Sepsis Rate and its Associated Factors among Patients Post-Surgery: Suggested Intervention Protocol

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Abstract

Background: Sepsis is a life-threatening organ dysfunction with high morbidity and mortality caused by impaired regulation of host response to infection. Because there is no confirmatory diagnostic test, the inpatients who develop sepsis may have delays in evaluation, testing, and treatment. Sepsis screening tools and interventional protocols based on standard criteria can provide a rapid method to identify sepsis and patients at risk for sepsis and organ dysfunction. **Aim**: Suggest sepsis interventional protocol for patients post-surgery. **Design**: A descriptive exploratory design was used. **Setting**: The study was carried in surgery and emergency intensive care units at Ain Shams University hospital. **Subjects**: A convenient sample consisted of all the health team (nurses and physician) and a purposive sample of adult patients from both gender in previous mentioned setting within 3 months. **Tools**: Two tools were used to collect data; Health team′ Self-administered questionnaire and Sepsis Screening Tool **Results:** showed that 53% of the studied patients had sepsis and 29% of them were had sever sepsis. In addition, there were no statistically significant differences between health team opinion in surgery and emergency intensive care units regarding factors associated with sepsis rate among studied patients $P > 0.05$ with a positive correlation between total sepsis rate and total score of factors associated with sepsis rate among patients' post-surgery in ICU surgery and ICU emergency **Conclusion:** showed that half of the studied patients had sepsis and one third of them were sever sepsis. In addition, there were no statistically significant differences between health team opinion in surgery and emergency intensive care units regarding factors associated with sepsis rate among studied patients with a positive correlation between total sepsis rate and total score of factors associated with sepsis rate among patients' post-surgery in ICU surgery and ICU emergency. **Recommendation:** Provide periodic in-service training based on best practice guidelines for health team who work in intensive care units and emergency units regarding early detection of sepsis and organ dysfunction.

Keywords: Associated Factors, Sepsis Rate, Intervention Protocol, Patients, Post-Surgery.

Introduction:

Sepsis is the body's overwhelming and life-threatening response to infection that can lead to tissue damage, organ failure, and death. In other words, it's body's overactive and toxic response to an infection. Like strokes or heart attacks, sepsis is a medical emergency that requires rapid diagnosis and treatment. Sepsis can lead to severe sepsis and septic shock **(Evans et al., 2021).** The core challenge is that sepsis, currently defined as a dysregulated host response to infection leading to organ dysfunction, is a heterogeneous clinical syndrome without a pathologic reference standard **(Singer et al., 2016)**

Sepsis is a serious and frequently occurring condition but early recognition and treatment can save lives. The challenge is that sepsis often presents with nonspecific symptoms, which demands a high degree of awareness, vigilance, and knowledge. Studies have demonstrated that a standardized care protocols can speed recognition and improve care. **(Royal Liverpool and Broadgreen University Hospitals Trust, 2018)**

The immune system usually works to fight any germs (bacteria, viruses, fungi, or parasites) to prevent infection. If an infection does occur, immune system will try to fight it, although may need help with medication such as antibiotics, antivirals, antifungals, and anti-parasitic. However, for reasons researchers don't understand, sometimes the immune system stops fighting the "invaders," and begins to turn on itself. This is the start of sepsis**. (Jane et al, 2020)**

Any infection can lead to sepsis and worldwide, one-third of people who develop sepsis die. Mortality from sepsis increases by as much as 8% for every hour that treatment is delayed. As many as 80% of sepsis deaths could be prevented with standardization and mobilization of tools and protocols already available in many institutions. **(Actionable Patient Safety Solutions, 2022)**

Nationally, it was estimated that nearly every 20 seconds in the United States alone, someone is diagnosed with sepsis. The number of sepsis cases per year is increasing and currently total 1.7 million. Sepsis is a medical emergency and a critical illness resulting from a toxic reaction to an infection, with often die consequences that may include death. Globally, 30 million people die of sepsis each year, while in the United States sepsis accounts for approximately 270000 deaths per year. Although 87% of cases are community acquired. **(Claire et al., 2020)**

The World Health Organization's first global report on sepsis finds that the effort to tackle millions of deaths and disabilities due to sepsis is hampered by serious gaps in knowledge, particularly in low- and middle-income countries. Furthermore recent studies, concerned that sepsis kills 11 million people each year. It disables millions more. **(World Health Organization, 2020)**

Sepsis affected different categories of population, these include the very young, the very old, those with chronic illnesses, and those with a weakened or impaired immune system. People who are malnourished can

also contract infections more easily. Patients are diagnosed with sepsis when they develop a set of signs and symptoms related to sepsis **(Centers for Disease Control and Prevention, 2018).** Sepsis is not diagnosed based on an infection itself. If patient have more than one of the symptoms of sepsis, especially if there are signs of an infection or fall into one of the higher risk groups, doctor will likely suspect sepsis. Sepsis progresses to severe sepsis when in addition to signs of sepsis, there are signs of organ dysfunction, such as difficulty breathing, low or no urine output, abnormal liver tests, and changes in mental status. Nearly all patients with severe sepsis require treatment in an intensive care unit (ICU). Septic shock is the most severe level and is diagnosed when your blood pressure drops to dangerous levels. **(Agency for Healthcare Research and Quality, 2017)**

