

Early Recognition and Management Skills of Emergency Department Nurses in Handling Acute Coronary Syndrome

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ABSTRACT

One of the most prevalent reasons for cardiac-related hospital admission is Acute Coronary Syndrome (ACS). Given the prevalence of ACS, nurses must be familiar with diagnostic techniques and pharmacological and coronary treatments. Hence, this paper determined the level of knowledge on early recognition and management skills of 110 Emergency Department (ED) nurses in handling patients with ACS in a tertiary level hospital in Riyadh, KSA. A descriptive-quantitative type of research design was used and found that the majority of the respondents were 23 – 39 years old (86%), female (84%), and had bachelor's degrees (80%). Eighty-five (85%) of them had adequate knowledge of early recognition of ACS. Position ($p=0.01$) and years of experience ($p=0.00$) as ED

nurses were associated with the overall knowledge, whereas training attended ($p=0.01$), position ($p=0.01$), and years of experience ($p=0.00$) were associated with the ED nurse's management skills in handling ACS. The study produced an Integrated Training Program on Triaging ACS for New Nurses, which aims to improve the competency of newly hired nurses, those with less than one year of experience as an ED nurse, and those working as Staff Nurse III in the early detection and management of ACS in the ED.

Keywords: *acute coronary syndrome, early recognition, management skills*

INTRODUCTION

Cardiovascular disease (CVD) is considered the leading cause of morbidity and mortality worldwide, accounting for 9 million deaths in 2015 Roth et al., (2017). This number is expected to reach almost 23.6 million by 2030 (World Health Organization, 2018).

The rate of CVD deaths in Saudi Arabia was 37%. The prevalence of Acute Coronary Syndrome (ACS) was 8.2% (WHO, 2016; AlHassan et al., 2016), and it is considered a disease in the middle age and elderly population. According to the study by Faisal (2019), of 1,242 patients with ACS, 4.5% were 45 years old and below, with the most common diagnosis of ST-elevation myocardial infarction (STEMI) followed by Non-ST Elevation Myocardial Infarction (NSTEMI) Acute Coronary Syndrome representing 57%, and 30% of the patients, respectively. Based on the first and national ACS registry in Saudi Arabia called the Saudi Project for Assessment of Coronary Events (SPACE) registry, ACS patients in Saudi Arabia present at a younger age, with delayed medication treatment, have the highest prevalence of diabetes and low in-hospital outcome (Alhabib et al., 2011). Another Saudi registry was established in 2015-2017 called the STARS-1 Program, and a total of 2,233 patients with ACS were enrolled from 50 hospitals in various health care sectors in Saudi Arabia (Alhabib et al., 2019). Patients from the STARS-1 Program

showed a high prevalence of coronary artery disease risk factors at a relatively young age (Alhabib et al., 2019).

Acute Coronary Syndrome (ACS) includes a group of pathological events and is one of the common reasons for cardiac-related hospital admission (Chan et al., 2020). It is characterized by a quick reduction of blood flow to the heart, usually caused by the rupture of an atherosclerotic plaque or fat deposits within the wall of a coronary artery. It may cause the formation of a blood clot (Eisen et al., 2016), and for individuals experiencing a life-threatening cardiac event, early intervention is critical. Therefore, time is very crucial to save the patients' lives as every minute that passes starves the heart muscle of the oxygen needed to function due to diminished or lack of blood supply, which could lead to damage or death of that heart muscle and the sudden death of the patient (Amsterdam et al., 2014).

ACS as a highly fatal condition is a challenge because it requires prompt symptom recognition, care-seeking behavior, and immediate nursing intervention (Patel, Mohanan, Prabhakaran, & Huffman, 2017), and early recognition of patients by the medical professional group is a significant contributor to the treatment, as delayed symptom recognition may lead to subsequent ACS mortality (Kaul et al., 2019).

Therefore, hospitals receiving patients with ACS must have an established protocol in the management approach based on guidelines to promote the reduction of death and morbidity (Wihastuti et al., 2019). Specifically, Emergency Departments (ED) are expected to apply evidence-based practice to rapidly identify patients who have ACS and other non-cardiac causes of chest pain. 2 ED Triage protocols improve prioritization for evaluation and treatment of patients by severity authorizing triage area staff or primary nurses to assess patients on arrival at the ED and initiate diagnostic, therapeutic, and management regimens based on chief complaints (Gillard, 2020).

In Saudi Arabia, most tertiary hospitals utilize the Canadian Triage Acuity System (CTAS) to define patients' needs for care in emergency departments. They usually encroach on the institutional protocol, policies, and procedures that serve as the hospital's legal basis in triaging patients utilizing a quick and systematic approach to assessing clients and allocating appropriate categories. However, this standardized pathway was developed for many diseases or chief complaints (Gillard, 2020). It is a generalized system that can be indiscriminate for patients with suspected cardiac diseases such as ACS and can be time-consuming during the triage process.

Consequently, without a specific standardized protocol for ACS and ED nurses as the first health professionals to meet ACS patients on their arrival, they are expected to use advanced clinical decision knowledge to competently sort patients into their perceived level of urgency based on the severity of the condition. However, with ACS a comprehensive, complex clinical presentation, rapid identification poses a challenge for ED nurses. However, studies showed triage level inaccuracies and the inability of the triage nurse to identify patients with emergency symptoms (Weeks, 2017). Likewise, a study showed a low triage accuracy rate of 54% for patients with symptoms suggestive of ACS and that ED nursing experience is not a predictor of ACS triage accuracy rates in the ED (Sanders & DeVon, 2016), supporting the need for consistent and specific training for ACS, as well as the need for standardized pathway specific for ACS.

