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# Effectiveness of Simulation-Based Training on Knowledge & Skills Regarding Triage Management among Healthcare Professionals at Tertiary Care Hospital

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**Abstract: Background:** It has been stated that *"triage in a disaster situation cannot be taught; it must be lived"*. Triage is a difficult procedure that calls for medical expertise, skills, and knowledge of the casualty's dynamic changes in health. Triage management takes into account a variety of criteria, including the type of incident, the number of patients impacted, transportation requirements, distances, hospital capabilities, and the availability of resources. Healthcare professionals must acquire and enhance their skills in triage.
**Objectives:** The study objectives were to assess the knowledge of healthcare professionals regarding triage management, assess the skills of healthcare professionals regarding triage management, evaluate the effectiveness of simulation-based training on knowledge & skills of healthcare professionals regarding triage management, determine the association of knowledge of healthcare professional regarding triage management with selected socio-demographic variables, determine the association of skills of healthcare professionals regarding triage management with selected socio-demographic variables.
**Materials and Methods:** A quantitative research approach and a quasi-experimental research design (Non-Randomized Control Group Design) were used in the study. A total of 118 healthcare professionals working in the Emergency Department & Intensive care unit of selected tertiary care hospitals were selected by total enumeration sampling technique. 59 healthcare professionals were selected in the experimental group and 59 were selected in the control group by the non-randomized method. A socio-demographic and Profession-related data questionnaire prepared by the investigators, a structured knowledge questionnaire, and a structured skill checklist on triage management were used to collect the data from the participants. First, the pre-test was taken for the experimental & control group participants. After that, the intervention was administered only to the healthcare professionals in the experimental group. The post-test was conducted for both experimental and control groups after seven days of the pre-test.
**Results:** In the experimental group's pre-test, 34% had adequate knowledge, 39% had moderate knowledge, and 27% had inadequate knowledge. Post-intervention, 93% demonstrated adequate knowledge, 7% moderate knowledge, and none had inadequate knowledge. Pre-test skills showed 17% high-level, 19% moderate, and 64% low-level triage skills, while post-test results were 92% adequate, 8% moderate, and none were in the inadequate category. For the control group, the pre-test showed 25% adequate knowledge, 51% moderate, and 24% inadequate. Post-test, 24% were adequate, and 51% moderate. Pre-test skills were 7% high-level, 7% moderate, and 86% low-level, with post-test results maintaining the same distribution. In the experimental group, the pre-knowledge mean was 16.66 (SD = 6.786), increasing significantly post-intervention to 27.08 (SD = 3.616). Skills improved from a mean of 4.71 (SD = 3.922) to 13.53 (SD = 2.285). In the control group, the pre-knowledge mean was 15.20 (SD = 6.504), with no significant change post-intervention (15.24, SD = 6.407). Skills also remained stable (pre: 3.86, SD = 2.974; post: 3.86, SD = 2.927). Significant associations were found between socio-demographic and professional variables like working department, Duration of work experience, Job Title/Professional Status, Occupation, Gender, Weekly Average shift, Family Income, religion, and education level of doctors.
**Conclusion:** Based on the study's findings, it was concluded that the simulation-based training was highly effective in improving the knowledge and skills regarding triage management among healthcare professionals.

**Keywords:** Simulation-Based Training, Triage, Knowledge, Skills, Healthcare Professionals.

## 1. Introduction

One of the most important aspects of patient management in situations of disaster emergency has been called triage.[3] Triage is defined as the management and sorting of patients using an algorithm or sorting system based on an evaluation of medical need, prioritizing, and evacuation. Triage in a disaster aims to decrease morbidity and mortality by offering the greatest benefit to the greatest number of sufferers.[1]
The World Health Organization (WHO) defines a disaster as, A serious disruption of the functioning of a community or a society causing widespread human, material, economic, or environmental losses that exceed the ability of the affected community or society to cope using its resources. [2] The goal of triage is to place the right patient in the right place, by the right time by the right person.[3]The priority part of triage is routinely used in the Emergency Department and elsewhere, but it is different from all aspects of triage utilized during a disaster. In disasters, triage involves not just selecting and prioritizing patients, but also allocating finite resources to "do the greatest good for the greatest number." Components of disaster triage are Sorting, Prioritizing, and Allocating resources and Disaster triage outcome considerations Survival, Quality of life, and Resource consumption.[4]
The World Health Organization (WHO) defines an MCI as "an event that generates more patients at one time than locally available resources can manage using routine procedures." Sometimes the word “disaster” is used as a synonym for MCI (mass casualty incident).[5]The word triage is derived from the French verb trier, which means “to sort”. We may trace the first known triage system back to military medicine in the 18th century. Instead of waiting to treat wounded soldiers until the war was over, Baron Dominique-Jean Larrey, the senior surgeon of Napoleon's Imperial Guard, established a system to treat and transport wounded soldiers during the war.[6]
One of the earlier civilian triage systems used in MCIs was Simple Triage and Rapid Transport (START), which was developed by the Newport Beach Fire and Marine Department and Hoag Hospital in Newport Beach, California in 1983. Because of its design, the assessment can be completed by the provider in 60 seconds. This is the most widely utilized triage method for managing MCIs in the United States, Canada, Saudi Arabia, portions of Australia, and Israel.[11] This meta-analysis set out to determine two things: (1) the general accuracy and under- and over-triage rates of the START technique when used by providers from different backgrounds; and (2) the precise accuracy rates for each of the four START categories (red, yellow, green, and black).[7]
Many catastrophe triage decisions focus on using the Simple Triage and Rapid Treatment (START) triage decision-making methodology. The key techniques utilized by these systems are the observation of injuries treated and the *prioritization* of patients based on specific physiological indicators, such as airway, Breathing, and circulation. It is a system aiming to take care of and transfer those with the most advanced cases first, then treat individuals with conditions needing less urgent attention. It suggests a *color-coded process* for quickly classifying victims based on the relative severity of their injuries. The widely recognized color-coding system & is commonly labeled as "Immediate," "Urgent”, “Delayed," and "Expectant," based on the severity of their injuries and the likelihood of survival with medical intervention. Green: injured parties whose wounds are sufficiently minor to be treated with volunteer or self-help aid. Yellow: injured parties who can wait a little while to receive medical attention. Red: Casualties whose wounds require immediate medical attention, either following resuscitation or as soon as is reasonably possible. Black: Dead victims.[8]
Triage is and should be a dynamic procedure meaning that the decision to place a patient must be intermittently reassessed and modified regarding their current condition and the outcomes of any interventions.[9] Even when the triage decision was made by skilled medical professionals, it may still alter, thus it is important to reevaluate it while the patient is being transported and treated.[9]

