

Responding to Patient Deterioration: A Medical Records Analysis

Salizar Mohamed Ludin^{1*}, Rusila Ruslan¹

¹*Department of Critical Care, Kulliyah of Nursing, International Islamic University Malaysia, Kuantan, Pahang, Malaysia*

ABSTRACT

Objective: This paper reports the medical record analysis findings to identify nurses and junior doctors risk assessment and response to the incidence of deteriorating patient in general ward. **Methods:** A medical records analysis was conducted at a medical ward in one Malaysian hospital. Patients that were admitted for more than 24 hours and scored at least 3 points on the Modified Early Warning Sign (MEWS) assessment with their last 24 hours parameters calculated and nurses and junior doctor's responses were analysed retrospectively. **Results:** Out of 200 records obtained, only 10 patients' medical records met the study inclusion criteria. Three main themes were evident in the study, namely 'track and trigger', 'hierarchical intervening' and 'attitude'. **Conclusion:** This study demonstrates that some nurses and junior doctors experience difficulties in effectively responding to patient deterioration which often occurs at a critical juncture. This study highlights factors which need to be addressed to increase patient safety and improve medical outcomes during hospitalization.

KEYWORDS: Nurses, Junior Doctors, Deteriorating Patients, Risk Assessment, Medical Records

INTRODUCTION

The monitoring and assessment of patients' condition in the ward has become increasingly complex throughout the years. In the general ward, 33.3% of inpatients exhibit comorbidities which commonly include diabetes, hypertension, and coronary artery disease (1). Due to the presence of comorbid diseases, 14-28% of patients in the general ward have been transferred back and forth from the acute cubicle to the Intensive Care Unit (ICU) (2). A similar finding was recorded in a previous study, whereby 30% of patients admitted to the general ward experienced unanticipated transfer to the ICU (1).

Patients who experience clinical deterioration in the hospital ward generally exhibit comorbidities and severe illness during their ICU admission (3). They also experience a higher mortality rate when discharged from ICU (4). This finding is in line a study which found higher mortality rate among patient with comorbidities (5).

Inpatients without comorbidities can also experience deterioration. A previous study found that 31% of patients deteriorated within the first 24 hours of admission and their mortality rate was four times higher (6). Early detection of patient deterioration is essential to minimise morbidity and forestall serious complications. Previous studies have shown that patient deterioration was not a sudden event. Rather, the deterioration is

generally indicated by subtle changes which occur 8 to 24 hours before visible deterioration. These changes may be evident in blood pressure, pulse rate, respiratory function, fluid, and acid-base balance which may culminate in catastrophic collapse if undetected (7).

In addition to complications which may be attributed to comorbidities, 33.3% of inpatients have been reported to experience deterioration due to delayed treatment (8). A delayed response can cause poor prognosis for a patient's condition, and early evaluation of the risks of patients' deterioration has been recognised as being important to ensure patient safety (9).

Patient deterioration occurs almost every day in the ward despite the presence of nurses and doctors. Hospitalised patients often show declining vital sign up for to 48 hours before deteriorating (10), and delayed action can lead to more serious conditions in patients (11).

METHODS

Study design and setting

A retrospective medical records analysis was conducted by scrutinising patients' medical records. The records were obtained from medical wards and selected based on the Modified Early Warning Score (MEWS) (12) according to criteria which is further elucidated later in this section. The medical records analysis examined the patients' medical records taken during their hospitalisation. A medical ward from one of the general hospital in Malaysia was randomly selected from the medical wards that were involved in the study.

200 admissions to the ward were recorded in April, 2015. All of the patients' medical records were included for screening. A formal request for the medical records was submitted in August 2015, and the screening and reviewing processes were conducted in the Medical Records Department of

* Corresponding Author

Email: msalizar@iium.edu.my
Tel: 0060192229942
Salizar Mohamed Ludin
Kulliyah of Nursing, International Islamic
University Malaysia, Jalan Hospital Campus,
Kuantan, Pahang, Malaysia.

one of the general hospital in Malaysia. The screening and reviewing processes commenced in November, 2015.

The Modified Early Warning Score (MEWS)(12) was used to screen the medical records. According to MEWS, a patient is at risk of deterioration if their MEWS score is 3 or above. As such, all patients' parameters that scored 3 or higher were included in the study. The parameters used in the MEWS were respiratory rate, heart rate, systolic blood pressure, urine output, body temperature, neurological status and oxygen saturation level. Patients were selected for the study based on this criterion and patients who were admitted for a period of less than 24 hours were excluded from the study. Once selected, patient parameters for the last 24 hours of their admission were calculated retrospectively.

