

## Student Corner

## Compliance to Recording of Modified Early Warning Score (MEWS) Following Educational Intervention and its Effect on Sepsis Related Patient Outcomes

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### Abstract

**Background:** Sepsis is a major medical problem with increasing mortality globally. Some studies have compared sepsis to other time-sensitive critical care conditions. Track and trigger systems like MEWS have been developed to aid in detection of deterioration in these patients by allowing early recognition of critical illness.

**Objectives:** The primary objective of this study was to determine the effect an educational simulation workshop on MEWS documentation compliance and also to determine the effect it had on the overall outcomes of sepsis patients by comparing the code rate records pre- and post-workshop.

**Methods:** Single arm retrospective study was done. All patients admitted with sepsis before and after the simulation workshop were included. Data was retrieved from medical records on MEWS documentation and code rates. Comparison was done between pre and post code rates to assess impact of workshop on documentation and subsequent action.

**Results:** Pre-workshop audit revealed that 184 patients were admitted with sepsis in 6 months out of which 52.2% (n=96) had proper documentation and 14.1% (n=26) underwent code events. Post-workshop 162 patients were admitted in 6 months, in which 76.5% (n=124) had proper documentation and 8.6% (n=14) underwent code events ( $p < 0.001$ ).

**Conclusion:** Simulation workshop resulted in improved compliance of MEWS documentation and led to decreased code rates. Workshops like these should be done on large scale and at predefined, regular intervals and should be included in undergraduate medical and nursing curricula.

**Keywords:** MEWS, Track and Trigger System, Sepsis, Simulation Workshop

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### Introduction

Sepsis is an ongoing problem in medicine that is responsible for over 500,000 emergency department (ED) visits annually and has a variable mortality rate of 25-50% related to severe sepsis, and septic shock.<sup>1</sup> Global burden is around 30 million every year with approximately 6 million deaths.<sup>2</sup> It has remained a major cause of admissions into the Intensive Care Units (ICUs) and mortality around the world for a

very long time and its reported incidence is on the rise.<sup>3</sup>

There is a dearth of published data on the outcome of sepsis in Pakistan, as a nation-wide registry of sepsis does not exist.<sup>4</sup> Sepsis progressing to septic shock with multi-organ failure is one of the leading causes of death in patients presenting to tertiary care hospitals in Karachi. From a retrospective review of older data, we have reported a mortality of 32-60% for

sepsis (including severe sepsis) and 40-80% for septic shock from The Aga Khan University Hospital (AKUH), which is higher than that reported internationally.<sup>5</sup> About 1.3% of all adult admissions at AKUH have been recorded to be due to sepsis and mortality rate in patients with sepsis or septic shock has remained around 38% at AKUH.<sup>6</sup>

Some studies have compared sepsis to other time-sensitive critical care conditions such as trauma, myocardial infarction (MI) and cerebral infarction (CVA). These disorders have exhibited improved outcomes with early identification and treatment in the Emergency Department (ED). Internationally, 19-21% mortality rate for severe sepsis and septic shock, surpasses the 8% mortality rate for MI patients.<sup>2</sup> Quality improvement methods to improve early identification and treatment of sepsis, such as sepsis order sets or bundles, have been developed to help reduce sepsis-related mortality.<sup>7</sup> Incidentally, the beneficial impact of sepsis bundles (SB) is highly correlated with compliance of using the bundles.<sup>8</sup>

In addition to these bundles, track and trigger systems have been developed to aid timely detection of deterioration in patients in wards and high dependency units.<sup>9</sup> Appropriately derived and validated scores help to optimize individual patient management through risk stratification and prognostication.<sup>10</sup> These track and trigger systems rely on measurement of vital signs either in the form of single or multiple parameter systems.<sup>11</sup> MEWS has been derived from "Early warning scores" (EWS) which was primarily developed as a tool to trigger skilled and experienced senior help for at-risk patients. Regular use of EWS ensured earlier and more appropriate intensive care referrals and its evolution into MEWS and has further increased its potential for identifying at-risk patients.<sup>12</sup>

Very little data is available for compliance with recording of MEWS and other bundles or track and trigger systems in our country.<sup>13,14</sup> The primary objective of this study was to determine the effect of an educational simulation workshop on the compliance of MEWS recording and also to determine the effect it had on the overall outcomes of sepsis patients by comparing the code rate records pre- and post-workshop.

## Methods

This single-arm retrospective study was conducted in the department of Medicine of The Aga Khan University Hospital Karachi, Pakistan. The Aga Khan University Hospital Karachi is a JCIA accredited academic tertiary care medical institute with around 750 beds. The study was conducted in the internal medicine ward of the hospital which is 54 bed unit containing 17 High dependency monitored beds and

37 general ward beds. An institutional ethical review committee approval was obtained before starting the study (ERC 2020-5055-10899). All patients admitted with diagnosis of sepsis 6 months before and after workshop were included in the study. Patients with prior Do not Resuscitate (DNR) orders were excluded. Patients were labeled as sepsis when they had two or more of the following clinical findings; i) body temperature higher than 38°C or lower than 36°C, ii) heart rate higher than 90/min, iii) hyperventilation evidenced by respiratory rate higher than 20/min or PaCO<sub>2</sub> lower than 32 mmHg and iv) white blood cell counts higher than 12,000 cells/  $\mu$ l or lower than 4,000/  $\mu$ l. Septic shock was defined when patients with clinical features of sepsis had persisting hypotension requiring vasopressors to maintain MAP  $\geq$  65 mm Hg or having a serum lactate level  $>$  2 mmol/L (18 mg/dL) despite adequate volume resuscitation.