Thus, this paper assessed the level of knowledge on early recognition and management skills of emergency staff nurses of patients with Acute Coronary Syndrome in a Tertiary level hospital in Riyadh, Kingdom of Saudi Arabia, and based on the results, an Integrated Training Program on Triaging ACS for New Nurses was crafted to aid in improving the knowledge and accuracy and efficiency skills in triaging, as well as in providing immediate interventions for patients presenting with ACS in the ED.

Statement of the Problem

This study aimed to characterize and determine the level of knowledge on early recognition and management skills of emergency staff nurses in handling acute coronary syndrome in a tertiary level hospital in Riyadh, Saudi Arabia. Hence, this research paper sought to answer the subsequent queries.

1. What is the respondents' demographic profile in terms of:
 - 1.1. Age;
 - 1.2. Sex;
 - 1.3. Highest Educational Attainment;
 - 1.4. Training;
 - 1.5 Position; and
 - 1.6 Years of experience in ER unit?
2. What is the level of emergency department nurses' knowledge on early recognition of acute coronary syndrome in terms of:
 - 2.1 Classifying types and causes;
 - 2.2 Recognizing early warning signs and symptoms;
 - 2.3 Implementing acute coronary syndrome protocol?
3. What is the level of emergency department nurses' management skills in handling acute coronary syndrome in terms of:
 - 3.1 Classifying types and causes;
 - 3.2 Recognizing early warning signs and symptoms;
 - 3.3 Implementing acute coronary syndrome protocol?
4. Is there a significant difference in the level of knowledge of the emergency department nurses on the early recognition of acute coronary syndrome when they are grouped according to demographic profile?
5. Is there a significant difference in the level of management skills of emergency department nurses in managing acute coronary syndrome when grouped according to demographic profile?
6. Based on the study findings, what Integrated Training Program on Triage ACS patients for New Nurses can be developed that will aid the ED Nurses in the early detection of Acute Coronary Syndrome?

Theoretical Framework

It is significant for Adult ED Nurses to understand the diagnostic approaches involving the pharmacology and coronary interventions, given the prevalence of ACS. Hence, this study is anchored on different concepts and some theories to provide a clear view of the role of nurses in the early recognition and management of data the acute coronary syndrome.

Clinical nursing expertise is a vital component of quality patient care. Individual nurses' characteristics influenced the level of knowledge in the Emergency Nurses' field of specialty. A summary of characteristics that relate to the knowledge and skills of ED Nurses in the early recognition and management of acute coronary syndrome are age, sex, educational attainment, training, position, and years of experience in ER unit. These characteristics are derived from a similar study conducted among ER nurses in the United States and India (Weeks, 2017; Karadkar et al., 2018). In addition, Erikson's theory in his Stages of Psychosocial Development aids in conceptualizing research ideas within the demographic characteristics of the present study. According to Erickson (1963), as cited by Boundless Psychology (2018), young adults or forming adults are usually a time to be productively focused on self-growth and taking responsibility for adulthood.

Moreover, the theoretical model that was selected for this research-practice project was based on the theories of Kolb (1984), Benner (2001), the American Association of Critical-Care Nurses (AACN's) Synergy Model, and the Canadian Triage Acuity Scale (CTAS). Kolb's (1984) experiential learning theory approach in two levels: a four-stage process and four different learning styles. Kolb's theory focuses and is concerned with a holistic perspective on the learner's perception, experience, cognition, and behavior. Kolb's experiential learning theory derives from the works of Piaget, and Lewin, four-staged Kolb's

experiential learning theory is represented as a four-stage process by which a learner grasps information and transforms it to be meaningful to that individual. The complete learning cycle of Kolb was: concrete experiences, abstract conceptualization, reflective observation, and active experimentation. In concrete experiences, knowledge, and information can be obtained, such as witnessing an event directly, while abstract conceptualization where information is theorized or comprehended based on past experiences. Reflective observation includes processing following concrete experiences and leads to abstract conceptualization when the observation is blended with prior knowledge. At this point, the learner begins active experimentation to test the situation in a real-world situation. The product of active experimentation is a new observation that leads the learner to repeat the cycle and determine if interventions have been effective or if new interventions are required. Kolb's four stages cycle can be extrapolated to define learning styles and may occur instantaneously or take days, weeks, or even months, depending upon the subject matter.

According to Kolb's practical learning theory is a process out of distinct learning styles based on a four-staged cycle result. Effective learning-based on two continuums or how the individuals understand (perceived continuum) and process (process continuum) the information. Kolb's learning styles include diverging, assimilating, converging, and accommodating. In diverging learning styles, individuals learn by watching than doing and tend to gather information using brainstorming and imagination to solve problems. In assimilating learning styles, individuals require excellent and clear explanations and prefer a straightforward, logical approach. In a converging learning style, individuals focus on a technical task and apply their learning to practical issues. Lastly, accommodating learning style, individuals prefer hand-on or take a practical, experiential approach.