Given the large number of sepsis cases worldwide, it is critical to understand factors that may contribute to increased rates of sepsis. Although it is well known that sepsis has many contributing factors including the presence of open wounds, urinary tract infections, age, and overall medical condition, to date no studies have addressed the impact of hospital characteristics and staffing levels on rates of sepsis. Therefore, the aim of this study was to examine hospital characteristics and staffing levels and how these factors may affect health care–acquired conditions that are associated with rates of sepsis. **(Mohammad et al. 2018)**

Significance of the study

Sepsis is a leading cause of death and the target of intense efforts to improve recognition, management and outcomes. This means strengthening health information systems and ensuring access to rapid diagnostic tools, and quality care including safe and affordable medicines and vaccines. The world must urgently step up efforts to improve data about sepsis so all countries can detect and treat this terrible condition in time. When sepsis is not recognized early and managed promptly, it can lead to septic shock, multiple organ failure and death. Patients who are critically ill and other infectious diseases are at higher risk of developing and dying from sepsis. Even sepsis survivors are not out of danger: only half will completely recover, the rest will either die within 1 year or be burdened by long-term disabilities. **(World Health Organization, 2020)**

From observation and reviewing related researches we found that sepsis is considered a silent critical illness, requiring attentive assessment of subtle changes in a person's condition as early detection and treatment of sepsis are critical to reducing the risk of negative outcomes, including death. Therefore, a growing global focus on sepsis has resulted in many checklists, protocols and guidelines designed to facilitate early detection, and intervention to prevent disability and/or death.

Aim

To suggest sepsis interventional protocol for patients post-surgery through the following:

1. Assess rate of sepsis among patients post-surgery.
2. Assess factors associated with rate of sepsis among the patients post-surgery.

3. Develop a sepsis interventional protocol for patients post-surgery.

Research question:

1. What is the rate of sepsis among patients post-surgery?
2. What are the factors associated with the rate of sepsis among patients post-surgery?
3. What is the suggested sepsis intervention protocol for patients post-surgery?

Subject & Method

Study design: A descriptive exploratory design used to achieve the aim of this study. This type of design used when the researcher wants to describe a specific behavior as it occurs in the environment without influencing or manipulating the variables in any way **(Rakesh and Priya, 2019).**

Setting: This study conducted in general surgical intensive care unit and emergency ICU units at El-Demerdash Hospital which afield to Ain Shams Units University Hospitals:

- General Surgery ICU: it located at first floor, containing 42 beds distributed in 4 main areas each area had from 12 to 14 beds for patients, 40 mechanical ventilator, 42 monitors and 4 emergency crash cart, and receiving 20 to 30 patients monthly with different surgical operations.
- Emergency ICU: it located at land floor, contains 20 beds, 20 mechanical ventilator, 20 monitors and 3 emergency cart; they are distributed in 2 main areas each area distributing to 3 areas for patients one of them for isolation. And receiving 10 to 15 patients monthly with different surgical operations.

Subject:

- A convenient sample consisted of all the nurses and doctors who working in previous mentioned setting.
- A purposive sample of adult patients from both gender who admitted to previous mentioned setting within 3 months.
    - Inclusion criteria: adult patient, post-operative, within 48 hours from operative.
    - Exclusion criteria: post neurological surgery, diagnosed with infected wound (septic wound, diabetic foot), and didn't have any type of infection or sepsis.

Tool for data collection: Two tools were used to collect data as follow:

Tool No.1: Health team′ Self-administered questionnaire: consists of two parts as following:

- **Part I**: It was concerned with demographic characteristic of health team under study that include 7 closed ended questions (age, gender, years of experience, nurses 'qualification, position, receiving training courses, and work place).
- **Part II**: It was used to assess health team opinion regard factors associated with sepsis rate among patient post-surgery. This part Adopted from **(Mitchell, 2003; and National**

Confidential Enquiry into Patient Outcome and Death NCEPOD, 2015; and Corina Meade, 2018) and modified by the researchers. This part consists of (67 questions) that cover the following areas:

- Factors related to Policy, protocol and guidelines (27 questions; 15 Yes/No questions and 12 closed ended questions)
- Factors related to Availability of Investigations and services (20 questions; 16 Yes/No questions and 4 closed ended questions)
- Factors related to Staffing (5 questions; 2 Yes/No questions and 3 closed ended questions)
- Factors related to Sepsis quality improvement and Audit (10 Yes/No questions)

Tool No.2: Sepsis Screening Tool: consists of three parts as following:

- **Part I**: It was concerned with demographic characteristics data of patients under study that include 5 closed ended questions (age, gender, marital status, occupation, and nature of work).
- **Part II**: It will concern with patients' clinical data that include 5 closed ended questions (site of surgery, length of ICU stay, post-operative complications, smoking, and presence of chronic illness.
- **Part III**: **Sepsis screening incidence Tool**. This part Adopted from **(Amanda, 2013).** This is a slandered tool used to assess incidence of sepsis among patients post-surgery that include 5 closed ended questions (patient already being treated for sepsis, sepsis criteria, infection suspect /confirmed, organ dysfunction, and patient screens positive for sepsis/ severe sepsis) in a form of Yes/No.

Scoring system:

- This part consisted of 5 questions in form of Yes/No question
- The correct answer was given one score, while the incorrect one was given zero, and a total score was categorized into three categories as follows:
  - None = 0
  - Sepsis = two or more of sepsis criteria.
  - Severe sepsis= sepsis criteria + organ dysfunction.

Field work: Data were collected by the researchers within three months from September 2022 to December 2022 in two phases:

Phase I: (Preparatory phase):

- Permission to conduct the study obtained from the hospital responsible authorities, after explaining the aim and nature of the study. The tools were developed by the researcher based on the relevant literature reviewing.
- All study subjects (heath team and patients) were met in the previous mentioned setting and purpose of the study was explained to them, and approval for participation was obtained.