### Hypotheses

H1 - There will be a significant difference between the pre-test and post-test knowledge scores of healthcare professionals regarding triage management after the implementation of skill-based training at 0.05 level of significance.
H2 - There will be a significant difference between the pre-test and post-test skill scores of healthcare professionals regarding triage management after the implementation of skill-based training at 0.05 level of significance.

## 2. Material and Methods

The current study was conducted using a quasi-experimental design (Non-Randomized Control Group Design) and a quantitative research methodology. The Total enumeration sampling approach was employed to choose the

sample for the current investigation, which included 118 healthcare professionals. The study was performed at the Emergency Department & Intensive care unit of Parul Sevashram Hospital, Vadodara. Before gathering the data, necessary permissions were obtained from the ethical committee, and informed written consent was taken from the study participants. A socio-demographic and profession-related data questionnaire, structured knowledge questionnaire, and structured skill checklist on triage management prepared by the investigators were utilized for collecting the information from the participants. The test-retest reliability of the structured knowledge questionnaire is 0.926 and for the structured skill checklist triage management r value was 0.706. The data was analyzed using SPSS version 25 for inferential and descriptive statistics.

## 3. Results

According to the study objectives, the data were collected in a Microsoft excel spreadsheet and then analyzed using descriptive and inferential statistics using SPSS. The results were organized as follows:

**Section A:**
Distribution of Healthcare professionals according to Socio-demographic data & Profession-related related data.
**Section B:** 1. Knowledge level of healthcare professionals regarding triage management.
2. Skill level of healthcare professionals regarding triage management
**Section C:** Effectiveness of simulation-based training on knowledge & skills of healthcare professionals regarding triage management.
**Section D:** 1. Association of Knowledge of healthcare professionals regarding triage management with selected socio-demographic data & profession-related data.
2. Association of skills of healthcare professionals regarding triage management with selected socio-demographic variables & profession- related data Section A:

Table 1: Frequency & percentage distribution of health care professionals based on socio-demographic data in experimental and control group

n=118

| Sr. No. | Socio-Demographic Data | Group | | | |
|---|---|---|---|---|---|
| | | Experimental Group (n = 59) | | Control Group (n = 59) | |
| | | No. of Participants (Frequency) | % | No. of Participants (Frequency) | % |
| 1 | Age | | | | |
| | 20-25 years | 34 | 58 | 38 | 64 |
| | 26-30 years | 18 | 31 | 11 | 19 |
| | 31-35 years | 4 | 7 | 6 | 10 |
| | >36 years | 3 | 5 | 4 | 7 |
| 2 | Gender | | | | |
| | Male | 20 | 34 | 24 | 41 |
| | Female | 39 | 66 | 35 | 59 |
| 3 | Marital status | | | | |
| | Married | 20 | 34 | 22 | 37 |
| | Unmarried | 39 | 66 | 36 | 61 |
| | Divorced | 0 | 0 | 1 | 2 |
| 4 | Religion | | | | |
| | Hindu | 56 | 95 | 55 | 93 |
| | Muslim | 1 | 2 | 3 | 5 |

| | | | | | |
|---|---|---|---|---|---|
| | Christian | 2 | 3 | 1 | 2 |
| 5 | Monthly Family Income (Rs.) | | | | |
| | 15001-20000 | 28 | 47 | 32 | 54 |
| | 21001-30000 | 6 | 10 | 12 | 20 |
| | 31001-40000 | 7 | 12 | 5 | 8 |
| | >41000 | 18 | 31 | 10 | 17 |

Table 2: Frequency & percentage distribution of healthcare professionals based on profession related data in experimental and control group
n=118

| Sr. No. | Profession related Data | Group | | | |
|---|---|---|---|---|---|
| | | Experimental Group (n = 59) | | Control Group (n = 59) | |
| | | No. of Participants (Frequency) | % | No. of Participants (Frequency) | % |
| 1 | Job Title/Professional Status | | | | |
| | **Doctor** | 21 | 36 | 24 | 41 |
| | **Nurse** | 37 | 63 | 34 | 58 |
| | **Paramedic** | 1 | 1 | 1 | 1 |
| | **If other, Specify** | 0 | 0 | 0 | 0 |
| 2 | Occupation | | | | |
| | **Intensivist** | 16 | 27 | 16 | 27 |
| | **Critical care registered nurse** | 37 | 63 | 34 | 58 |
| | **Emergency Medical Technician-Paramedic** | 1 | 1 | 1 | 1 |
| | **Other** | 5 | 9 | 8 | 14 |
| 3 | Education level, if Doctor | | | | |
| | **MBBS** | 6 | 29 | 15 | 63 |
| | **BHMS** | 11 | 52 | 9 | 38 |
| | **BAMS** | 1 | 5 | 0 | 0 |
| | **Others** | 3 | 14 | 0 | 0 |
| 4 | Education level, if Nurses | | | | |
| | **Diploma in Nursing** | 17 | 46 | 20 | 59 |
| | **Bachelor in Nursing** | 15 | 41 | 12 | 35 |

