Problems, section 5 problems of oxygenation and ventilation, 5th ed, Australia and New Zealand, p 498.
- Burns, N., and Grove, S. K. (2010):** Understanding Nursing Research-eBook: Building an Evidence-Based Practice, 5th ed, Elsevier, p81.
- Cairo, J. M. (2015):** Pilbeam's Mechanical Ventilation-E-Book: Physiological and Clinical Applications chapter 19, 20, 6th ed, Elsevier, p 9, 233, 364:388
- Cairo J. M., Sandra T Hinskoi and Susan P. Pilbeam (2016):** Work book for Pilbeam's mechanical ventilation E-Book, 6th ed, Elsevier, p 183.
- Cameran P., Jelinek G., Anne-Maree Kelly, Anthony Brown, et al., (Apr, 2014):** text book of emergency medicine E-book, 4th ed, Elsevier, p 434.
- Chang, D. W. (Mar 20, 2013):** Workbook for Chang's Clinical Application of Mechanical Ventilation, chapter 1, 3, 4, 4th ed, Cengage Learning, p56, 127.
- Chiumello D. (28, Apr, 2017):** Acute respiratory distress syndrome, 1st ed, Springer, p 147.
- Des Jardins, T., & Burton, G. G. (Aug 13, 2013):** Clinical Manifestations & Assessment of Respiratory Disease-E-Book, chapter 9 the therapist – driven program and the role of the respiratory.
- Edwards, S. L., and Sabato, M. (Oct 1, 2009):** A Nurse's Survival Guide to Critical Care E-Book, 1st ed, Elsevier, p 241.



**The 5th Annual & 2nd International Scientific Conference of The Faculty of Nursing Benha University
In Collaboration with Najran University & Lebanese Nursing Student Association (LNSA)**

- Elliott M., Nava S. and Schonhofer B. (Sep 24, 2010):** Noninvasive ventilation and weaning: - principles and practice, psychological issues for the mechanically ventilated patient, 1st ed, CRC Press, p 59.
- Ferrer M. and Pelosi P. (Mar 1, 2012):** New development in mechanical ventilation, 1st ed, European Respiratory Society, p 68.
- Ganda, K. (May 30, 2013):** Dentist's Guide to Medical Conditions, Medications and Complications, 2nd ed, John Wiley & Sons, p 45.
- Giakoumidakis, K., Eltheni, R., Brokalaki, H., Galanis, P., et al., (2011):** Preoperative and intraoperative risk factors for prolonged mechanical ventilation among cardiac surgery patients, Health science journal, 5(4), 297.
- Giménez, M. L., Verde, G. A., Salvati, I. G., Tozzi, W. A., et al., (2016):** Characteristics of Patients Weaning from Invasive Mechanical Ventilation. A Multicenter Study. Revista Americana de Medicina Respiratoria, 16(2), 113- 119.
- Goldsworthy, S., and Graham, L. (Dec 10, 2013):** Compact clinical guide to mechanical ventilation: foundations of practice for critical care nurses, 1st ed, Springer, p86, 87.
- Hansen, B. S., and Severinsson, E. (Aug 23, 2007):** Intensive care nurses' perceptions of protocol-directed weaning—a qualitative study. Intensive and Critical Care Nursing, 23(4), 196-205.
- Hammash, M. H. (2010):** Cardiac rhythm during mechanical ventilation and weaning from ventilation, UKnowledge
- Hasan A. (Feb 1, 2010):** Understanding Mechanical Ventilation: A Practical Handbook, chapter 12 discontinuation from mechanical ventilation, 2nd ed, Springer, p391.
- Haugen, N., and Galura, S. J. (2010):** Ulrich & Canale's Nursing Care Planning Guides-E-Book, chapter 4 A cutal risks for dysfunctional ventilatory weaning response, 7th ed , Elsevier, p 151.
- Hillegass E. (Dec 23, 2012):** Essentials of cardiopulmonary physical therapy, 3rd ed, Elsevier, p 586.
- Hinski, S. T. (2014):** Respiratory Care Clinical Competency Lab Manual-E-Book, 1st ed, Elsevier, p 350, 353.
- Hohnson R. and Taylor W. (Mar 22, 2012):** skills for midwifely practice, 3rd ed , Elsevier, p71.
- Ignatavicius, D. D., and Workman, M. L. (Jan 30, 2015):** Medical-Surgical Nursing-E-Book: Patient-Centered Collaborative Care, chapter 11 assessment and care of patients with fluids and electrolytes imbalances, unit VII management of patients with problems of respiratory tract problem, 8th ed, Elsevier, p 163, 622.
- Jacque F. L. (Aug 26, 2014):** Intensive care nurses' knowledge of evidence based guidelines regarding weaning the mechanically ventilated patient available at wiredspace.wits.ac.za/handle/10539/15279 accessed at 16, 7, 2018, at 4pm.
- Karkada S. (July, 2015):** Evidence based practice, international journal of nursing research and practice, Vol 2, No 2.
- Kumar, B. U. (Jan 30, 2016):** Handbook of mechanical ventilation, 2nd ed, JP Medical Ltd, p1, 124.
- Lee k. (Sep 15, 2017):** The Neuro ICU Book chapter 6, 2nd ed, McGraw Hill Professional, p 145.
- Leslie H. Nicoli and Rick D. (Mar 14, 2011):** Contemporary medical – surgical nursing, 2nd ed, Cengage, P 480.