After screening, nurses and junior doctors' reports were screened based on the framework adapted from the Australia National Clinical Guideline by NICE. Actions taken by the nurses and junior doctors throughout the patients' treatment process were compared with the suggested actions in the guidelines. If their actions were in line with the suggestions in the guideline, then the 'Yes' box was ticked and vice versa. However, some patients were recorded as 'not applicable' as their particular condition did not align precisely with the information in the guideline.

In addition, all medications that were prescribed throughout the admission were listed in the medication checklist and compared according to drug action, side effect, and drug-to-drug interaction. Drug to drug interaction was identified according to the British National Formulary by British Medical Association and Royal Pharmaceutical Society as guidelines.

Ethical Statement

This project has been approved by International Islamic University Malaysia (IREC) (564) and Medical Research Ethic Committee (Medical Research Ethic Committee of Malaysia (NMRR-14-1558-19570 (IIR). All papers used in this review were referenced accordingly.

Analysis Methods

Framework analysis method (13) was selected to analyse the medical records. This method consists of five steps, which are: (a) familiarisation, (b) identifying a thematic framework, (c) coding, (d) charting, and (e) interpretation(14). For the thematic analysis framework, the themes were adapted and modified from NICE Clinical Guidelines (14) and Grounded Theory methods (15).

The theme from NICE (14) was the track and trigger theme that consists of: failure to take an observation; (failure to recognise early sign of deterioration; lack of communication concerning observation; and failure to prioritise specific treatment. The themes established by researchers were hierarchical intervening and attitude.

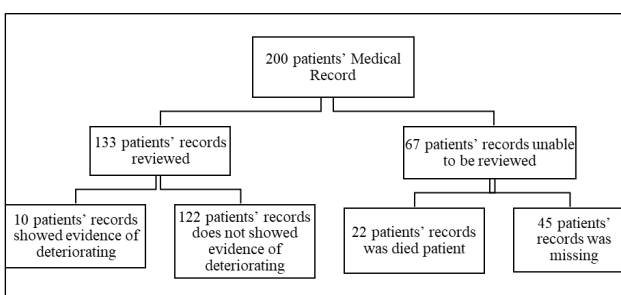
Further to the analysis, coding categories employed by the researchers included: inadequate knowledge in disease management; inadequate knowledge in drugs interactions; routinizing; delayed management after office hours; professional role limitation; inadequate response to complaint/report; and medication prescription error

error. The development of these coding categories resulted from a discussion among all researchers. Charting was conducted as the fourth step. During charting, the data were lifted from its original textual context and placed in charts that consist of headings and subheadings that were established during the thematic framework. Finally, the data were interpreted and re-confirmed with other researchers.

RESULTS

200 medical records (Figure 1) were analysed and only a total of 10 medical records that contained information related to deteriorating events. These medical records were included in the study and, of these cases, hypertensive issues were common. Six of the cases included in the study had hypertensive issues, three patients experienced shortness of breath, and one had hypotension issues (Table1)

Figure 1: Summary of medical record's screening



Three main themes were identified as a response towards deteriorating patients which were track and trigger, hierarchical intervening, and attitude (Figure 2).

Track and trigger is categorised into two sub-themes: knowledge, and failure to recognise the early signs of deterioration. Meanwhile, hierarchical intervening is divided into two sub-themes, which are inadequate communication concerning observation, and professional role limitation. Last but not least is the attitude of the respondents which can be divided into two sub-themes; inadequate response to complaint/report, and medication prescription error. Details of the themes and their corresponding sub-themes will be discussed further below (Refer Figure 2).