| | | | | | |
|---|---|---|---|---|---|
| | **Postgraduate in Nursing** | 1 | 3 | 1 | 3 |
| | **Others** | 4 | 11 | 1 | 3 |
| **5** | Education level, if Paramedics | | | | |
| | **EMT-B** | 0 | 0 | 0 | 0 |
| | **EMT- A** | 0 | 0 | 0 | 0 |
| | **APGDEC- Advanced Post Graduate Diploma in Emergency Care** | 1 | 100 | 1 | 100 |
| | **PGDEMS- PG Diploma in Emergency Medical Services** | 0 | 0 | 0 | 0 |
| **6** | Working Department | | | | |
| | **Emergency Room** | 13 | 22 | 17 | 29 |
| | **Emergency ICU** | 16 | 27 | 12 | 20 |
| | **Medical ICU** | 11 | 19 | 14 | 24 |
| | **Surgical ICU** | 7 | 12 | 4 | 7 |
| | **Cardiac ICU** | 12 | 20 | 12 | 20 |
| **7** | Duration of work experience in work place / Department | | | | |
| | **<6 Months** | 21 | 36 | 19 | 32 |
| | **01 Years – 03 Years** | 19 | 32 | 29 | 49 |
| | **04 Years – 06 Years** | 11 | 19 | 6 | 10 |
| | **> 6 years** | 8 | 14 | 5 | 8 |
| **8** | Total Work Experience in Years | | | | |
| | **<5 Years** | 38 | 64 | 36 | 61 |
| | **6-10 Years** | 14 | 24 | 17 | 29 |
| | **11-15 Years** | 2 | 3 | 5 | 8 |
| | **>15 Years** | 5 | 8 | 1 | 2 |
| **9** | Weekly average shift (hours) | | | | |
| | **24-32 hrs.** | 14 | 24 | 13 | 22 |
| | **40-48 hrs.** | 32 | 54 | 27 | 46 |
| | **56-64 hrs.** | 9 | 15 | 11 | 19 |
| | **>72 hrs.** | 4 | 7 | 8 | 14 |
| **10** | Previously Attended any Triage Training | | | | |
| | **No** | 59 | 100 | 59 | 100 |
| | **Yes** | 0 | 0 | 0 | 0 |

As mentioned in Tables 1 & 2 in both groups, the majority of participants were aged 20-25 years, with 58% in the experimental group and 64% in the control group falling within this age range. Females dominated both groups, comprising 66% in the experimental group and 59% in the control group. Most participants were unmarried, accounting for 66% in the experimental group and 61% in the control group. In terms of religion, Hindus constituted the majority in both groups, comprising 95% in the experimental group and 93% in the control group. Family income distribution varied, with the highest proportion in the 15001-20000 Rs bracket for both groups. Nurses were the predominant profession in both groups, constituting 63% in the experimental group and 58% in the control group. Regarding education, BHMS doctors were more in the experimental group (52%), while MBBS doctors were more in the control group (63%). A diploma in Nursing was the most common educational qualification for nurses in both groups. The majority of healthcare professionals worked in the emergency ICU in both groups, with 27% in the experimental group and 29% in the control group. Work experience was primarily <6 years, with 36% in the experimental group and 49% in the control group falling within this range. Weekly average shifts were mostly 40-48 hours for both groups, with 54% in the experimental group and 46% in the control group falling into this category. No participants in either group had previously attended any triage training.

**Section B:**

Table 3: Pre-test knowledge level of healthcare professionals regarding triage management in experimental & control group
n =118

| Pre-Test Knowledge Level | Experimental Group | | Control Group | | Total |
|---|---|---|---|---|---|
| | No. of Healthcare professionals (f) | % | No. of Healthcare professionals (f) | % | |
| Adequate | 20 | 34 | 15 | 25 | 35 |
| Moderate | 23 | 39 | 30 | 51 | 53 |
| Inadequate | 16 | 27 | 14 | 24 | 30 |
| Total | 59 | 100 | 59 | 100 | 118 |

In the pre-test, the experimental group consisted of 20 healthcare professionals (34%) with adequate knowledge, 23 (39%) with moderate knowledge, and 16 (27%) with inadequate knowledge. In comparison, the control group had 15 (25%) with adequate knowledge, 30 (51%) with moderate knowledge, and 14 (24%) with inadequate knowledge.

Table 4: Post-test of the knowledge level of healthcare professionals regarding triage management in experimental and control group
n=118

| Post-Test Knowledge Level | Experimental Group | | Control Group | | Total |
|---|---|---|---|---|---|
| | No. of Healthcare professionals (f) | % | No. of Healthcare professionals (f) | % | |
| Adequate | 55 | 93 | 14 | 24 | 69 |
| Moderate | 4 | 7 | 30 | 51 | 34 |
| Inadequate | 0 | 0 | 15 | 25 | 15 |
| Total | 59 | 100 | 59 | 100 | 118 |

In the experimental group, 55 healthcare professionals (93%) had adequate knowledge, 4 (7%) had moderate knowledge, and none had inadequate knowledge. In the Control group, 14 (24%) had adequate knowledge, and 30 (51%) had moderate knowledge.

Table 5: Pre-test skill level of healthcare professionals regarding triage management in experimental and control group
n=118

| Pre-Test Skill Level | Experimental Group | | Control Group | | Total |
|---|---|---|---|---|---|
| | No. of Healthcare professionals (f) | % | No. of Healthcare professionals (f) | % | |
| High-Level | 10 | 17 | 4 | 7 | 14 |
| Moderate Level | 11 | 19 | 4 | 7 | 89 |
| Low-Level | 38 | 64 | 51 | 86 | 15 |
| Total | 59 | 100 | 59 | 100 | 118 |

In the pre-test, the experimental group had 10 (17%) with High-Level Triage Skills, 11 (19%) with Moderate-Level Triage Skills, and 38 (64%) with Low-Level Triage Skills. The control group had 4 (7%) with High-Level Triage Skills, 4 (7%) with Moderate-Level Triage Skills, and 51 (86%) with Low-Level Triage Skills.