Validity & reliability: Content validity; the revision of the tools were done by a panel of 7 expertise's of Ain shams University (3 professors and 2 assistance professors of Nursing staff in critical care and emergency nursing at faculty of nursing and 2 surgical emergency professor doctors at faculty of medicine) to measure the content validity of the tools and necessary

modification were done accordingly. **The reliability**; was tested for tool one and tool two using Cronbach's alpha (tau-equivalent reliability) coefficient (r= 0.877 & r=0.92 respectively).

Pilot study: It will conducted on 10% of study subjects in selected setting to evaluate the applicability and clearly of tools, it was served to estimate the time required to fill the form, then tools were modified according to the result of pilot study.

Phase II :(Implementation phase):

- All health team and patients agreed to participate in the study were met. The purpose and importance of the study was explained to them by the researchers, and the approval for participation was secured from each one of them.
- Data collection for this study carried out approximately in three months after taking the research ethical approval. The researchers were available in the morning and afternoon shift three days per week by rotation.
- Based on data collection by Tool 1, and Tool 2 the researchers develop the suggested sepsis interventional protocol which was adapted from **(Australian Commission on Safety and Quality in Health Care 2021; Evans et al., 2021; Weinberger, Rhee & Klompas 2020; and National Institute for Health and Care Excellence 2017)** and it was revise and modified based on the expertise comments in English language with illustration.
    - The interventional protocol aimed to ensure signs and symptoms of sepsis and factors associated with it among patients post-surgery in ICU is observed/detected early and receives best-practice care so that the risk of death or ongoing morbidity is reduced and it included the following seven sepsis clinical interventions: (1) Could it be sepsis; (2) Critical time management (hour-1 bundle); (3) Antimicrobial therapy; (4) Multidisciplinary team coordination of care in ICU; (5) Patient education and information; (6) Transitions of care and clinical communication, and (7) Care after hospital and survivorship

Ethical consideration:

- Research proposal was approved from Ethical Committee in the Faculty of Nursing.
- There is no risk for study subject during application of the research.
- The study followed common ethical principles in this research.
- Study subjects' confidentiality and anonymity were assured.
- Study subjects assured that the data of this research will be used only for the purpose of research.
- Study subjects had the right to refuse to participate and or withdraw from the study without any rational at any time.

Statistical analysis: The data obtained had reviewed, coded, analyzed and tabulated.

- Descriptive statistics (frequencies and percentages,
  mean and standard deviation, i.e.) were done using computer program (SPSS) version (28).
- Independent sample T-test, Pearson correlation coefficient test used in the relationship between study variables.

- It's considered significant when P value less than (0.05).

Results:

Result in **Table (1)** shows that 71.7% and 70% of the studied patients in ICU surgery and ICU Emergency age ranged from 45 to less than 60 years old. Also, 70% and 75% of them were males (72 patients from the total number of patients under study). Regarding marital status, 78.3% and 75% of them were married. Also, 40% and 37.5% had a private work. In addition, there is no statistical significant difference between the studied patients in ICU surgery and ICU emergency in all demographic characteristics with p-value > (0.05).

Table (2) shows that 56.7% and 55% of the studied patients in ICU Surgery and ICU Emergency had abdominal surgeries and 38.3% and 37.5 of them stay in ICU from 24 hours to less than 48 hrs. Also, 85% and 80% of them had no post-operative complications. Regarding past history, 71.7% and 70% of them had hypertension and 48.3% and 52.5% had diabetes mellitus. In addition, there is no statistical significant difference between the studied patients in ICU surgery and ICU emergency in all demographic characteristics with p-value > (0.05).

Table (3) shows that, 53% and 50% of the studied patients in ICU Surgery and ICU Emergency of the studied patients had sepsis. Also, 29% and 33% of them had sever sepsis. In addition, there is no statistical significant difference between total patient's sepsis rate in ICU surgery and ICU emergency with p-value > (0.05).

Table (4): this table shows that, 45.2% and 33.3% of the studied nurses in ICU Surgery and ICU emergency age ranged from 30 to less than 45 years old. Also 50% of physicians' age ranged from 45 to less than 60 years old. Regarding gender, 85.7% and 83.3 of the studied nurses were females. Also, 75% and 80% of doctors were females. Regarding years of experience, 59.5% and 50% of the studied nurses had 5 to less than 10 years of experience. Also 87.5% and 80% of physicians had 10 or more years of experience. Regarding training courses, 61.9% and 66.7% of nurses received training courses. Also 62.5% and 70% received training courses. Regarding nurses' and physicians' qualifications and positions, 40% and 50% of nurses were diploma nurse, 21.4% and 16.7% of them were bachelor degree. 18.8% & 10% of physicians were had MD. Also 76.2% and 75% of nurses were junior. In addition, there is no statistical significant difference between the studied health team staff (physician & nurses) in ICU surgery and ICU emergency in all demographic characteristics with p-value > (0.05).

Table (5): this table shows that, regarding policy, protocols and guidelines, 56.9% and 59.1% in ICU surgery and ICU emergency had policy, protocols and guidelines. Also, 77.6% and 77.3% had investigations and services availability. Regarding staffing, 58.6% and 68.2% reported staff opinionated. Also 53.4% and 54.5% reported sepsis quality improvement and Audit. In addition, there is no statistical significant difference between total health team staff' opinion regard factors associated with sepsis rate among patients post-surgery in ICU surgery and ICU emergency with p-value > (0.05).