Kolb's experiential learning was applied in this study to determine the emergency skills of the ED nurses in handling ACS patients demonstrating psychomotor responses and reasoning processes when applying observations or assessment skills and decision-making to the clinical setting using critical thinking and problem-solving skills, and technical competence.

Also, the Stages of Clinical Competence by Benner, illustrated by Ozdemir (2019) in her study on Nurse's Individualized Care Perceptions and Practices, nurses develop their knowledge, skill, clinical competence, and comprehension of patient care through experiential learning over years of experience. The model introduced by Dr. Benner describes how an individual gains new knowledge and skills from the novice stage to the expert stage. The five stages were as follows: novice, advanced beginner, competent, proficient, and expert. Development of these phases increases from the length of working time in particular factors critical skills, intuition, decision making, and problem-solving abilities. In each stage, nurses face unique situations where they learn new procedures, abilities, and clinical knowledge for effectively managing in the clinical area. A well-educated and experienced nurse can make critical clinical decisions in different situations and implement individualized nursing care based on theories and experience.

Benner's five stages of proficiency in the novice to expert model is a good framework from which the demographic characteristics of the length of experience and training were anchored as it discusses how an individual start in the novice stage and as new skills and knowledge are gained, advances through several stages to end in the expert level.

Another framework that guided the study was adapted from the American Association of Critical-Care Nurses (AACN's) Synergy Model for Patient Care, initially developed in 1996 (Hardin & Kaplow, 2017). The model has become widely accepted as a viable model for professional nursing that comprises eight patient characteristics and eight nurse competencies that constitute professional nursing practice. It provided a framework for outcome evaluation for the patient, the nurse, and the system. Therefore, this model was an excellent guiding framework for the formulation of the questions and or items under each category or sub-variables on classifying types and causes; recognizing early warning signs and symptoms; implementing acute coronary syndrome protocol both in the knowledge and the skills aspects to determine the precise understanding of nurses on early recognition and management of ACS as the study was focused

on the dimensions of nursing practice such as clinical judgment, caring practices, collaboration, systems thinking, response to diversity, facilitator of learning, and clinical inquiry. Furthermore, the Synergy Model was considered in developing the output of the study, which is an institutional Transition to Practice Program in Handling ACS Patients for Newly Hired ED Nurses which focused on early recognition and management of ACS, matching nurse knowledge, skills, and abilities with patient needs that will improve patient care outcomes.

Similarly, the Canadian Triage Acuity Scale (CTAS) was developed in 2013; the Advanced Cardiovascular Life Support Algorithm (ACLS) of the American Heart Association (AHA), which was developed first 1974 and was updated in 2020 standard, was used to identify the competencies of nurses in assessing, classifying, and managing patients with ACS. These concepts on CTAS, ACLS, and AHA concepts will be considered in formulating the research instrument on knowledge and skill. They will be combined with the different categories identified by Bastos Pina et al. (2020) in terms of the following: Management of Care Designed for Client Autonomy, Management of Complex Therapeutic Protocols, Risk Management and Prevention of Adverse Events, Initial Care Assessment Procedure, and Management of Complex Therapeutic Protocols.

In addition, the study was anchored on the key performance indicators of STEMI Protocol which was developed and utilized by the selected institution/locale in managing ACS in the ED. The protocol includes the following: Door to ECG, Door to Physician, Door to Needle, and Door to Balloon. This protocol is a framework from which the output of the study was based and developed to improve the performances of nurses as well as to attain optimum care for patients presenting in the ED with the acute coronary syndrome.

Theoretical Paradigm

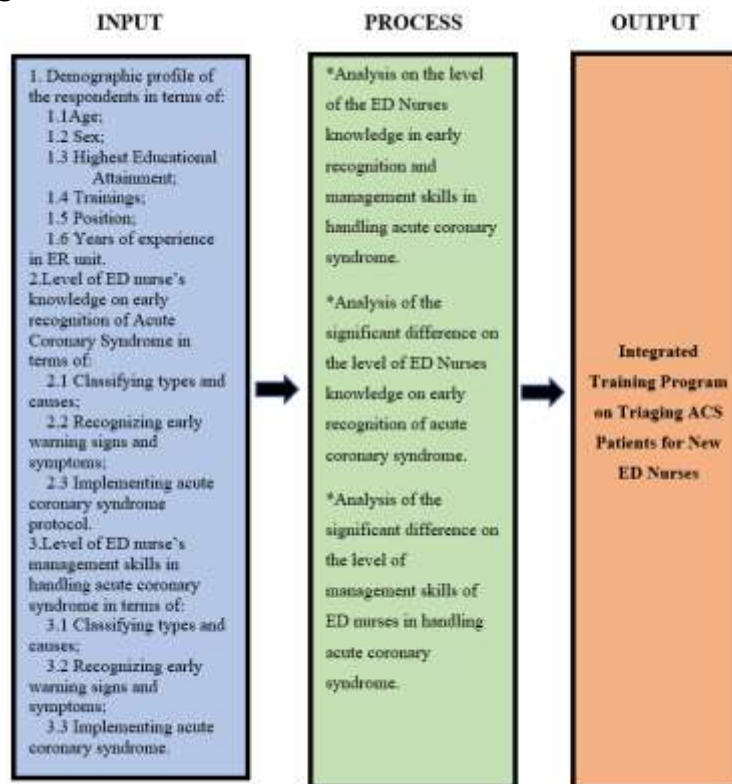


Figure 1. Theoretical paradigm on the level of knowledge and skills of emergency staff nurses in managing acute coronary syndrome in a tertiary level hospital, Riyadh, K.S.A.