Table 6: Post-test skill level of healthcare professionals regarding triage management in experimental and control group
n=118

| Post-Test Skill Level | Experimental Group | | Control Group | | Total |
|---|---|---|---|---|---|
| | No. of Healthcare professionals (f) | % | No. of Healthcare professionals (f) | % | |
| High-Level | 54 | 92 | 4 | 7 | 58 |
| Moderate Level | 5 | 8 | 4 | 7 | 51 |
| Low-Level | 0 | 0 | 51 | 86 | 9 |
| Total | 59 | 100 | 59 | 100 | 118 |

In the post-test, the experimental group had 54 (92%) with high-level triage skills, 5 (8%) with moderate-level triage skills, and 0 (0%) with low-level triage skills. The control group had 4 (7%) with high-level triage skills, 4 (7%) with moderate-level triage skills, and 51 (86%) with low-level triage skills.

**Section c:**

Table 7: Mean, standard deviation, and Z–test of pre-test & post-test knowledge and skills scores in the experimental group.
n=59

| Experimental Group | Mean | SD | Z - value | p-value | Result |
|---|---|---|---|---|---|
| Pre-Test Knowledge Score | 16.66 | 6.786 | -21.399 | <0.0001 | HS |
| Post-Test Knowledge Score | 27.08 | 3.616 | | | |
| Pre-Test Skill Total Score | 4.71 | 3.922 | -30.15 | <0.0001 | HS |
| Post-Test Skill Total Score | 13.53 | 2.285 | | | |

**Table 7** indicates that in the experimental group, the pre-knowledge score was 16.66 with SD 6.786, and the post-post-knowledge score was 27.08 with SD 3.616. The test statistic value was -21.399 with p – a value <0.0001. i.e., the mean post-knowledge score was significantly increased in the experimental group. Also, the skill score

was 4.71 with SD 3.922 which increased in the post-test to 13.5 3 with SD 2.285 test statistic was -30.15 with p – a value <0.0001. i.e., the mean post-test score was significantly increased in the experimental group.

Table 8: Mean, standard deviation, and Z–test of pre-test & post-test knowledge and skills scores in the control group.
n=59

| Control Group | Mean | SD | Z - value | p-value | Result |
|---|---|---|---|---|---|
| Pre-Test Knowledge Score | 15.20 | 6.504 | -0.0621 | 0.475 | NS |
| Post-Test Knowledge Score | 15.24 | 6.407 | | | |
| Pre-Test Skill Total Score | 3.86 | 2.974 | -0.006 | 0.498 | NS |
| Post-Test Skill Total Score | 3.86 | 2.927 | | | |

**Table 8** indicates that in the control group, the pre-knowledge score was 15.20 with SD 6.504, and post post-knowledge score was 15.24 with SD 6.407. test statistic value was -0.0621 with p – value 0.475 > 0.05(significance level). i.e., the mean post-knowledge score was not significantly increased in the Control group. Also, the skill score was 3.86 with SD 2.974 which increased in the post-test to 3.86 with SD 2.927. test statistic was -0.006 with p – p-value 0.498 > 0.05 (significance level). i.e., the mean post-test score was not significantly increased in the Control group.

**Section d:**

Table 9: Association between pre-test level of knowledge on triage management of healthcare professionals in experimental group with selected socio-demographic data & Profession related data
n=59

| EXPERIMENTAL GROUP | | | | | | | |
|---|---|---|---|---|---|---|---|
| Socio-demographic Data and Professional Related Data | Pre-Test Knowledge Level | | | Total | Fisher's Exact Test | p-value | Result |
| | Adequate | Moderate | Inadequate | | | | |
| **AGE** | | | | | | | |
| 20-25 years | 8 | 17 | 9 | 34 | 7.307 | 0.218 | NS |
| 26-30 years | 8 | 4 | 6 | 18 | | | |
| 31-35 years | 2 | 2 | 1 | 5 | | | |
| >36 years | 2 | 0 | 0 | 2 | | | |
| **GENDER** | | | | | | | |
| Male | 8 | 9 | 3 | 20 | 2.252 | 0.368 | NS |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Female | 12 | 14 | 13 | 39 | | | |
| **MARITAL STATUS** | | | | | | | |
| Married | 8 | 4 | 8 | 20 | 4.98 | 0.083 | NS |
| Unmarried | 12 | 19 | 8 | 39 | | | |
| **RELIGION** | | | | | | | |
| Hindu | 19 | 21 | 16 | 56 | 2.55 | 1 | NS |
| Muslim | 0 | 1 | 0 | 1 | | | |
| Christian | 1 | 1 | 0 | 2 | | | |
| **FAMILY INCOME** | | | | | | | |
| 15001-20000 | 5 | 13 | 10 | 28 | 13.571 | 0.02 | S |
| 21001-30000 | 1 | 2 | 3 | 6 | | | |
| 31001-40000 | 2 | 4 | 1 | 7 | | | |
| >41001 | 12 | 4 | 2 | 18 | | | |
| **JOB TITLE/PROFESSIONAL STATUS** | | | | | | | |
| Doctor | 10 | 10 | 1 | 21 | 10.681 | 0.01 | S |
| Nurse | 10 | 13 | 14 | 37 | | | |
| Paramedic | 0 | 0 | 1 | 1 | | | |
| **OCCUPATION** | | | | | | | |
| Intensivist | 7 | 7 | 2 | 16 | 10.045 | 0.06 | NS |
| Critical care registered nurse | 10 | 12 | 15 | 37 | | | |
| Emergency Medical | 0 | 0 | 1 | 1 | | | |
| Other | 3 | 2 | 0 | 5 | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **THE EDUCATION LEVEL OF THE DOCTOR** | | | | | | | |
| MBBS | 5 | 0 | 1 | 6 | 12.260 | 0.02 | S |
| BHMS | 2 | 1 | 8 | 11 | | | |
| BAMS | 1 | 0 | 0 | 1 | | | |
| Others | 3 | 0 | 0 | 3 | | | |
| **EDUCATION LEVEL OF NURSES** | | | | | | | |
| Diploma in Nursing | 3 | 9 | 5 | 17 | 9.034 | 0.10 | NS |
| Bachelor in Nursing | 3 | 4 | 8 | 15 | | | |
| Postgraduate in Nursing | 0 | 1 | 0 | 1 | | | |
| Others | 3 | 0 | 1 | 4 | | | |
| **WORKING DEPARTMENT** | | | | | | | |
| Emergency Room | 7 | 6 | 0 | 13 | 30.90 | <0.0001 | HS |
| Emergency ICU | 2 | 9 | 5 | 16 | | | |
| Medical ICU | 0 | 3 | 8 | 11 | | | |
| Surgical ICU | 2 | 2 | 3 | 7 | | | |
| Cardiac ICU | 9 | 3 | 0 | 12 | | | |
| **DURATION OF WORK EXPERIENCE IN WORKPLACE / DEPARTMENT** | | | | | | | |
| <6 Months | 6 | 12 | 3 | 21 | 18.687 | 0.006 | HS |
| 01 Years – 03 Years | 3 | 10 | 6 | 19 | | | |
| 04 Years – 06 Years | 7 | 1 | 3 | 11 | | | |
| > 6 years | 4 | 0 | 4 | 8 | | | |
| **TOTAL WORK EXPERIENCE IN YEARS** | | | | | | | |
| <5 Years | 10 | 18 | 10 | 38 | 6.199 | 0.357 | NS |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6-10 Years | 5 | 4 | 5 | 14 | | | |
| 11-15 Years | 2 | 0 | 0 | 2 | | | |
| >15 Years | 3 | 1 | 1 | 5 | | | |
| **WEEKLY AVERAGE SHIFT (HOURS)** | | | | | | | |
| 24-32 hrs. | 2 | 8 | 4 | 14 | 14.583 | 0.011 | S |
| 40-48 hrs. | 9 | 13 | 10 | 32 | | | |
| 56-64 hrs. | 8 | 0 | 1 | 9 | | | |
| >72 hrs. | 1 | 2 | 1 | 4 | | | |