Figure 2: Themes emerging from the medical records analysis

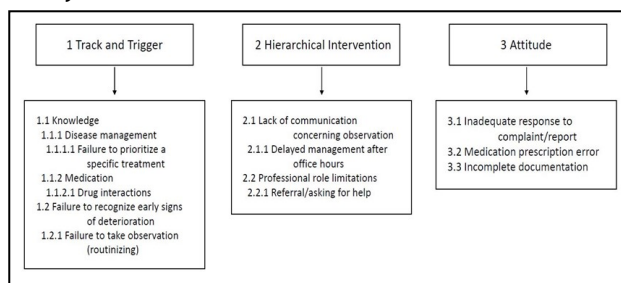


Table 1: Patients' Details

ID	Patient's details	Parameters		
		Pre-event	During-event	Post-event
132	68 years old Male Malay Comorbid: 1) Ischemic Heart Disease 2) Diabetes Mellitus Current diagnosis: Triple Vessel Disease Current issue: 1) Hypotension 2) Post Percutaneous Coronary Intervention (PCI)	BP: 159/69mmHg HR: 65/min RR: 21/min SpO₂: 96% via nasal prong 3L/min GCS: Alert Temp: 36.6°C MEWS: 4	BP: 70/40mmHg HR: 49/min RR: 18/min SpO₂: 95% via nasal prong 3L/min GCS: Alert Temp: 36.7 °C MEWS: 6	BP: 129/73mmhg HR: 54/min RR: 20/min SpO₂: 96% via nasal prong 3L/min GCS: Alert Temp: 36.6 °C MEWS: 3
058	40 years old Male Malay Comorbid: Nil Current diagnosis: Right Cerebrovascular Accident with Left Hemiparesis secondary to Hypertensive Emergency Current issue: Hypertension	Pre-event	During-event	Post-event
		BP: 165/98mmHg HR: 83/min RR: 20/min SpO₂: 98% via nasal prong 3L/min GCS: Alert Temp: 36.6°C MEWS: 3	BP: 190/100mmHg HR: 102/min RR: 20/min SpO₂: 97% under room air GCS: Alert Temp: 36.6°C MEWS: 3	BP: 200/120mmHg HR: 94/min RR: 20/min SpO₂: 97% under room air GCS: Alert Temp: 36.8°C MEWS: 2
152	54 years old Male Malay Comorbid: Nil Current diagnosis: Hypertensive emergency with Transient Ischemic Attack (TIA) Current issue: 1) Hypertension	Pre-event	During-event	Post-event
		BP: 162/99mmHg HR: 66/min RR: 21/min SpO₂: 97% under room air GCS: Alert Temp: 36.6°C MEWS: 2	BP: 190/112mmHg HR: 64/min RR: 21/min SpO₂: 97% under room air GCS: Alert Temp: 37.0°C MEWS: 3	BP: 180/100mmHg HR: 76/min RR: 21/min SpO₂: 98% under room air GCS: Alert Temp: 36.7°C MEWS: 3
178	59 years old Male Malay Comorbid: Chronic kidney disease Current diagnosis: Acute Pulmonary Oedema precipitated with accelerated hypertension Current issue: Hypertension	Pre-event	During-event	Post-event
		BP: 173/83mmHg HR: 60/min RR: 20/min SpO₂: 98% via nasal prong 3L/min GCS: Alert Temp: 36.7°C MEWS: 3	BP: 189/92mmHg HR: 68/min RR: 20/min SpO₂: 97% via nasal prong 3L/min GCS: Alert Temp: 36.6°C MEWS: 4	BP: 178/87mmHg HR: 55/min RR: 20/min SpO₂: 98% via nasal prong 3L/min GCS: Alert Temp: 36.6°C MEWS: 3
052	55 years old Male Malay Comorbid: Diabetic Mellitus Current diagnosis: Cerebrovascular Accident (CVA) Current issue: 1) Hypertension 2) Hyperglycaemia	Pre-event	During-event	Post-event
		BP: 180/98mmHg HR: 101/min RR: 21/min SpO₂: 100% under room air GCS: Alert Temp: 37.0°C MEWS: 4	BP: 191/117mmHg HR: 141/min RR: 20/min SpO₂: 100% under room air GCS: Alert Temp: 36.6°C MEWS: 5	BP: 190/120mmHg HR: 109/min RR: 21/min SpO₂: 100% under room air GCS: Alert Temp: 36.9°C MEWS: 4
138	32 years old Male Malay Comorbid: 1) Diabetic Mellitus 2) Chronic Kidney Disease (CKD) Current diagnosis: Advanced Chronic Kidney Disease secondary to Diabetic Nephropathy Current issue: 1) Hypertension	Pre-event	During-event	Post-event
		BP: 110/83mmHg HR: 78/min RR: 20/min SpO₂: 97% under room air GCS: Alert Temp: 36.6°C MEWS: 1	BP: 180/110mmHg HR: 80/min RR: 22/min SpO₂: 97% under room air GCS: Alert Temp: 36.9°C MEWS: 3	BP: 140/100mmHg HR: 87/min RR: 21/min SpO₂: 98% under room air GCS: Alert Temp: 36.8°C MEWS: 2