Table (6-a): this table shows that, there were statistically significance between demographic data and policy, protocols and guidelines. Also, there were statistically significance between demographic data and availability of Investigations and services with p-value < (0.05).

Table (6-b): this table shows that, there were statistically significance relation between demographic data and staffing and sepsis quality improvement and Audit with p-value < (0.05).

Table (7): shows a positive correlations between total sepsis rate and total score of factors associated with sepsis rate among patients post-surgery in ICU surgery and ICU emergency.

Table (1): **Frequency & percentage distribution of demographic characteristics of the studied patients in ICU surgery and Emergency ICU (n=100).**

Variables	ICU Surgery (N=60)		Emergency ICU (N=40)		χ2	P-value
	N	%	N	%		
Age						
30- <45	13	21.7	10	25.0	2.533	0.865
45- <60	43	71.7	28	70.0		
60 or more	4	6.7	2	5.0		
Gender						
Male	42	70.0	30	75.0	2.178	0.337
Female	18	30.0	10	25.0		
Marital Status						
Single	13	21.7	10	25.0	0.072	0.965
Married	47	78.3	30	75.0		
Occupation						
None	10	16.7	8	20.0	5.601	0.469
Private work	24	40.0	15	37.5		
Office work	7	11.7	4	10.0		
House wife	4	6.7	2	5.0		
Government work	15	25.0	11	27.5		

Non-significant P >0.05 ***Statistical significant P<0.05***

Table (2): Frequency & percentage distribution of the studied patients' clinical data in ICU surgery and Emergency ICU (n=100)

Clinical data	ICU Surgery (N=60)		Emergency ICU (N=40)		$\chi 2$	P-value
	N	%	N	%		
Site of Surgery						
Abdominal surgery	34	56.7	22	55.0	0.233	0.890
Traumatic surgery	16	26.7	11	27.5		
Others	10	16.7	7	17.5		
Length of stay						
2 hours < 4 hours	4	6.7	2	5.0	2.277	0.320
4hours < 8 hours	10	16.7	7	17.5		
8 hours < 24hours	9	15.0	8	20.0		
24 hours < 48 hours	23	38.3	15	37.5		
> 48 hours	14	23.3	8	20.0		
Had Post-operative complications						
Yes	9	15.0	8	20.0	3.391	0.184
No	51	85.0	32	80.0		
Smoking	26	43.3	18	45.0	5.379	0.068
Presence of chronic illness:						
Heart diseases	13	21.7	8	20.0	1.500	0.472
Hypertension	43	71.7	28	70.0	3.433	0.180
Diabetes mellitus	29	48.3	21	52.5	0.271	0.873
Renal disease	14	23.3	8	20.0	0.088	0.957
Lung	3	5.0	3	7.5	2.983	0.225
Hepatic disease	6	10.0	5	12.5	1.819	0.403

Non-significant P >0.05 ***Statistical significant P<0.05***

Table (3): Total post-surgery sepsis rate among studied patient in ICU surgery and Emergency ICU (n=100)

Variables	ICU Surgery (N=60)		Emergency ICU (N=40)		$\chi 2$	P-value
	N	%	N	%		
None	11	18	7	17	1.750	0.417
Sepsis	32	53	20	50		
Severe sepsis	17	29	13	33		

Non-significant P >0.05 ***Statistical significant P<0.05***

Table (4): Frequency & percentage distribution of demographic characteristics of the studied Health team in ICU surgery and Emergency ICU (n=80)

Variables	ICU Surgery (N=58)				Emergency ICU (N=22)				χ2	P-value
	Nurse (N=42)		Physician (N=16)		Nurse (N=12)		Physician (N=10)			
	N	%	N	%	N	%	N	%		
Age										
<30	18	42.9	0	6	5	41.7	0	0	0.426	0.808
30- <45	19	45.2	1	6.3	4	33.3	1	10		
45- <60	5	11.9	8	50.0	3	25.0	5	50		
60 or more	0	0.0	7	43.8	0	0.0	4	40		
Gender										
Male	6	14.3	4	25.0	2	16.7	2	20	0.651	0.722
Female	36	85.7	12	75.0	10	83.3	8	80		
Years of experience										
<5	17	40.5	0	0.0	5	41.7	0	0	0.494	0.781
5- <10	25	59.5	2	12.5	6	50.0	2	20		
10 or more	0	0.0	14	87.5	1	8.3	8	80		
Received training courses										
Yes	16	38.1	10	62.5	4	33.3	7	70	4.992	0.082
No	26	61.9	6	37.5	8	66.7	3	30		
Nurses' Qualification										
Diploma	17	40.5	0	0.0	6	50.0	0	0	0.719	0.698
technical	12	28.6	0	0.0	4	33.3	0	0		
Bachelor degree	9	21.4	13	81.3	2	16.7	9	90		
MD	4	9.5	3	18.8	0	0.0	1	10		
Position										
Senior nurse	10	23.8	-	-	3	25.0	-	-	0.0790	0.960
Junior nurse	32	76.2	-	-	9	75.0	-	-		

Non-significant P >0.05 ***Statistical significant P<0.05***

Table (5): Total Health team' opinion regard factors associated with post-surgery sepsis rate among studied patient in ICU surgery and Emergency ICU (n=80)

Variables	ICU Surgery (N=60)				Emergency ICU (N=40)				χ2	P-value
	Yes		No		Yes		No			
	N	%	N	%	N	%	N	%		
Policy, Protocols, and guidelines	33	56.9	25	43.1	13	59.1	9	40.9	3.969	0.137
Availability of Investigations and services	45	77.6	13	22.4	17	77.3	5	22.7		
Staffing	34	58.6	24	41.4	15	68.2	7	31.8		
Sepsis quality improvement and Audit	31	53.4	27	46.6	12	54.5	10	45.5		

Non-significant P >0.05 ***Statistical significant P<0.05***

Table 6-a: Relation between health team demographic characteristics and factors associated with sepsis rate among patients post-surgery in surgery & emergency ICU post-surgery.