**Table 9** reveals the association between structured knowledge questionaries' pre-test scores with socio-demographic variables and Profession-related data of healthcare professionals of the experimental group. There was a highly significant association between some variables like Working department and duration of work experience in work workplace / Department. There was a significant association between some variables like family income, Job Title/Professional status, education level of doctors, and weekly average shift (hours). There was no significant association between age, gender, marital status, religion, occupation, education level of nurses, and total work experience in a year.

Table 10: Association between pre-test level of knowledge on triage management of healthcare professionals in control group with selected socio-demographic data & profession related data
n=59

| **CONTROL GROUP** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Socio-demographic Data and Professional Related Data** | **Pre-Test Knowledge Level** | | | **Total** | **Fisher's Exact Test** | **p-value** | **Result** |
| | Adequate | Moderate | Inadequate | | | | |
| **AGE** | | | | | | | |
| 20-25 years | 7 | 18 | 13 | 38 | 7.69 | 0.204 | NS |
| 26-30 years | 5 | 5 | 1 | 11 | | | |
| 31-35 years | 2 | 4 | 0 | 6 | | | |
| >36 years | 1 | 3 | 0 | 4 | | | |
| **GENDER** | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Male | 7 | 14 | 3 | 24 | 2.387 | 0.387 | NS |
| Female | 8 | 16 | 11 | 35 | | | |
| **MARITAL STATUS** | | | | | | | |
| Married | 5 | 14 | 3 | 22 | 5.104 | 0.213 | NS |
| Unmarried | 9 | 16 | 11 | 36 | | | |
| Divorced | 1 | 0 | 0 | 1 | | | |
| **RELIGION** | | | | | | | |
| Hindu | 12 | 29 | 14 | 55 | 7.347 | 0.025 | S |
| Muslim | 3 | 0 | 0 | 3 | | | |
| Christian | 0 | 1 | 0 | 1 | | | |
| **FAMILY INCOME** | | | | | | | |
| 15001-20000 | 6 | 18 | 8 | 32 | 11.0404 | 0.05 | S |
| 21001-30000 | 2 | 6 | 4 | 12 | | | |
| 31001-40000 | 0 | 4 | 1 | 5 | | | |
| >41000 | 7 | 2 | 1 | 10 | | | |
| **JOB TITLE/PROFESSIONAL STATUS** | | | | | | | |
| Doctor | 11 | 8 | 5 | 24 | 14.575 | 0.005 | HS |
| Nurse | 3 | 21 | 10 | 34 | | | |
| Paramedic | 0 | 1 | 0 | 1 | | | |
| **OCCUPATION** | | | | | | | |
| Intensivist | 4 | 4 | 8 | 16 | 13.04 | 0.02 | S |
| Critical care registered nurse | 3 | 17 | 14 | 34 | | | |
| Emergency Medical | 0 | 1 | 0 | 1 | | | |
| Other | 6 | 1 | 1 | 8 | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **THE EDUCATION LEVEL OF THE DOCTOR** | | | | | | | |
| MBBS | 8 | 0 | 7 | 15 | 8.053 | 0.01 | S |
| BHMS | 4 | 4 | 1 | 9 | | | |
| BAMS | 0 | 0 | 0 | 0 | | | |
| Others | 3 | 0 | 0 | 3 | | | |
| **EDUCATION LEVEL OF NURSES** | | | | | | | |
| Diploma in Nursing | 1 | 8 | 11 | 20 | 5.62 | 0.62 | NS |
| Bachelor in Nursing | 2 | 2 | 8 | 12 | | | |
| Postgraduate in Nursing | 0 | 0 | 1 | 1 | | | |
| Others | 0 | 0 | 1 | 1 | | | |
| **WORKING DEPARTMENT** | | | | | | | |
| Emergency Room | 9 | 7 | 1 | 17 | 17.03 | 0.015 | S |
| Emergency ICU | 2 | 4 | 6 | 12 | | | |
| Medical ICU | 2 | 10 | 2 | 14 | | | |
| Surgical ICU | 0 | 4 | 0 | 4 | | | |
| Cardiac ICU | 2 | 5 | 5 | 12 | | | |
| **DURATION OF WORK EXPERIENCE IN WORKPLACE / DEPARTMENT** | | | | | | | |
| <6 Months | 7 | 9 | 3 | 19 | 5.527 | 0.467 | NS |
| 01 Years – 03 Years | 6 | 14 | 9 | 29 | | | |
| 04 Years – 06 Years | 0 | 5 | 1 | 6 | | | |
| > 6 years | 2 | 2 | 1 | 5 | | | |
| **TOTAL WORK EXPERIENCE IN YEARS** | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| <5 Years | 10 | 18 | 8 | 36 | 2.818 | 0.933 | NS |
| 6-10 Years | 3 | 9 | 5 | 17 | | | |
| 11-15 Years | 2 | 2 | 1 | 5 | | | |
| >15 Years | 0 | 1 | 0 | 1 | | | |
| **WEEKLY AVERAGE SHIFT (HOURS)** | | | | | | | |
| 24-32 hrs. | 2 | 6 | 5 | 13 | 7.703 | 0.248 | NS |
| 40-48 hrs. | 7 | 12 | 8 | 27 | | | |
| 56-64 hrs. | 2 | 8 | 1 | 11 | | | |
| >72 hrs. | 4 | 4 | 0 | 8 | | | |