METHODS

Research Design

The researcher utilized descriptive survey, descriptive-evaluative, and descriptive-comparative research methods in conducting the study. A descriptive survey was utilized for the demographic data of the adult emergency nurses (age, sex, job title, highest educational attainment, position, training, and length of experience as an ED). The descriptive-evaluative method was utilized to measure and compare the level of knowledge on early recognition and the emergency management skills of adult emergency nurses in handling ACS Patients parameters as follows: classifying types and causes, recognizing early warning signs and symptoms, and implementing acute coronary syndrome protocol. Descriptive-comparative was used to answer the significant difference in the hypothesis stipulated in the Problem Statement.

The researcher developed an Integrated Training Program on Triaging ACS for New Nurses to improve their level of knowledge and management skills to help them in their competence to accurately and safely handle patients in the ED.

Research Locale

The study was conducted in King Saud University Medical City - King Khalid University Hospital, Riyadh, Saudi Arabia. It is a large government hospital institution under the Ministry of Education. It is a 1,400-bedded capacity teaching hospital with ongoing expansion. The researcher focused his study on the Department of Emergency Medicine because it is a teaching hospital operated by ED nurses from various countries with varied working experience, training, positions, and education from their country of origin.

Furthermore, newly hired nurses that are locally recruited are directly hired in a particular area like emergency medicine, and internationally recruited nurses are required to have at least three years of nursing experience from the country of origin with valid certifications in their area of specialties. It was, in fact, a huge hospital with a variety of cases and capable of advanced medical equipment and diagnostic procedures like the cardiac catheterization laboratory.

In addition, there is an estimated range of 20 to 30 Electrocardiogram censuses being recorded for ECG per day in the Triage section alone of adult emergency for a patient with a complaint of chest pain and chest pain-related complaints.

Consequently, due to the global pandemic, various opportunities were open for experienced nurses from western countries, and others were for personal reasons. As a result, there are increased turnover rates among nurses. Therefore, the researcher chose this tertiary level hospital at the heart of Riyadh Kingdom of Saudi Arabia due to the increasing numbers of newly hired nurses, partially recruited internationally and mainly from the local Saudi citizens in response to Saudi Vision and Mission 2030 of the Saudi government.

In addition, the researcher was affiliated as a clinical resource nurse of the study locale assigned in the emergency department by which the study was conducted. The research study identifies the needs assessment of emergency nurses that would help them initiate, plan and recommend an Institutional Transition to Practice Program in Handling ACS for newly hired ED Nurses. of care that will help them benefit in early recognizing and managing acute coronary syndrome.

Research Population and Sample

The study involved a total population of 110 adult ED nurses based on the computation of sample size using the Cochran's standard sample utilizing purposive sampling technique, as the respondents were chosen according to the following criteria: a) Adult ED nurses from 23 years old and above; b) assigned in the ED from one (1) year; c) with varied educational attainment; d) willing to participate on the study; e) regardless of nationality and country of origin. These nurses were assigned to triaging in the ED and handled varied cases of patients, including patients presenting with ACS. The sample size formula was calculated utilizing the Cochran standard sample size equation.

$$n_0 = \frac{Z^2 pq}{e^2}$$

Where:

- n is the sample size,
- z is the selected critical value of desired confidence level,
- p is the estimated proportion of an attribute that is present in the population,
- q is $p - 1$
- e is the desired level of precision

New formula for small sample size

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

whereas

$$n_0 = \frac{Z^2 pq}{e^2} = \frac{(196^2)(0.05)(1 - 0.5)}{0.05^2} = 384$$

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}} = \frac{385}{1 + \frac{384}{154}} = 110 \text{ respondents}$$

Research Instrument

The researcher utilized a researcher-made questionnaire. The questionnaire was based on existing scientific knowledge obtained from the related literature. The survey questionnaire consists of three parts: Part I included the demographic profile of the respondents in terms of age, sex, highest educational attainment, training, position, and years of experience in ER unit. Part II determined the level of the ED nurses' knowledge on early recognition of acute coronary syndrome consisting of 28-item multiple-choice questions considering the sub-variables of classifying types and causes of ACS; recognizing warning signs and symptoms, and implementing management protocols; and Part III determined the level of the ED nurse's management skills in handling acute coronary syndrome which is a 5-item each sub-variable similar to the Part II, with a total of 15 items checklist and it was answered using the 4-point Likert scale based on the SHC Statistical Guide Revised Edition 2021, with the following the continuum: 4- Highly Skillful ;3- Skillful; 2- Less Skillful; and 1-Least Skillful.