ID	Patient's details	Parameters		
		Pre-event	During-event	Post-event
092	71 years old Male Malay Comorbid: 1) Chronic Obstructive Pulmonary Disease 2) Hypertension 3) Diabetic Mellitus 4) Ischemic Heart Disease Current diagnosis: Acute Exacerbations Chronic Obstructive Pulmonary Disease (AECOPD) Current issue: 1) Shortness of breath	Pre-event	During-event	Post-event
		BP: 148/94mmHg HR: 148/min RR: 25/min SpO₂: 99% via Ventrimask 60% GCS: Alert Temp: 36.6°C MEWS: 7 ABG: pH: 7.12 pCO ₂ : 28.3 pO ₂ : 158 hCO ₃ : 9.1	BP: 153/86mmHg HR: 120/min RR: 24/min SpO₂: 99% via Non-invasive ventilation support (FiO ₂ 0.4) GCS: Alert Temp: 36.7°C MEWS: 6 ABG: pH: 7.50 pCO ₂ : 34.5 pO ₂ : 55.3 hCO ₃ : 5.1	BP: 111/76mmHg HR: 80/min RR: 21/min SpO₂: 99% via Ventrimask 40% GCS: Alert Temp: 36.9°C MEWS: 4
171	82 years old Male Malay Comorbid: 1) Chronic Obstructive Pulmonary Disease Current diagnosis: Right Pleural Effusion Current issue: Shortness of breath	Pre-event	During-event	Post-event
		BP: 110/90mmHg HR: 100/min RR: 22/min SpO₂: 98% via nasal prong 3L/min GCS: Alert Temp: 37.0°C MEWS: 4	BP: No record found HR: 88/min RR: 34/min SpO₂: 95% via nasal prong 3L/min GCS: Drowsy Temp: 36.6°C MEWS: 6 ABG: pH : 7.19 pCO ₂ :114.2 pO ₂ : 157.6 hCO ₃ : 42.7	BP: 98/62mmHg HR: 95/min RR: 23/min SpO₂: 99% via Non-invasive ventilation support (FiO ₂ 0.4) GCS: Alert Temp: 36.8°C MEWS: 5 ABG: pH : 7.216 pCO ₂ : 96.2 pO ₂ : 115.8 hCO ₃ : 38.1
062	53 years old Male Chinese Comorbid: Nil Current diagnosis: Hypertensive emergency Current issue: 1) Hypertension	Post-event	Pre-event	During-event
		BP: 180/84mmHg HR: 90/min RR: 20/min SpO₂: 97% under room air GCS: Alert Temp: 36.6°C MEWS: 2	BP: 201/84mmHg HR: 89/min RR: 20/min SpO₂: 97% under room air GCS: Alert Temp: 36.9°C MEWS: 3	BP: 151/94mmhg HR: 89/min RR: 20/min SpO₂: 97% under room air GCS: Alert Temp: 36.7°C MEWS: 1
086	66 years old Male Malay Comorbid: 1) Ischaemic Heart Disease 2) Hypertension Current diagnosis: Acute Pulmonary Oedema Current issue: 1) Shortness of breath	Pre-event	During-event	Post-event
		BP: 178/89mmhg HR: 92/min RR: 21/min SpO₂: 98% via nasal prong 3L/min GCS: Alert Temp: 36.6°C MEWS: 4	BP: 185/95mmHg HR: 96/min RR: 25/min SpO₂: 98% via nasal prong 3L/min GCS: Alert Temp: 36.6°C MEWS: 5	BP: 187/96mmHg HR: 83/min RR: 21/min SpO₂: 97% via nasal prong 3L/min GCS: Alert Temp: 36.9°C MEWS: 5

DISCUSSION

Track and trigger-deteriorating events

Knowledge in disease management

The track and trigger system is closely connected to early warning signs. Parameters in the track and trigger system consist of routine measurement of vital signs such as blood pressure, heart rate, respiratory rate, oxygen saturation, consciousness level, and body temperature (16). Early warning signs are indicators of patient deterioration which help to indicate current organ function.