**Table 10** reveals the association between structured knowledge questionaries' pre-test scores with socio-demographic variables and Profession-related data of healthcare professionals of the control group. There was a highly significant association between variables like job title/professional status. There was a significant association between some variables like religion, family income, occupation, education level of doctors, and working department. There was no significant association between age, gender, marital status, education level of nurses, duration of work experience in workplace/department, and total work experience in a year and weekly average shift (hours).

Table 11: Association between pre-test level of skill on triage management of healthcare professionals in experimental group with selected socio-demographic data & profession related data
n=59

| **EXPERIMENTAL GROUP** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Socio-demographic Data and Professional Related Data | Pre-Test Skill Level | | | Total | Fisher's Exact Test | p-value | Result |
| | High-Level | Moderate Level | Low-Level | | | | |
| **AGE** | | | | | | | |
| 20-25 years | 7 | 6 | 21 | 34 | 4.39 | 0.597 | NS |
| 26-30 years | 3 | 2 | 13 | 18 | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 31-35 years | 0 | 2 | 3 | 5 | | | |
| >36 years | 0 | 1 | 1 | 2 | | | |
| **GENDER** | | | | | | | |
| Male | 7 | 5 | 8 | 20 | 8.931 | 0.008 | HS |
| Female | 3 | 6 | 30 | 39 | | | |
| **MARITAL STATUS** | | | | | | | |
| Married | 1 | 3 | 16 | 20 | 3.721 | 0.164 | NS |
| Unmarried | 9 | 8 | 22 | 39 | | | |
| **RELIGION** | | | | | | | |
| Hindu | 10 | 9 | 37 | 56 | 5.455 | 0.286 | NS |
| Muslim | 0 | 1 | 0 | 1 | | | |
| Christian | 0 | 1 | 1 | 2 | | | |
| **FAMILY INCOME** | | | | | | | |
| 15001-20000 | 3 | 6 | 19 | 28 | 6.698 | 0.298 | NS |
| 21001-30000 | 0 | 0 | 6 | 6 | | | |
| 31001-40000 | 1 | 2 | 4 | 7 | | | |
| >41001 | 6 | 3 | 9 | 18 | | | |
| **JOB TITLE/PROFESSIONAL STATUS** | | | | | | | |
| Doctor | 10 | 5 | 6 | 21 | 26.063 | <0.0001 | HS |
| Nurse | 0 | 6 | 31 | 37 | | | |
| Paramedic | 0 | 0 | 1 | 1 | | | |
| **OCCUPATION** | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Intensivist | 9 | 4 | 3 | 16 | 31.523 | <0.0001 | HS |
| Critical care registered nurse | 0 | 6 | 31 | 37 | | | |
| Emergency Medical | 0 | 0 | 1 | 1 | | | |
| Other | 3 | 2 | 0 | 5 | | | |
| **THE EDUCATION LEVEL OF THE DOCTOR** | | | | | | | |
| MBBS | 5 | 0 | 1 | 6 | 7.163 | 0.225 | NS |
| BHMS | 3 | 5 | 3 | 11 | | | |
| BAMS | 1 | 0 | 0 | 1 | | | |
| Others | 1 | 1 | 1 | 3 | | | |
| **EDUCATION LEVEL OF NURSES** | | | | | | | |
| Diploma in Nursing | 0 | 14 | 3 | 17 | 1.353 | 0.867 | NS |
| Bachelor in Nursing | 0 | 13 | 2 | 15 | | | |
| Postgraduate in Nursing | 0 | 1 | 0 | 1 | | | |
| Others | 0 | 3 | 1 | 4 | | | |
| **WORKING DEPARTMENT** | | | | | | | |
| Emergency Room | 8 | 5 | 0 | 13 | 36.041 | <0.0001 | HS |
| Emergency ICU | 2 | 4 | 10 | 16 | | | |
| Medical ICU | 0 | 0 | 11 | 11 | | | |
| Surgical ICU | 0 | 1 | 6 | 7 | | | |
| Cardiac ICU | 0 | 1 | 11 | 12 | | | |
| **DURATION OF WORK EXPERIENCE IN WORKPLACE / DEPARTMENT** | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| <6 Months | 7 | 5 | 9 | 21 | 8.934 | 0.315 | NS |
| 01 Years – 03 Years | 2 | 3 | 14 | 19 | | | |
| 04 Years – 06 Years | 0 | 2 | 9 | 11 | | | |
| > 6 years | 1 | 1 | 6 | 8 | | | |
| **TOTAL WORK EXPERIENCE IN YEARS** | | | | | | | |
| <5 Years | 9 | 7 | 22 | 38 | 3.422 | 0.766 | NS |
| 6-10 Years | 1 | 3 | 10 | 14 | | | |
| 11-15 Years | 0 | 0 | 2 | 2 | | | |
| >15 Years | 0 | 1 | 4 | 5 | | | |
| **WEEKLY AVERAGE SHIFT (HOURS)** | | | | | | | |
| 24-32 hrs. | 5 | 1 | 8 | 14 | 11.646 | 0.036 | S |
| 40-48 hrs. | 1 | 8 | 23 | 32 | | | |
| 56-64 hrs. | 3 | 1 | 5 | 9 | | | |
| >72 hrs. | 1 | 1 | 2 | 4 | | | |