The questionnaire was submitted to the five experts in emergency medicine, such as an emergency physician consultant, a cardiology fellow, an emergency Clinical Service Manager, and two Nurse educators assigned to the Emergency Department. In addition, pilot testing was conducted on 10 ED nurses from the selected locale who were not part of the actual data gathering to establish the acceptability and internal reliability of the instrument. The internal consistency and reliability were tested using Cronbach's alpha. The Level of Knowledge in Early Recognition of Acute Coronary Syndrome result was 0.74, with an acceptable internal consistency. Likewise, the Cronbach's Alpha on the overall Management Skills of Emergency Nurses in Handling Acute Coronary Syndrome result was 0.88 with good internal consistency. An alpha coefficient range of 0.7 to 0.8 indicates that the questionnaire is acceptable, 0.8 to 0.9 as good, and greater than 0.9 as excellent internal consistency. Cronbach's alpha is vital in describing the internal consistency and reliability of any Multiple Choice and Likert-type scale questionnaire.

Lastly, after the survey questionnaire was crafted, validated, pilot tested, and passed the Cronbach's alpha test, the researcher sought the approval of the oral examination committee prior to the administration of the questionnaire in actual data gathering.

Data Gathering Procedure

The researcher adhered to all the established protocols in conducting the procedure. Initially, the researcher requested a letter of approval from the Dean of the graduate school, administrative clearance was obtained from the Institutional Review Board (IRB), the Medical Director, and the Nursing Director of the selected tertiary hospital. The letter was also sent to the concerned individual, such as the Unit manager, a nurse educator, and an Emergency Physician, to seek permission and demonstrate basic courtesy. After the approval of the hospital management, the researcher personally visited the clinical area where the study was conducted and approached the unit head nurse.

The study was conducted via an online modality using Google forms distributed by a link that was forwarded via email and or Whatsapp messenger accounts. The google form was set so that no item was left unanswered. Confidentiality of information was ensured to protect the personal information of the respondents.

The data collection was done via the online google form platform for four days, from March 24 until March 27, 2022. After the data gathering procedure was completed, the researcher converted the google form into a google excel sheet to analyze the data systematically.

Descriptive and analytical statistics were used to describe numerical data and analyze the significant difference in the gathered quantitative information using the SPSS licensed to SHC.

Post analysis, based on the findings, the Integrated Training Program on Triaging ACS for New Nurses was developed. It will be for implementation once approved by the hospital and nursing service administrators and the unit head of the emergency department to improve the level of knowledge and practices.

Statistical Treatment of the Data

The researcher used different statistical formulas. The researcher utilized various statistical tools to analyze the obtained data to tabulate and interpret the results. The results of the research were analyzed utilizing descriptive statistics. The accuracy of the answered questions was evaluated using the mean and calculated the standard deviation. The Nominal levels of measurement were used to analyze the data using percentages and frequencies to compare and contrast data. The test that is used for parametric is the analysis of variance (ANOVA). A p -value of <0.05 was considered significant. Moreover, for non-parametric, the Mann-Whitney U for comparing two variables and Kruskal-Wallis were used for comparing three or more variables.

For sub-problem no. 1, which dealt with the demographic profile of the respondents, including age, sex, highest educational attainment, training, position, and years of experience in ER unit, frequency-percentage distribution was used.

$$P = \frac{\text{no. of responses}}{\text{total no. or respondents}} \times 100$$

For sub-problem no.2, which dealt with the staff nurses' knowledge of early recognition of acute coronary syndrome, percentage rating, and indicator analysis were used.

Percentage Rating

$$PR = \left(\frac{S}{TI} \times 60 \right) + 40$$

Continuum	Qualitative Index
90 – 100%	Very Knowledgeable
80 – 89%	Knowledgeable
75 – 79%	Less Knowledgeable
below 75%	Least Knowledgeable

Source: SHC Statistical Guide Revised Edition 2021

Indicator Analysis

$$P = \frac{\text{no. of respondents with correct answer}}{\text{total no. of respondents}} \times 100$$

Continuum	Qualitative Index
96 – 100%	Mastered
86 – 95%	Closely Approximately Mastery
66 – 85%	Moving Toward Mastery
35 – 65%	Average Mastery
15 – 34%	Low Mastery
5 – 14%	Very Low Mastery
0 – 4%	Least Mastery

Source: SHC Statistical Guide Revised Edition 2021

The first table on percentage rating shows the percentage rating and indicator analysis based on the SHC Statistical guide Revised Edition 2021. The first table demonstrates the diagnostic test results taken by the respondents based on the level of knowledge of ED nurses on early recognition of ACS. It describes the overall findings of the results in the form of a percentage continuum when the respondents were grouped based on the sub-variables, which include the Classifying types and Causes, Recognizing Early Warning Signs and Symptoms, and Implementing ACS Protocol with the corresponding qualitative index.

However, the second table (indicator analysis) corresponds to the analysis of indicators or results of the questionnaire per item/indicator in the form of a percentage continuum with the equivalent qualitative indicators demonstrated above.

For sub-problem no. 3, which dealt with the data representing the level of management skills of emergency nurses in handling acute coronary syndrome, the researcher used the weighted arithmetic mean formula to determine the degree of agreement and disagreement on a particular issue statement. Considering the participant rated the statement based on their agreement. The formula to get the WAM is:

$$WAM = \frac{\sum fw}{n}$$

Where:

WAM - Weighted Arithmetic Mean

$\sum fw$ - Summation of the products of frequencies and weights

n - Total no. of responses per item

Continuum	Qualitative Index
3.26 – 4.00	Highly Skillful
2.51 – 3.25	Skillful
1.76 – 2.50	Less Skillful
1.00 – 1.75	Least skillful

Source: SHC Statistical Guide Revised Edition 2021

The above table demonstrates the continuum of the Weighted Arithmetic Mean (WAM) used to answer the questionnaire for the Likert Scale in terms of the management skills or practices of ED Nurses in managing ACS with the corresponding qualitative index.