Variables	Policy, Protocols, and guidelines associated factors											
	ICU Surgery						Emergency ICU					
	Yes		No		Chi-square		Yes		No		Chi-square	
	N	%	N	%	X^2	P-value	N	%	N	%	X^2	P-value
Years of experience												
<5	3	17.6	14	82.4	21.346	<0.001*	0	0.0	5	100.0	9.360	0.009*
5- <10	16	59.3	11	40.7			6	75.0	2	25.0		
10 or more	14	100.0	0	0.0			7	77.8	2	22.2		
Received training courses												
Yes	16	72.7	6	27.3	27.415	<0.001*	6	85.7	1	14.3	10.314	0.016*
No	17	47.2	19	52.8			7	46.7	8	53.3		
Nurses' Qualification												
Diploma	3	17.6	14	82.4	37.238	<0.001*	1	16.7	5	83.3	10.655	0.014*
technical	2	16.7	10	83.3			2	50.0	2	50.0		
Bachelor degree	21	95.5	1	4.5			10	90.9	1	9.1		
MD	7	100.0	0	0.0			0	0.0	1	100.0		
Availability of Investigations and services associated factors												
	ICU Surgery						Emergency ICU					
Years of experience												
<5	7	41.2	10	58.8	18.987	<0.001*	2	40.0	3	60.0	6.626	0.036*
5- <10	24	88.9	3	11.1			6	75.0	2	25.0		
10 or more	14	100.0	0	0.0			9	100.0	0	0.0		
Received training courses												
Yes	19	72.2	3	13.6	12.151	0.007*	7	100.0	0	0.0	8.677	0.013*
No	26	86.4	10	27.8			10	66.7	5	33.3		
Nurses' Qualification												
Diploma	9	52.9	8	47.1	16.873	<0.001*	2	33.3	4	66.7	9.231	0.026*
technical	7	58.3	5	41.7			4	100.0	0	0.0		
Bachelor degree	22	100.0	0	0.0			10	90.9	1	9.1		
MD	7	100.0	0	0.0			1	100.0	0	0.0		

Non-significant P >0.05 ***Statistical significant P<0.05***

Table 6-b: Relation between health team demographic characteristics and factors associated with sepsis rate among patients post-surgery in surgery & emergency ICU post-surgery.

Variables	Staffing associated factors											
	ICU Surgery						Emergency ICU					
	Yes		No		Chi-square		Yes		No		Chi-square	
	N	%	N	%	X^2	P-value	N	%	N	%	X^2	P-value
Years of experience												
<5	3	17.6	14	82.4	21.858	<0.001*	1	20.0	4	80.0	9.670	0.008*
5- <10	17	63.0	10	37.0			5	62.5	3	37.5		
10 or more	14	100.0	0	0.0			9	100.0	0	0.0		
Received training courses												
Yes	16	50.0	18	50.0	4.080	0.043*	7	53.3	7	46.7	4.791	0.029*
No	18	72.7	6	27.3			8	100.0	0	0.0		
Nurses' Qualification												
Diploma	4	23.5	13	76.5	34.584	<0.001*	2	33.3	4	66.7	7.054	0.070
technical	2	16.7	10	83.3			2	50.0	2	50.0		
Bachelor degree	21	95.5	1	4.5			10	90.9	1	9.1		
MD	7	100.0	0	0.0			1	100.0	0	0.0		
	Sepsis quality improvement and Audit associated factors											
	ICU Surgery						Emergency ICU					
Years of experience												
<5	2	11.8	15	88.2	24.113	<0.001*	0	0.0	5	100.0	14.438	<0.001*
5- <10	15	55.6	12	44.4			3	37.5	5	62.5		
10 or more	14	100.0	0	0.0			9	100.0	0	0.0		
Received training courses												
Yes	14	47.2	19	52.8	34.998	<0.001*	7	33.3	10	66.7	8.556	0.003*
No	17	63.6	8	36.4			5	100.0	0	0.0		
Nurses' Qualification												
Diploma	2	11.8	15	88.2	36.901	<0.001*	0	0.0	6	100.0	15.308	0.002*
technical	2	16.7	10	83.3			1	25.0	3	75.0		
Bachelor degree	20	90.9	2	9.1			10	90.9	1	9.1		
MD	7	100.0	0	0.0			1	100.0	0	0.0		

Non-significant P >0.05 ***Statistical significant P<0.05***

Table (7): Correlation between total factors associated with post-surgery sepsis rate total sepsis rate among studied patients in ICU surgery and Emergency ICU

Variables	Total Sepsis rate			
	ICU Surgery (N=60)		ICU Emergency (N=60)	
	r	p-value	r	p-value
Policy, Protocols, and guidelines	0.635	<0.001**	0.56	<0.001**
Availability of Investigations and services	0.538	0.008*	0.45	0.008*
Staffing	0.381	0.007*	0.466	0.039*
Sepsis quality improvement and Audit	0.546	0.014*	0.602	0.032*

r- Pearson Correlation Coefficient ***Non-significant P >0.05*** ***Statistical significant P<0.05***

Discussion:

Intensive care units serve a variety of different patients that vary by factors that influence patient outcomes, including sepsis risk factors, comorbidities, acuity of illness type of surgery and length of ICU stay. Therefore, availability of sepsis protocols and guidelines with rapid assessment includes history and clinical examination, tests for both infectious and noninfectious causes of patients' symptoms within 3 hours of presentation and timely antimicrobial therapy provided can eliminate sepsis and prevent complications and further organ dysfunction.