**Table 11** depicts the association between structured skill checklist pre-test scores with socio-demographic variables and Profession-related data of healthcare professionals of the experimental group. There was a highly significant association between some variables like gender, job title, occupation, and working department. There was a significant association between some variables like weekly average shift(hours). There was no significant association between age, marital status, religion, family income, education level of doctor, education level of doctor nurses, and duration of work experience in workplace/department.

Table 12: Association between pre-test level of skill on triage management of healthcare professionals of the control group with selected socio-demographic data & profession-related data
n=59

| **CONTROL GROUP** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Socio-demographic Data and Professional Related Data | Pre-Test Skill Level | | | Total | Fisher's Exact Test | p-value | Result |
| | High-Level | Moderate Level | Low-Level | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **AGE** | | | | | | | |
| 20-25 years | 2 | 3 | 33 | 38 | 2.979 | 0.829 | NS |
| 26-30 years | 1 | 1 | 9 | 11 | | | |
| 31-35 years | 1 | 0 | 5 | 6 | | | |
| >36 years | 0 | 0 | 4 | 4 | | | |
| **GENDER** | | | | | | | |
| Male | 3 | 2 | 19 | 24 | 2.387 | 0.387 | NS |
| Female | 1 | 2 | 32 | 35 | | | |
| **MARITAL STATUS** | | | | | | | |
| Married | 1 | 0 | 21 | 22 | 9.484 | 0.052 | NS |
| Unmarried | 2 | 4 | 30 | 36 | | | |
| Divorced | 1 | 0 | 0 | 1 | | | |
| **RELIGION** | | | | | | | |
| Hindu | 3 | 4 | 48 | 55 | 5.6 | 0.451 | NS |
| Muslim | 1 | 0 | 2 | 3 | | | |
| Christian | 0 | 0 | 1 | 1 | | | |
| **FAMILY INCOME** | | | | | | | |
| 15001-20000 | 1 | 2 | 29 | 32 | 10.644 | 0.032 | S |
| 21001-30000 | 0 | 0 | 12 | 12 | | | |
| 31001-40000 | 0 | 0 | 5 | 5 | | | |
| >41001 | 3 | 2 | 5 | 10 | | | |
| **JOB TITLE/PROFESSIONAL STATUS** | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Doctor | 4 | 4 | 16 | 24 | 17.222 | 0.004 | HS |
| Nurse | 0 | 0 | 34 | 34 | | | |
| Paramedic | 0 | 0 | 1 | 1 | | | |
| **OCCUPATION** | | | | | | | |
| Intensivist | 1 | 1 | 14 | 16 | 16.912 | 0.002 | HS |
| Critical care registered nurse | 0 | 0 | 34 | 34 | | | |
| Emergency Medical | 0 | 1 | 0 | 1 | | | |
| Other | 1 | 1 | 6 | 08 | | | |
| **THE EDUCATION LEVEL OF THE DOCTOR** | | | | | | | |
| MBBS | 3 | 9 | 3 | 15 | 0.791 | 0.706 | NS |
| BHMS | 1 | 7 | 1 | 9 | | | |
| BAMS | 0 | 0 | 0 | 0 | | | |
| Others | 0 | 0 | 0 | 0 | | | |
| **EDUCATION LEVEL OF NURSES** | | | | | | | |
| Diploma in Nursing | 0 | 0 | 20 | 20 | 1.353 | 0.867 | NS |
| Bachelor in Nursing | 0 | 0 | 12 | 12 | | | |
| Postgraduate in Nursing | 0 | 0 | 1 | 1 | | | |
| Others | 0 | 0 | 1 | 1 | | | |
| **WORKING DEPARTMENT** | | | | | | | |
| Emergency Room | 3 | 4 | 10 | 17 | 11.613 | 0.034 | S |
| Emergency ICU | 1 | 0 | 11 | 12 | | | |
| Medical ICU | 0 | 0 | 14 | 14 | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Surgical ICU | 0 | 0 | 4 | 4 | | | |
| Cardiac ICU | 0 | 0 | 12 | 12 | | | |
| **DURATION OF WORK EXPERIENCE IN WORKPLACE / DEPARTMENT** | | | | | | | |
| <6 Months | 3 | 3 | 13 | 19 | 6.015 | 0.301 | NS |
| 01 Years – 03 Years | 1 | 1 | 27 | 29 | | | |
| 04 Years – 06 Years | 0 | 0 | 6 | 6 | | | |
| > 6 years | 0 | 0 | 5 | 5 | | | |
| **TOTAL WORK EXPERIENCE IN YEARS** | | | | | | | |
| <5 Years | 3 | 3 | 30 | 36 | 5.355 | 0.572 | NS |
| 6-10 Years | 0 | 1 | 16 | 17 | | | |
| 11-15 Years | 1 | 0 | 4 | 5 | | | |
| >15 Years | 0 | 0 | 1 | 1 | | | |
| **WEEKLY AVERAGE SHIFT (HOURS)** | | | | | | | |
| 24-32 hrs. | 0 | 2 | 11 | 13 | 6.237 | 0.264 | NS |
| 40-48 hrs. | 1 | 2 | 24 | 27 | | | |
| 56-64 hrs. | 1 | 0 | 10 | 11 | | | |
| >72 hrs. | 2 | 0 | 6 | 8 | | | |

**Table 12** reveals the association between structured skill checklist pre-test scores with socio-demographic variables and Profession-related data of healthcare professionals of the control group. There was a highly significant association between variables like occupation, and job title. There was a significant association between some variables like family income, and working department. There was no significant association between age, gender, marital status, religion, education level of doctor, education level of doctor nurses, duration of work experience in workplace/department, and total work experience in a year and weekly average shift (hours).