For sub-problem 4 and 5, a Test of Significance was used to identify the appropriate specific statistical tools to interpret the data.

Test of Normality

Using the SPSS authorized for SHC, the test for normality was used as a requirement to determine the proceeding statistical analysis to determine the significant differences and relationship of the variables in the study. The Shapiro Wilk was utilized as the sample size will be less than 2000.

Test of Homogeneity of Variances

Using the SPSS authorized for SHC, the test for homogeneity of variances was used as a requisite together with the Test for Normality to determine the proceeding statistical analysis to determine the significant differences and relationship of the variables in the study. This time, Levene's Test for Equality of Variances will be used.

Parametric Test

ANOVA (Analysis of Variance)

$$SS_b = \sum \frac{(x_j)^2}{n_j} - \frac{(\sum \sum x_j)^2}{N}$$

$$SS_w = \sum \sum x_j^2 - \sum \frac{(x_j)^2}{n_j}$$

$$df_b = k - 1 \quad \begin{matrix} SS_t = SS_b + SS_w \\ df_w = N - k \end{matrix} \quad df_t = N - 1$$

$$MS_b = \frac{SS_b}{df_b}$$

$$MS_w = \frac{SS_w}{df_w}$$

$$F = \frac{MS_b}{MS_w}$$

Source: SSB Licensed to SHC

Non-Parametric Test

Mann-Whitney U Test – This Statistical Treatment (Non-Parametric Test) was used to compare two variables.

$$U_x = N_x \cdot N_y + \frac{N_x(N_x + 1)}{2} - \sum r_x$$

Kruskal-Wallis H Test - This Statistical Treatment (Non-Parametric Test) was used for comparing three or more variables.

$$H = \frac{12}{n(n+1)} \sum \frac{R_i^2}{n_i} - 3(n+1)$$

Post Hoc Tests

LSD/Scheffe's for ANOVA

Dunn or Dunn-Bonferroni (for Kruskal-Wallis)

Ethical Considerations

The researcher ensured the voluntary participation of the respondents. Anonymity, confidentiality, and privacy of all gathered information were maintained until the completion of the study. The researcher completely adhered to all ethical standards throughout the conduct of the study. An ethics approval was sought from the Institutional Review Board of Health Sciences College Research on Human Subject (IRB Approval of Research project No. E-22-6638).

Furthermore, permission to collect the data from the clinical area of the participating institution was obtained from the nursing administration along with a signed endorsement letter.

A cover letter was encroached to the questionnaire to explain the details of the study, including the nature and purpose, the potential subjects, who had access to the data, and the proposed outcome of the research. It was clarified to the respondents that informed consent is implied should they decide to accomplish the online survey questionnaire. They do not have an obligation to accomplish the survey questionnaire, and no monetary compensation was provided for participating in the study. All potential identifiers were eliminated in the questionnaire. Hence, the confidentiality of the research participants was ensured and protected.

RESULTS AND DISCUSSION

The study determined the level of knowledge, skills on early recognition, and management skills of emergency ED nurses in managing acute coronary syndrome in a tertiary level hospital, Riyadh, KSA. The findings of the study were summarized as follows:

1. Demographic Profile

The respondents were 23 – 39 years (95; 86%), female (92; 84 %), with Bachelor's Degree in Nursing (88;80%), attended more than 10 trainings (68;62%), Staff Nurse III (61; 55%), and with 6 years and above of working experience in the emergency department (59; 54%).

2. *Level of Staff Nurse's Knowledge of Early Recognition of Acute Coronary Syndrome*

- More than half of the ED nurses were knowledgeable (62; 56 %) on Classifying Types and Causes, specifically, the question with the highest number of the correct answer (110;100%) and where the respondents showed mastery was “EKG readings indicating myocardial infarction”, while the question with the lowest correct answers (73;66%), indicating that respondents were moving towards mastery was on “EKG changes that may indicate ischemia”.
- Most of the respondents were knowledgeable (53; 48%) on recognizing early warning signs and symptoms. Specifically, the question with the highest number of correct answers (109; 99%) and mastered by the respondents was “the signs and symptoms of a woman experiencing Acute Coronary Syndrome”. On the other hand, the question with the lowest number of the correct answer (69; 63%) was on “ the ECG findings suggestive of myocardial ischemia” which means average mastery.
- Half of the respondents (55; 50%) were knowledgeable about Implementing Acute Coronary Syndrome (ACS) Protocol. In particular, the question with the highest number of correct answers (97; 88%), indicating that the respondents were closely approximating mastery was on “the appropriate concentration and dose of epinephrine for an unresponsive, pulseless patient”, whereas, the question with the lowest number of correct (68; 62%) indicating average mastery was on “the anticipated outcome for a patient with cardiogenic shock with a nursing diagnosis of decreased cardiac output with appropriate interventions”.
- The overall percentage rating of 85% was obtained, with 93 respondents being very knowledgeable to knowledgeable (93;85%) on Early Recognition of Acute Coronary Syndrome. The sub-variables that obtained the highest number of respondents who were very knowledgeable to knowledgeable (96; 87%) was on Classifying Types and Causes, while the sub-variable with the lowest number of respondents indicating less to least knowledgeable (30;27%) was on Implementing Acute Coronary Syndrome (ACS) Protocol with thirty.