Regarding patient's demographic characteristics, the present study revealed that more than two third of the studied samples were male and their age ranged from 45 to 60 years old. In addition to three quarter of the studied patients were married and one third of them had a private work. This is may be due to that they had uncontrolled hypertension, diabetes mellitus and abdominal surgeries so, they admitted to ICU for observation and treatment.

This finding is consistent with **Ahmed (2020)** in his study entitled "Effect of Evidence Based Sepsis Care Bundle on Patient Outcome in Medical Intensive Care Unit" who found that more than two third of the studied samples their age ranged from 50 to 60 years old. In addition to **Al-Wadees et al., (2021)** in his study entitled "The Outcome of Sepsis Patients Admitted to the Intensive Care Unit" who estimated that more than half of the studied samples were males.

Regarding patients' clinical data, more than half of the studied patients had abdominal surgeries and one third of them were stayed more than 48 hours in ICUs. This is may be due to more than two third of patients under study were had comorbid illness and they age were ranged from 50 to 60 years old so they need closed observation in ICU for few days post-operatively. This finding in the same line with **Sakr et al., (2018)** in his study entitled "Sepsis in Intensive Care Unit Patients: Worldwide Data from the Intensive Care over Nations Audit" who found that more than half of the studied patients admitted to ICU with abdominal disordered. As well as **Ahmed (2020)** who found that near half of the studied samples spent less than one week in ICU.

Regarding post- operative complications, the present study estimated that the majority of the studied patients had no post-operative complications. While two third of them were hypertensive patients and half of them were diabetic. This finding may be due to the

researcher excluded all post-operative patients who had post-operative complications to guarantee that the application of Sepsis screening incidence tool will be accurate and will detect patients who already had sepsis criteria or at risk for sepsis.

This finding in the same line with **Whitfield et al., (2020)** in his study entitled **"**Implementation of an adult code sepsis protocol and its impact on SEP-1 core measure perfect score attainment in the ED" who mentioned that the patients admitted to ICU for various reasons and comorbidities as diabetes mellitus – insulin dependent.

Concerning total patient sepsis rate, the present study shows that half of the studied sample had criteria of sepsis and one third of them were had criteria of sever sepsis which confirmed sepsis. This result may be due to that there is no sepsis protocol / guideline or sepsis management bundle and there is no screening tool for sepsis applied in surgery and emergency ICU, the health team only follow and apply infection control precautions so they didn't recognize sepsis early they consider it post-operative fever , acquired infection or surgery complication. This finding is consistent with **Claire et al., (2020)** in study entitled "Surveillance Strategies for Tracking Sepsis Incidence and Outcomes" who mentioned that patient had medical risks to sepsis and sever sepsis and stated that pneumonia represented the highest infection proportion (26%) in the ICU patients.

Regarding health team demographic data, the present study shows that near half of the studied samples working at ICU surgery and more than one third of them working at emergency ICU their age ranged from 30 to 45 years old and the majority of them were females. Also, more than half of them had more than ten years of experience in ICUs. This is may be due to that ICUs are critical areas which need qualified and competent staff with years of experiences for management critical cases.

This finding is consistent with **Zanaty et al., (2016)** in study entitled "Critical care nurses' knowledge and practices about sepsis bundle among critically ill patients at emergency hospital Mansoura University" who estimated that all of the studied samples of nurses were females and more than half of them their age group were from 30 to 40 years old. Also, one third of them had 15 to 20 years of experiences. However, these findings are contradicted with **Eskander et al., (2013)** in study entitled "Intensive Care Nurses' Knowledge and Practices regarding Infection Control Standard Precautions at a Selected Egyptian Cancer Hospital" who revealed that most of the studied nurses were in the age group of 20-29 years old. As well as, **Yousefi et al., 2012** who mentioned that the studied nurses had less than one year of experiences.

Regarding nurses' qualifications, the present study shows that more than one third of the studied nurses in ICU surgery and half of them in emergency ICU were diploma nurses. It may be due to the majority of Egyptian nurses were graduate of secondary nursing schools. this finding is contradicted with **Houston Methodist Hospital (2014)** which carried out research entitled early recognition and rapid intervention of sepsis on 53 nurses and this study revealed that majority of nurses (84.9%) carrying baccalaureate degree.

Concerning training courses, the present study estimated that more than two third of them hadn't received training courses

related sepsis. This may be due to lack of in-service training programs/ workshops / scientific conferences regarding the care of patients with sepsis which are very important in improving quality of care regarding patient with sepsis. These findings with harmony of **Eskander et al., (2013)** who revealed around two thirds of the studied sample (63.6%) never attends any continuing education courses.