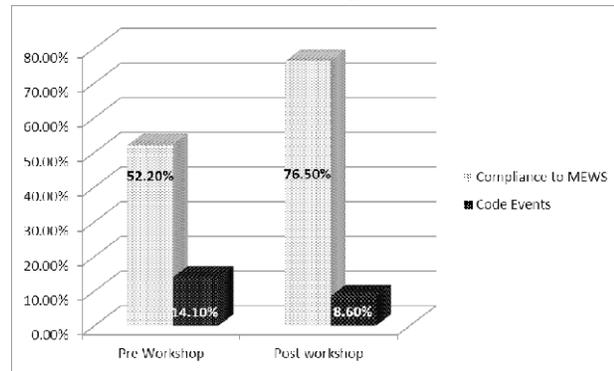
A 2-day educational simulation workshop was conducted at Aga Khan University – Centre of Innovation and Medical Excellence (CIME) in October 2019 as part of teaching exercise for nurses. The CIME has state-of-the-art facilities for simulation-based learning, including mannequins and patient monitoring systems. Forty healthcare professionals were enrolled into the program after random selection by the computer from a pool of staff with 3 months to 3 years' working experience in internal medicine unit. Educational course consisted of detailed sessions on concepts of sepsis, sepsis bundles and importance of MEWS and other track and trigger systems on day 1; on day 2 participants were divided into 5 groups for simulation scenarios. Data was retrieved from the medical records on MEWS compliance and code rates prior to the workshop and prospectively, after the workshop. Results were compared pre and post educational intervention using Wilcoxon rank sum test. All analyses was done via Statistical package for the social sciences (SPSS) version 22 with significance at P-value  $<$  0.05.

## Results

A total of 40 healthcare professionals were enrolled in the workshop. The mean duration of working experience in critical areas was 20.0 $\pm$ 10.4 months with a maximum duration of 36 months and minimum duration of 5 months. Audit of 6 months data before the simulation / workshop showed that a total of 184 patients were admitted with a diagnosis of sepsis, out of which 65 (35.3%) had a diagnosis of septic shock. A total of 26 patients (14.1%) had undergone code events during this period. The compliance of MEWS documentation was 52.2% (n=96).

Data collected from 6 months after the simulation course from the ward showed that a total of 162

patients were admitted with the diagnosis of sepsis, out of which 59 (36.4%) had septic shock. A total of 14 patients (8.6%) underwent a code event and the MEWS documentation compliance was 76.5% (n=124) as shown in figure 1 ( $p < 0.001$ ).



MEWS: Modified Early Warning Score

**Figure 1:** Pre and Post Workshop Data on MEWS Compliance and Code Event Percentage

### Discussion

Teaching and training on practical aspects of clinical care remain largely opportunistic in low-middle income countries like Pakistan. In-patient wards and outpatient clinics serve as the only areas where clinical skills may be acquired. Simulation centers are too few in resource-limited settings but where available, it is important to ensure their optimal utilization. Sepsis remains one of the most common cause of morbidity and mortality in patients admitted to hospital despite availability of newer therapeutic agents.<sup>2</sup> The sepsis bundles along with track and trigger systems were initiated in order to improve sepsis outcomes, however compliance remains a big issue.<sup>15</sup> World-wide, simulation workshops are now a big part of training for all healthcare professionals and have resulted in better learning outcomes as well as improved patient management.<sup>16</sup> Literature review has shown that simulation workshops have also worked in achieving better outcomes in patients admitted with sepsis.<sup>17-20</sup>

Our study was conducted with the objective of assessing the effectiveness of simulation workshops in achieving better documentation compliance and its effects on quality of patient care and outcomes. There was a statistically significant difference in the clinical outcomes of patients, pre- and post-simulation as we saw better documentation compliance by the healthcare staff which directly resulted in fewer code events.

Herron et al. have reported that post-simulation workshop, more patients with sepsis were reviewed in the first hour, compliance with sepsis bundle improved and healthcare staff was better able to pick changes earlier which led to improved clinical outcomes.<sup>18</sup>

Similar simulation workshops with medical students showed significant improvement in the pre- and post-quiz scores and a significant increase in the confidence level of the students.<sup>19</sup>

### Limitations

Our study has some important limitations. A small cohort of participants undergoing simulation training, is expected lead to mixed results if overall documentation and impact on adverse events and outcome are to be assessed. Secondly the data of the admitted patients has not been stratified according to severity of patients' condition. However, even with all these limitations, our results clearly show improved outcomes as a direct result of early recognition and documentation of deterioration in clinical condition of admitted patients through MEWS.

### Conclusion

Simulation workshops are a cost-effective tool to sensitize and train healthcare workers in recognition of warning signs in hospitalized patients. Timely recognition of these warning signs allows institution of appropriate management strategies, which may be life-saving. Opportunities should be created for offering such trainings on a larger scale and serious consideration should be given to making them part of the curriculum for both medical and nursing students.

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