3. *Level of ED Nurse's Management Skills in Handling Acute Coronary Syndrome. Specifically,*

- The ED nurses were highly skillful (WAM=3.54) in classifying types and causes. The highest WAM (3.67) was on “obtaining the accurate chief complaint, history taking, and vital signs of a patient with the suspected case of the acute coronary syndrome; the lowest WAM (3.40) obtained was on “identifying cardiac angina / anginal equivalent from non-cardiac chest pain.
- The ED nurses were highly skillful (WAM=3.66) in recognizing early warning signs and symptoms. The highest WAM (3.72) was on “accurately assessing the patient's degree of chest pain utilizing the Numerical and/or Wong-Baker Face Scale”; the lowest WAM (3.59) was on “promptly completing the assessment of a patient with suspected ACS according to hospital/institutional protocol”.
- The ED nurses were highly skillful (WAM=3.69) in Implementing Acute Coronary Syndrome (ACS) Protocol. The highest WAM (3.78) was on “positioning the head-of-bed elevated to at least 30-45 degrees and administering oxygen therapy independently; the lowest WAM (3.57) was on “performing the skin shaving on patient's right wrist or groin, secure/witness the consent as explained by the physician, and completion of pre-procedure checklist before shifting the patient to the cardiac catheterization laboratory.
- The ED nurses were highly skillful WAM (3.63) based on the overall results on Management Skills in Handling Acute Coronary Syndrome. The category with the highest WAM (3.68) was on Implementing Acute Coronary Syndrome Protocol with 3.68 which means Highly Skillful, whereas, the Category with the lowest WAM (3.54) was on Classifying Types and Causes.

4. Significant Difference in the Level of Knowledge of ED Nurses according to their Demographic Profile.

- No significant difference was found between the age of the emergency nurses and knowledge of Classifying Types and Causes ($p=0.62$), Recognizing Early Warning Signs and Symptoms($p=0.38$), Implementing Acute Coronary Syndrome (ACS) Protocol ($p=0.49$), and Overall Level of Knowledge($p=0.68$);
- No significant difference was noted between sex and knowledge on Classifying Types and Causes ($p=0.64$), Recognizing Early Warning Signs and Symptoms($p=0.12$), Implementing Acute Coronary Syndrome (ACS) Protocol ($p=0.76$), and Overall Level of Knowledge ($p=0.34$);
- No significant difference was noted between educational attainment and knowledge on Classifying Types and Causes ($p=0.76$), Recognizing Early Warning Signs and Symptoms($p=0.35$), Implementing Acute Coronary Syndrome (ACS) Protocol ($p=0.14$), and Overall Level of Knowledge ($p=0.25$);
- No significant difference was noted between training and knowledge on Classifying Types and Causes ($p=0.51$), Recognizing Early Warning Signs and Symptoms($p=0.20$), Implementing Acute Coronary Syndrome (ACS) Protocol ($p=0.15$), and Overall Level of Knowledge ($p=0.21$);
- A significant difference was noted between position and knowledge on Recognizing Early Warning Signs and Symptoms($p=0.04$), Implementing Acute Coronary Syndrome (ACS) Protocol ($p=0.01$), and Overall Level of Knowledge ($p=0.01$); In particular, the emergency nurses in Staff Nurse III position were the least knowledge on early recognition of acute coronary syndrome in terms of Recognizing Early Warning Signs and Symptoms($p=0.02$) implementing acute coronary syndrome protocol ($p=0.02$), and on the over-all knowledge as compared with Staff Nurse III ($p=0.03$) and Staff Nurse II($p=0.01$). However, no significant difference was found between position and knowledge of Classifying Types and Causes ($p=0.58$);
- A significant difference was noted between years of experience in the ED and knowledge of Implementing Acute Coronary Syndrome Protocol ($p=0.00$) and Overall Level of Knowledge ($p=0.00$) with the group of 6 years and above had the highest level of knowledge as compared with those who are 1-2 years ($p=0.00$) and 2-3 years ($p=0.00$). On the other hand, no significant difference was found between years of experience and knowledge on Classifying Types and Causes of ACS ($p=0.09$).

5. Significant Difference in the Level of Emergency Nurse's Management Skills in Handling Acute Coronary Syndrome

- No significant difference was found between the age of the emergency nurses and practices on Classifying Types and Causes ($p=0.15$), Recognizing Early Warning Signs and Symptoms($p=0.08$), Implementing Acute Coronary Syndrome (ACS) Protocol ($p=0.13$), and Overall Level of Emergency Nurse's Management Skills ($p=0.15$);
- No significant difference was found between the sex of the emergency nurses and practices on Classifying Types and Causes ($p=0.61$), Recognizing Early Warning Signs and Symptoms($p=0.50$), Implementing Acute Coronary Syndrome (ACS) Protocol ($p=0.18$), and Overall Level of Emergency Nurse's Management Skills ($p=0.29$);
- A significant difference was found between the educational attainment of the emergency nurses and practices on Recognizing Early Warning Signs and Symptoms ($p=0.02$) with those who finished a Diploma in Nursing as being highly skillful as compared with those with Bachelors in Nursing Degree ($p=0.02$), and with those with master's degree ($p=0.02$). On the other