## 4. Discussion

The study aimed to evaluate the effectiveness of simulation-based training on triage management knowledge and skills among healthcare professionals. A total of 118 professionals from Emergency Department & Intensive Care

Unit participated. Findings revealed significant improvements in knowledge and skills in the experimental group, while no significant changes were observed in the control group.
In comparison to the pre-test, the experimental group's post-test knowledge scores significantly increased from 16.66 to 27.08, with skill scores increasing from 4.71 to 13.53. Conversely, the control group showed no significant changes in knowledge and skill scores. Hence, both hypotheses were accepted: H1 for knowledge and H2 for skills, indicating significant improvement in the experimental group due to simulation-based training.
A similar study was conducted by, Supriya Rai, Godhuli Ghosh et. al in 2021 to assess the effectiveness of a structured teaching programme on knowledge and skill regarding the management of patients admitted in hospital triage setting among the staff nurses at Era Hospital Lucknow, using an experimental research design among 30 nurses. Structured knowledge questionnaire was used to assess the knowledge level of staff nurses regarding the management of patients admitted in triage setting- test scores Knowledge, 5(16.66%) were the poor level of knowledge, 22(73.33%) were Average level of knowledge and 3(10%) were the good level of knowledge. Post-test scores, 2(6.66%) had a poor level of knowledge, 8(26.66%) had an Average level of knowledge and 20(66.66%) had a good level of knowledge. They concluded that nurses who participated in this study demonstrated significant knowledge and skill deficits in patients triaging in the emergency departments of Era Hospital[10].
Additionally, in the current study significant associations were found between certain socio-demographic and professional variables and knowledge/skill levels in both groups. Factors such as family income, working department, and duration of work experience were significantly associated with knowledge and skills improvement in the experimental group. Similar associations were observed with variables like job title/professional status and education level of doctors. However, no significant associations were found with variables like age, gender, marital status, and religion.

## 5. Conclusion

The study concluded that the simulation-based training was highly effective in improving the knowledge and skills regarding triage management among healthcare professionals. Hence, the researchers recommend the use of simulation-based teachings to improve the knowledge and skills of health professionals in various settings.

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**Consent and Ethical Approval**
From the institutional research and ethical committee, the necessary ethical approvals were acquired to conduct a study (PUIECHR/PIMSR/00/081734/6103), and the participants' specific informed permission was also acquired.

**Conflict of Interests**
The Authors have declared that no competing interests exist.

**Authors contribution:**
Author 1- Data collection and analysis, Interpretation of results, preparing of manuscript
Author 2- Approval and finalizing of study conception and design and final drafting of manuscript

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## 6. References

1. Debacker M, Hubloue I, Dhondt E, Rockenschaub G, Rüter A, Codreanu T, et al. Utstein-style template for uniform data reporting of acute medical response in disasters. PLoS Curr 2012;4:1–40.
2. Mass Casualty Management Systems Strategies and guidelines for building health sector capacity, Health Action in Crises Injuries and Violence Prevention, WHO Library Cataloguing-in-Publication Data, ISBN 978 92 4 159605 3 (NLM classification: WX 185), World Health Organization 2007
3. Emergency Care for MO-Triage in Emergencies.pdf
4. Kennedy K, Aghababian RV, Gans L, et al. Triage: techniques and applications in decision making. Ann Emerg Med 1996;28(2):136–44.

5. Triage Management of the trauma patient, Department of Clinical and Experimental Medicine, Center for Center for Teaching and Research in Disaster Medicine and Traumatology, Linköping University Medical Faculty SE-581 83 Linköping, Sweden Linköping 2017, Printed in Sweden by LiU-Tryck AB, Linköping, Sweden, 2016.
6. Iserson KV., Moskop JC. Triage in medicine, part I: concept, history, and types. Ann Emerg Med 2007;49:275–81
7. METASTART: A Systematic Review and Meta-Analysis of the Diagnostic Accuracy of the Simple Triage and Rapid Treatment (START) Algorithm for Disaster Triage, Jeffrey M.Franc, Scott W. Kirkland, Uirá D. Wisnesky, Sandra Campbell and Brian H. Rowe Published online by Cambridge University Press: 17 December 2021
8. Adel Hamed Elbaih1,2, Shukri Raed Alnasser, Teaching approach for START triage in disaster management, Received 30 July 2020; Accepted 09 August 2020Availableonline27.09.2020withdoi:10.5455/medscience.2020.07.147,OnlineSTARTTriageMS.pdf
9. Pelaccia T, Delplancq H, Triby E, Bartier JC, Leman C, Hadef H, et al. Can teaching methods based on pattern recognition skill development optimize triage in mass-casualty incidents? Emerg Med J 2009;26:899–902.
10. Supriya Rai | Godhuli Ghosh | Swastika Das "A Study to Assess the Effectiveness of Structured Teaching Programme on Knowledge and Skill Regarding Management of Patients Admitted in Hospital Triage Setting Among the Staff Nurses at Era Hospital Lucknow" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456- 6470, Volume-5 | Issue-5, August 2021, pp.1863- 1878, URL: www.ijtsrd.com/papers/ijtsrd45160.pdf