Regarding Total Health team opinion regard factors associated with sepsis rate among patient post-surgery, the study shows that there were no statistically significant differences between the opinion of both of health teams in ICU surgery and emergency ICU regarding factors associated with sepsis (policy, protocols, and guidelines, availability of investigations and services, staffing and sepsis quality improvement and audit). It may be due to both of them had the same organizational in-service inadequate and lack of policy, protocols and services regarding sepsis. However, the physicians noted that they attend training courses but they follow infection control precautions as there is no written sepsis protocol or guideline in ICU surgery and emergency.

This finding incongruent with **Taj et al., (2022)** in study entitled "Sepsis protocols to reduce mortality in resource-restricted settings: A systematic review" who stated that Rates of compliance with standardized sepsis protocols improved with the proper education of nursing assistants, nurses, and physicians. The standardized sepsis protocols were associated with a significant decrease in the overall sepsis-related mortality rate by 22.6%.

Concerning relation between factors associated with sepsis rate among patients post-surgery and health team' demographic data, the present study shows that there was statistically significant relation between factors associated with sepsis rate and health team' demographic data (years of experience, qualification and training courses). From researcher point of view it may interpreted to the reasons that they had not any previous educational programs, workshops related sepsis care. As well as diploma nurses were based on traditions and imitations. Also, more than one third of the studied nurses in ICU surgery and half of them in emergency ICU were diploma nurses, and their knowledge was obtained during school study years and it might be forgotten.

In addition to the lack of performance pertinent to sepsis bundle for nurses in their clinical practice settings, lack of protocols and guidelines on sepsis bundle, curriculum gaps during training, lack of funding for organizing regular workshops, lack of cooperation between multidisciplinary health team members (nurses & physician); and negative attitude of nurses whereby new information learned at workshops was not readily applied in clinical practice.

This result in the agreement with **Zanaty et al., (2016)** in study entitled "Critical care nurses' knowledge and practices about sepsis bundle among critically ill patients at emergency hospital Mansoura University" who revealed that significant statistical differences were found in health team knowledge about sepsis protocols, services and audit in relation to years of experience. As the bachelor nurses have got the higher knowledge scores than secondary diploma and technical diploma nurses.

Also, the current study finding agreed with **Tromp et al. (2010)** who carried out research about the role of nurses in the recognition and treatment of patients with sepsis in the emergency department revealed that only (3.5%) of the studied sample performed the complete sepsis bundle. On

the other hand, lack of protocols and guidelines on sepsis bundle, curriculum gaps during training, lack of funding for organizing regular workshops; and negative attitude of nurses whereby new information learned at workshops was not readily applied in clinical practice.

Regarding Correlation between total sepsis rate and associated factors among patients' post-surgery, there were a positive correlation between total sepsis rate and total score of factors associated with sepsis rate among patients post-surgery in ICU surgery and ICU emergency. It may be due to sepsis protocols, services and quality improvement and Audit are essential to improving sepsis-related mortality and adequate training of clinicians and protocols are necessary for successful implementation.

Also, the protocols and guidelines is necessary for health team to improve their knowledge, practice and skills. This is based on the recognition that knowledge must also be viewed in conjunction with practice as practice invades not only the use of knowledge but also gaining of knowledge. Health team competencies depend largely on intuitive knowledge and skills. Therefore, the reasons for improper performance are usually the lack of knowledge and skills.

This results similarly **Whitfield et al., (2020)** who mentioned that Implementation of an Adult Code Sepsis Protocol resulted in a significant improvement and other clinical outcome measures among patients. In addition to, the protocol resulted in a significant improvement when assessed and implement individually.

Conclusion:

Study concluded that half of the studied patients had sepsis and one third of them were sever sepsis. In addition, there were no statistically significant differences between health team opinion in surgery and emergency intensive care units regarding factors associated with sepsis rate among studied patients with a positive correlation between total sepsis rate and total score of factors associated with sepsis rate among patients' post-surgery in ICU surgery and ICU emergency.

Recommendations:

- Availability of updated sepsis protocol and guidelines in surgery and emergency ICU based on standard and universal sepsis screening tools.
- Provide periodic in-service training based on best practice guidelines for health team who work in intensive care units and emergency units regarding early detection of sepsis and organ dysfunction.

References

1. Ahmed Sayed, Z. (2020). Effect of Evidence Based Sepsis Care Bundle on Patient Outcome in Medical Intensive Care Unit. Egyptian Journal of Health Care, 11(2), 826-836.
2. Al-Wadees, A. A. N., Al-Khayyat, A. N., & Yaqoob, Q. A. (2021). The Outcome of Sepsis Patients Admitted to the Intensive Care Unit: Experience of 100 Cases. Medical Archives, 75(1), 35.
3. Actionable Patient Safety Solutions (APSS), 2022 Early Detection and Treatment of Sepsis http://patientsafetymovement.org/downloads/APSS_Sepsis.pdf
4. Agency for Healthcare Research and Quality. Patient Safety Indicator 13 (PSI 13): postoperative sepsis rate. 2017. https://www. qualityindicators. ahrq.gov/

Downloads/Modules/PSI/V60-ICD09/TechSpecs/PSI_13_ Postoperative_ Sepsis_ Rate.pdf26