- hand, no significant difference was found between educational attainment and the practices in Classifying types and Causes ($p=0.07$), Implementing Acute Coronary Syndrome (ACS) Protocol ($p=0.23$), and Overall Level of Emergency Nurse's Management Skills ($p=0.07$);
- A significant difference was noted between trainings attended and the practices in Classifying Types and Causes ($p=0.00$), Implementing Acute Coronary Syndrome (ACS) Protocol ($p=0.04$), and Overall Level of Emergency Nurse's Management Skills ($p=0.01$) with those who have attended more than 10 trainings as more skillful than those with lesser trainings. However, no significant difference was noted between trainings attended and practices on Recognizing Early Warning Signs and Symptoms ($p=0.054$);
 - A significant difference was found between the position of the ED nurses and the practices on Classifying Types and Causes ($p=0.01$), Recognizing Early Warning Signs and Symptoms ($p=0.00$), Implementing Acute Coronary Syndrome (ACS) Protocol ($p=0.02$), and Overall Level of ED Nurse's Management Skills ($p=0.01$) with the respondents on Staff Nurse III position as the least skillful as compared with those in Staff Nurse I and Staff Nurse II positions;
 - A significant difference was found between years of experience in the ED, and Emergency Management Skills in Handling Acute Coronary Syndrome in terms of Classifying Types and Causes ($p=0.00$), Recognizing Early Warning Signs and Symptoms ($p=0.01$), and Overall Level of Emergency Nurse's Management Skills ($p=0.00$), with those respondents who had 1 – 2 years stay in the ED as the least skillful as compared with those with long years of stay. However, no significant difference was noted between years of experience and the emergency management skills in Implementing Acute Coronary Syndrome (ACS) Protocol ($p=0.07$).

CONCLUSIONS

Based on the gathered data and findings of the study, the following conclusions were drawn:

1. The majority of the 110 ED nurses were 23 – 39 years old, female, with Bachelor's Degree in Nursing, attended more than 10 trainings, Staff Nurse III, and are working in the ED for 6 years and above.
2. More than half of the respondents were knowledgeable in terms of Classifying Types and Causes; nearly half of the respondents had adequate knowledge in terms of Recognizing Early Warning Signs and Symptoms, least knowledgeable in categorizing ACS using the CTAS guideline, with the majority as knowledgeable to very knowledgeable in overall knowledge on early recognition and management of ACS.
3. The ED nurses were highly skillful in the levels of emergency management in handling ACS in all the identified sub-variables in terms of classifying types and causes, recognizing early warning signs and symptoms, and implementing ACS Protocol.
4. The demographic variables of age, sex, educational attainment, and training were not associated with the level of knowledge on early recognition and management of ACS among ED nurses. However, the position is associated with the overall level of knowledge, recognizing signs and symptoms, and implementing ACS Protocol. Moreover, the years of working experience in the ED are associated with the overall knowledge and implementation ACS Protocol.
5. The demographic variables of educational attainment is associated with recognizing early warning signs and symptoms; trainings were associated with management skills in Classifying Types and Causes, Implementing Acute Coronary Syndrome (ACS) Protocol, and Overall Level of Emergency Nurse's Management Skills; Position and experience is associated in all the aforementioned three sub-variables.
6. The output of the study, entitled "Integrated Training Program on Triage ACS Patients for New ED Nurses" will be part of the in-service transition to practice educational program that will

specifically target the newly hired and less than 1 year working as ED nurses with SN III Position to be able to easily adapt the fast-paced emergency work setting with the aim to prepare them to become competent in early recognizing and managing patients with ACS, thus providing safety and reducing morbidity and mortality of clients in the ED.

Recommendations

In light of the findings obtained from the current study, the following recommendations were suggested:

1. For Adult Emergency Nurses

- Attending mandatory training and certifications related to ACS.
- Use of Clinical Judgement. (Application of the learned theory into practice).
- Integrated Training Program on Triaging ACS for New ED Nurses

2. For the Nursing Service and Administrator

- To Implement a Comprehensive Orientation for Newly Hired ED Nurses.
- Selection/Delegation of appropriate Mentor-preceptor.
- De-loading of Mentor's patient assignment, to give quality guidance and support to new Nurses.
- Inclusion of specific personal and professional objectives pertaining to ACS management should be involved in the staff Annual Appraisal.

3. For the Nursing Practice

- The results and findings of this study may be used as part of the modification of current practice in the ED.

4. For the Nursing education administrator

- Integration of Training Program on Triaging ACS for New Nurses to the new in-service Transition to Practice Program in the ED.
- Provision of Comprehensive Case-Based- Discussion of ACS to the various group of nurse learners (Staff Nurses, Post Graduate students, Nurse Interns, undergrad Students).
- Facilitation, supervision, and random audit of nurses' performance by Clinical Resource Nurses and Educators in the ED.

5. For Future Researchers

- To conduct a resembling study that pertains to the relationship between early recognition and management skills of ED nurses in handling Acute Coronary Syndrome and socio-demographic characteristics.
- Constitute a more thorough related research that contains different variables like the area of assignment in the ED and a larger respondent aiming to produce a more enhanced Integrated Training Program on Triaging ACS for New Nurses in the ED.

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