Before any patient deteriorates, they will generally show signs and symptoms that can be detected for up to 24 hours before the incident (17). Appropriate response to an early warning sign ensures that the patient receives proper care. Proper management of deteriorating patients has significantly contributed to the improvement of lowering the national mortality rate (18). The early warning system assists nurses in working to maintain safe parameters (19).

In Malaysia, there is no specific early warning sign system that can be used during patient assessment (12). Therefore, the healthcare teams, especially nurses, do not have a structured system to assist them to identify patients who are at risk of deterioration. Sometimes, recognising deteriorating patients is of little use once the patients enter the acute critical stage.

In the United Kingdom, National Early Warning Sign (NEWS) by NICE (20) was used as a guideline for healthcare staff in assessing deteriorating patients (15). With the application of NEWS, patient care is improved as frequent monitoring of a patient's vital signs provides more rapid and reliable detection of deteriorating patients (21). Absence of a proper referral system decreases the awareness of a patient's risk of deteriorating, especially for inexperienced nurses and junior doctors. In addition, junior doctors were found to be mentally and physically unprepared to diagnose and manage patients (21). For example, medical record 058 showed that the nurses and the junior doctor did not inform any of their superiors when a patient's blood pressure reached an alarming reading of 200/120mmHg. Such a critical situation required immediate action from medical personnel.

According to the Modified Early Warning Score (MEWS) examined in a previous study, systolic blood pressure reading between 180-200mmHg indicates a risk of deterioration (12). In ensuring that patients receive optimal care, familiarity with a treatment guideline is an advantage. This study found that personnel were not familiar with the guidelines as their treatment goal showed that they did not follow the recommended procedure. Clinical Practice Guideline (CPG) for the management of hypertension stated that the practitioner should aim for blood pressure not lower than 160/90 mmHg (Ministry of Health Malaysia). However, this recommendation was not fully followed by all nurses and doctors, probably due to a lack of awareness and knowledge in disease management.

Compared to hospitals with comprehensive systems to detect early warning signs, such as is

the case in the United Kingdom, Australia, and the United States, the system in Malaysia requires many more improvements to provide proper patient management. A previous study mentioned the benefit of early warning sign systems in reducing the incidence of patient deterioration (22). In addition, a study reported that both doctors and nurses experienced a positive impact from the National Early Warning Sign (NEWS) on patient safety (21).

However, another study reported no significant difference in detecting deterioration among patients during hospitalisation when using the track and trigger system (23). Some doctors prefer to rely on their own judgement in determining whether the patient is deteriorating or not. They found that junior doctors frequently cited the National Early Warning Sign (NEWS) as a source of conflict between doctors and nurses which stemmed from the belief that nurses only focused on patients' scores rather than assessing the full clinical picture (21).

Nurses hold the great responsibility of obtaining accurate parameter measurements and the interpretation of the clinical data (24). However, a study reported a gap of knowledge in emergency management for registered nurses working in a clinical environment such as a ward (9). In addition, a study found that nurses and doctors also have limited knowledge in monitoring and dealing with deteriorating patients (25).

Most of the deteriorating conditions that were found in this study were associated with high systolic blood pressure. An example is shown in medical record 058, where the doctor put the target blood pressure between the range of 160-180/90-100 mmHg as suggested in CPG for Hypertension (Ministry of Health Malaysia). At the same time, the patient was also diagnosed with diabetes Mellitus. However, a previous study recommended a lower target blood pressure of less than 130/80 mmHg for patients with diabetes Mellitus in order to prevent any cardiovascular event (26).

Knowledge of medication

Drug-to-drug interaction is one of the key components in clinical pharmacology. Knowing how drug interactions occur and how to manage them are important parts of clinical practice (27). It is important for nurses and doctors to have extensive knowledge in clinical pharmacology in the interest of patient care and safety (28). A study among Iranian nurses found that only 23.3% of the respondents are knowledgeable of clinical pharmacology despite the fact that 45% of these nurses initially claimed to be familiar with the matter (29).

A study also reported that doctors in the ward have insufficient pharmacological knowledge (30). This finding is in parallel with this study as shown in medical record 132, where a drug-to-drug interaction was found. In this incidence, the patient had complained of being unable to pass urine after 12 hours of post-Percutaneous Cardiac Intervention. Frusemide and Alprazolam were prescribed together despite the pharmacodynamic interaction between the two drugs which is known to cause urinary retention. However, the possibility of contrast induces nephropathy still need to be considered.