**The 5th Annual & 2nd International Scientific Conference of The Faculty of Nursing Benha University
In Collaboration with Najran University & Lebanese Nursing Student Association (LNSA)**

- Levin RF, Fineout-Overholt E, Melnyk BM, Barnes M., et al., (2011):** Fostering evidence-based practice to improve nurse and cost outcomes in a community health setting: a pilot test of the advancing research and clinical practice through close collaboration model. 35 (1), 21–33.
- Linton, A. D. (Apr, 14, 2014):** Introduction to medical surgical nursing, 5th ed, Elsevier, p 206.
- MacIntyre N. R. (Feb, 2005):** Respiratory mechanics in the patient who is weaning from the ventilator. Respiratory care, 50(2), 275-286.
- Marthe J. Moseley, Deborah Goldenberg and May Lou Sole (Dec 27, 2013):** Introduction to critical care Nursing E-Book, 6th ed, Elsevier, P 213.
- Melnyk, B.M. and Fineout-Overholt, E. (2015):** Evidence-based practice in nursing & healthcare: A guide to best practice, 3rd ed, Philadelphia, PA: Wolters Kluwer Health. pp. 13-23.
- Melnyk, B. M., and Fineout-Overholt, E. (2011):** Evidence-based practice in nursing & healthcare: A guide to best practice, 2nd ed, Lippincott Williams & Wilkins, p 234.
- Paz, J. C., and West, M. P. (2013):** Acute care handbook for physical therapists- E-Book, 4th ed, Elsevier, p 395.
- Polit, D. F., and Beck, C. T. (2012):** Nursing research: Generating and assessing evidence for nursing practice. Philadelphia: 1st ed, Lippincott Williams and Wilkins, p 121.
- Pradhan, C., and Shrestha, R. (2017):** Nurses knowledge regarding weaning criteria of the patients with mechanical ventilation in a teaching hospital, Chitwan, Journal of Pulmonology and Clinical Research, 1(1): 11-14.
- Robert V. Digregorio, Pharmd, Carol Green- Hernandez, Stephen Paul Holzener and Jason T. Slyer (2014):** Pulmonary care on inter-professional practice, unit N, endocrine conditions, 2nd ed, springer, p 274.
- Rosenoer, V. M., Oratz, M., and Rothschild, M. A. (May 18, 2014):** Albumin: Structure, function and uses, 1st ed, Elsevier, p 232
- Shadhan S. K. (2015):** Practical application of mechanical ventilation, part 33, 2nd ed, oxford, p 438, 581.
- Shehata, M. A., El-Maksoud, A. M. A., & Elmetwally, R. A. (2012):** Pressure-regulated volume controlled ventilation in acute respiratory failure of pulmonary diseases. Egyptian Journal of Chest Diseases and Tuberculosis, 61(3), 151-158.
- Stein-Parbury, J. (Oct 1, 2013):** Patient and person: Interpersonal skills in nursing, 5th ed, Elsevier, p 8.
- Terrence H. Liu, Manual Suarez and Eugene C. Toy (2017):** Case files critical care, 2nd ed, McGraw Hill Professional, P121.
- Tingsvik, C., Johansson, K., and Mårtensson, J. (2015):** Weaning from mechanical ventilation: factors that influence intensive care nurses' decision-making. Nursing in critical care, 20(1), 16-24.
- Thomas W. Shields, Joseph LoCicero, Rishard H. Fein and Carolyn E (2011):** General thoracic surgery valves, 7th ed, Elsevier, p594.
- Urden, L. D., Stacy, K. M., and Lough, M. E. (2017):** Critical Care Nursing-E-Book: Diagnosis and Management, Chapter 18 pulmonary diagnostic procedures, 8th ed, Elsevier, p 445.
- Walker, B. R., and Colledge, N. R. (2013):** Davidson's Principles and Practice of Medicine E-Book, 22nd ed, Elsevier, p 197, 195.
- Ward D. and Fulbrook P (2016):** Nursing strategies for effective weaning of critically ill mechanically ventilated patient. Crit Care Nurs Clin North Am.; 28(4):499-512.
- Wiegand, D. L. (2013):** AACN Procedure Manual for Critical Care-E-Book, unit 1 pulmonary system, chapter weaning process, 6th ed, Elsevier, p197, 266, 292.



**The 5th Annual & 2nd International Scientific Conference of The Faculty of Nursing Benha University
In Collaboration with Najran University & Lebanese Nursing Student Association (LNSA)**

Wongrostrai, Y., Fongkaew, W., Pinyokham, N., and Hanneman, S. K. (2016): A Qualitative Study of Factors Affecting Sustainable Implementation of a Mechanical Ventilation Weaning Protocol. Pacific Rim International Journal of Nursing Research, 20(2), 132-147.

Woody, N. (2013): Ventilator Weaning Protocols: Influencing Outcomes and Promoting Success, Graduate Research Projects, Southern Adventist University, Paper 23, p2.

Wyckoff, M., and Houghton, M. D. (2009): Critical Care: Concepts, Role, and Practice for the Acute Care Nurse Practitioner, 1st ed, Springer, p 79, 80.

Zamzama M. A., Abd El Aziza A. A., Elhefnawya M. Y. and Shaheenb N. A. (2015): Study of the characteristics and outcomes of patients on mechanical ventilation in the intensive care unit of EL-Mahalla Chest Hospital, Egyptian Journal of Chest Diseases and Tuberculosis, Volume 64, P 693-70.