5. Amanda Venable MSN, RN, CCRN: Sepsis Screening Tools. The Southwest Respiratory and Critical Care Chronicles 2013;1(3).
6. Australian Commission on Safety and Quality in Health Care. National Sepsis Program [Internet]. Sydney: ACSQHC; 2021 .Available from: www.safetyandquality.gov. au/our-work/partnering-consumers/national-sepsis-program
7. Centers for Disease Control and Prevention. Data & reports. Published 2018.Available at: https://www.cdc.gov/sepsis/datareports/ index.html
8. Claire N Shappell, Michael Klompas, Chanu Rhee, Surveillance Strategies for Tracking Sepsis Incidence and Outcomes, The Journal of Infectious Diseases, Volume 222, Issue Supplement_2, 15 August 2020, Pages S74–S83, https://doi.org/10.1093/infdis/jiaa102
9. Corina Meade, 2018: Intensive Care Unit Nurse Education to Reduce Sepsis Mortality Rates. Walden University scholar works. Doctorate thesis. Available at: : https://scholarworks.waldenu.edu/dissertations
10. Eskander, H.; Morsy, W. and Elfeky, H. (2013). Intensive Care Nurses' Knowledge and Practices regarding Infection Control Standard Precautions at a Selected Egyptian Cancer Hospital, Master Thesis at Cairo University, Journal of Education and Practice;4(19):160-174.
11. Evans L, Rhodes A, Alhazzani W, Antonelli M, Coopersmith CM, French C, et al. Surviving Sepsis Campaign: international guidelines for management of sepsis and septic shock 2021. Crit Care Med 2021 Nov 1;49(11):e1063–143.
12. Houston Methodist Hospital (2014). Early recognition and rapid intervention of sepsis: Implementation of a focused educational initiative emphasizing early goal-directed therapy in the emergency department, Journal of Nursing Education and Practice; 4(6): 23-29
13. Jane M. Flanagan,; Catherine ; and Judith Shindul-Rothschild: Factors Associated With the Rate of Sepsis After Surgery . Critical Care Nurse (2020) 40 (5): e1–e9. https://doi.org/10.4037/ccn2020171
14. Mitchell M L. , Mitchell P F., John C M., Edward A., Derek A., Deborah C., Jonathan C., Steven M O., Jean L. V., and Graham R.: 2001 SCCM/ESICM/ACCP/ATS/SIS International Sepsis Definitions Conference. Crit Med 2003 Apr; 31(4):1250-6. Available at: https://pubmed.ncbi.nlm.nih.gov/12682500/
15. Mohammad Fathi ; Nader Markazi Moghaddam ;Azra Ramezan khani : A systematic review on risk factors associated with sepsis in patients admitted to intensive care units. Available online 21 March 2018. https://doi.org/10.1016/j.aucc.2018.02.005
16. National Confidential Enquiry into Patient Outcome and Death (NCEPOD): sepsis study.2015. Available at: sepsis@ncepod.org.uk
17. National Institute for Health and Care Excellence. Sepsis: recognition,

diagnosis and early management [Internet]. London: NICE; 2017. Available from: www. nice.org.uk/guidance/ng51

18. Rakesh A., and Priya R.,: Study designs: Part 2 – Descriptive studies. Perspect Clin Res. 2019 Jan-Mar; 10(1): 34–36.available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6371702/
19. Royal Liverpool and Broadgreen University Hospitals Trust, 2018: e-Sepsis Blueprint Pilot. https://cdn.digitalhealth.ne
20. Sakr, Y., Jaschinski, U., Wittebole, X., Szakmany, T., Lipman, J., Ñamendys-Silva, S. A., ... & ICON Investigators. (2018, December). Sepsis in Intensive Care Unit Patients: Worldwide Data from the Intensive Care over Nations Audit. In Open Forum Infectious Diseases (Vol. 5, No. 12, p. ofy313). US: Oxford University Press.
21. Singer, M, Deutschman CS, Seymour CW, et al. The third international consensus definitions for sepsis and septic shock (Sepsis-3).JAMA 2016; 315:801–10.
22. Taj, M., Brenner, M., Sulaiman, Z., & Pandian, V. (2022). Sepsis protocols to reduce mortality in resource-restricted settings: A systematic review. Intensive and Critical Care Nursing, 72, 103255.
23. Tromp, M.; Hulscher, M.; Bleeker-Rovers, C.; Peters, L.; Berg, D.; Borm, G.; Kullberg, B.; Achterberg, T. and Pickkers, P . (2010). The role of nurses in the recognition and treatment of patients with sepsis in the emergency department: A prospective before and after intervention study, International Journal of Nursing Studies; (47):1464-1473.
24. Weinberger J, Rhee C, Klompas M. A critical analysis of the literature on time-to- antibiotics in suspected sepsis. J Infect Dis 2020 Jul 21; 222 (Suppl 2):S110–8.
25. Whitfield, P. L., Ratliff, P. D., Lockhart, L. L., Andrews, D., Komyathy, K. L., Sloan, M. A., ... & Judd, W. R. (2020). Implementation of an adult code sepsis protocol and its impact on SEP-1 core measure perfect score attainment in the ED. The American Journal of Emergency Medicine, 38(5), 879-882.
26. World Health Organization,2020: WHO calls for global action on sepsis -cause of 1 in 5 deaths world widehttps://www.who.int/news/item/08-09-2020-who-calls-for-global-action-on-sepsis-cause-of-1-in-5-deaths-worldwide
27. Yousefi, H., Nahidian, M., & Sabouhi, F. (2012). Reviewing the effects of an educational program about sepsis care on knowledge, attitude, and practice of nurses in intensive care units. Iranian journal of nursing and midwifery research, 17(2 Suppl1), S91.
28. Zanaty, M. M., Morsy, W., Elshamy, K., & Ali, S. (2016). Critical care nurses' knowledge and practices about sepsis bundle among critically ill patients at emergency hospital Mansoura University. Mansoura Nursing Journal, 3(1), 35-54.