Pharmacodynamics of drug-drug interactions occur when interacting drugs have either additive effects, in which case the overall effect is increased; or opposing effects, in which case the overall effect is decreased or even 'cancelled out' (27). Poor knowledge of medicine pharmacology has been identified as a contributing factor to errors made by both doctors (in prescribing drugs) and nurses (in administering drugs) (31).

Routinizing

Continuous monitoring is important to ensure patients' conditions, especially under certain volatile conditions, where the patient needs frequent monitoring. A further example of this is in medical record 132 where the patient had a history of syncope attack (blood pressure [BP] 70/40mmHg, heart rate [HR] 49/min, respiration rate [RR] 18/min, oxygen saturation [SpO₂] 95% on oxygen therapy 3L/min via nasal cannula) which was recorded post angiogram procedure. Even though the doctor and nurse managed to stabilise the patient's condition, patient monitoring was not of a sufficient frequency. The patient's parameters were assessed four hours after the incidence. The majority of healthcare personnel considered their role in the care of patients as being adequate to excellent. However, the current situation indicates a lack of critical self-assessment by the healthcare personnel involved (32).

Hierarchical intervening

Delayed patient management after office hours

Delayed treatment is a concern as it may contribute to a decline in patients' conditions. Accurate and timely judgement is required in providing care for deteriorating patients. Findings from this study reported that junior doctors have delayed patients' treatment, due to waiting for medical team to provide instruction which is in parallel with findings of several other studies (33). The objective of the treatment should be reviewed among the medical team to ensure the treatment is on the right track.

Referral and asking for help

Each healthcare professional has his/her own specific roles. However, no role is more or less important than other roles within the healthcare environment. All roles are vital to ensure smooth function of the team, despite the limitations of each role. Nurses have the required knowledge to provide treatment and care though limitations still exist where nurses are prohibited from prescribing medication for patients as shown in medical record 132 where standard policy in Malaysia, only medical doctors allowed prescribing medications.

Along with healthcare personnel, a medical ward as a facility can also have limitations in treating a deteriorating patient. If a patient is deteriorating and worsening, they will immediately be referred to the ICU. Usually, mechanical ventilation and non-invasive ventilation devices and treatment will be provided in the ICU under the supervision of well-trained and experienced staff. However, often these patients needed to be treated in the general medical ward due to bed shortages.

Attitude

Inadequate response to a complaint/report

In providing care to the patient, it is impossible for nurses and doctors to carry out their roles effectively in isolation. Trust between these two entities is crucial and a referral is the link between them. However, doctors in some circumstances, especially junior doctors, do not respond to the referrals received from their nurses.

Generally, the junior doctor in medical wards will be the person in charge to make a decision, especially after office hours. It is their responsibility to decide on each action to be taken. Initially, patients' conditions will be monitored by nurses, where any abnormality will be referred to a junior doctor for further action. Unfortunately, not all referrals from nurses are taken seriously, probably due to the junior doctor's lack of experience and knowledge to decide the appropriate treatment for patients (34).

Some junior doctors assume a patient's condition is not declining and refuse to assess the patients even after the nurses have reported changes in a patient's condition. For example, two samples from this study showed that junior doctors did not respond to nurses' reports regarding patient complaints. In this situation, clinical experience does play an important role. Workload has also been cited as a reason why the junior doctors failed to respond to the nurses' referrals (35).

Errors in prescribing medication

Medication errors are a significant global concern and can cause serious medical consequences for patients (30). Prescribing errors were found to be a common occurrence in a hospital setting (35). Common prescription errors by doctors are incorrect dose, frequency and drug strength (31). One of the factors that lead to prescribing errors among doctors is their tendency to overlook the recommended dose and frequency of the drug as they mainly focus on the drug itself (36). This study recorded a similar finding in medical records 178 and 058, where the doctor prescribed IV Isoket 2mls/hour. According to the Guideline on Safe Use of High Alert Medication, the doctor should specify the dose, route, and rate of infusion when prescribing this medication (Ministry of Health Malaysia). In this prescription, the doctor has violated a principle of drug prescription as the doctor did not specify the strength and dosage of the drug, which can lead to potential mistakes when administering the drug to the patient. Lack of adequate guidelines or information in regards to the prescribed drug can lead to medication error(37).

Limitations

Many of the medical records were found to be incomplete. Most of the information regarding the patients' observation and management by the nurses and doctors was not documented adequately. Limited documentation caused difficulties for the researchers in ascertaining whether or not certain procedures had been carried out. Therefore, the researchers used a structured guideline from NICE (20) to guide the document analysis (14). This ensured that all

aspects of risk assessment and treatment were correctly identified. The obtained findings were reviewed and discussed critically between the researchers and experts in order to avoid bias.

CONCLUSION

In conclusion, this study found that some nurses and junior doctors did not effectively respond to deteriorating patients due to inadequate knowledge, delay in tracking and triggering themselves to respond, hierarchical issues, conducting routine activities, and attitudes. Nurses and junior doctors also need to improve their teamwork and communication to ensure patient safety. Patient safety is a sensitive issue because it involves human life. A healthcare professional's responsibilities do not end with the patient, but also include the patient's family members. Therefore, knowledge and practice around effectively responding to patient deterioration must be integrated into routine work practice.

CONFLICT OF INTEREST

We confirm that none of the authors have any competing interests in the manuscript. The research data is stored in the external hard drive and kept safely in the university storage. It can be accessed from the principal researcher.

ETHICAL STATEMENT

This project has been approved by International Islamic University Malaysia (IREC) (564) and Medical Research Ethic Committee (Medical Research Ethic Committee of Malaysia (NMRR-14-1558-19570 (IIR)). All papers used in this review were referenced accordingly.

ACKNOWLEDGEMENT

We would like to thank all personnel involved and contributed towards this project in the development of the new knowledge. Our gratitude also goes to Ministry of Health Malaysia for the ethical approval, and last but not least, thank you to the International Islamic University Malaysia for funding the project (Research Endowment fund type B - 14-112-0997).

REFERENCES

- Che HT, Ching WC, Shao JW, Chin YH, Hung TY, Hsiu LC. Comparison of risks factors for unplanned ICU transfer after ED admission in patients with infections and those without infections. *The Scientific World Journal* 2014; 168: 1300-1308.
- Kerlin MP, Small DS, Cooney E, Fuchs BD, Bellini LM, Mikkelsen ME, et al. A Randomized Trial of Nighttime Physician Staffing in an Intensive Care Unit. *N Engl J Med* [Internet]. 2013;368(23):2201-9. Available from: <http://www.nejm.org/doi/10.1056/NEJMoa1302854>
- Long AC, Kross EK, Engelberg RA, Downey L, Nielsen EL, Back AL, et al. Quality of dying in the ICU: is it worse for patients admitted from the hospital ward compared to those admitted from the emergency department? *Intensive Care Med*. 2014;40(11):1688-97.
- Ensminger SA, Morales IJ, Peters SG, Keegan MT, Finkielman JD, Lymp JF, et al. The hospital mortality of patients admitted to the ICU on weekends. *Chest* [Internet]. 2004;126(4):1292-8. Available from: <http://dx.doi.org/10.1378/chest.126.4.1292>
- Delgado MK, Liu V, Pines JM, Kipnis P, Gardner MN, Escobar GJ. Risk factors for unplanned transfer to intensive care within 24 hours of admission from the emergency department in an integrated healthcare system. *J Hosp Med*. 2013;8(1):13-9.
- Henriksen DP, Brabrand M, Lassen AT. Prognosis and risk factors for deterioration in patients admitted to a medical emergency department. Vol. 9, *PLoS ONE*. 2014.
- Hravnak M, Edwards L, Clontz A, Valenta C, DeVita MA, Pinsky MR. Defining the incidence of cardiorespiratory instability in patients in step-down units using an electronic integrated monitoring system. *Arch Intern Med*. 2008;168(12):1300-8.
- Tsai JCH, Cheng CW, Weng SJ, Huang CY, Yen DHT, Chen HL. Comparison of risks factors for unplanned ICU transfer after ED admission in patients with infections and those without infections. Vol. 2014, *The Scientific World Journal*. 2014.
- Buykx P, Cooper S, Kinsman L, Endacott R, Scholes J, McConnell-Henry T, et al. Patient deterioration simulation experiences: Impact on teaching and learning. *Collegian* [Internet]. 2012;19(3):125-9. Available from: <http://dx.doi.org/10.1016/j.colegn.2012.03.011>
- Simmes FM, Schoonhoven L, Mintjes J, Fikkers BG, van der Hoeven JG. Incidence of cardiac arrests and unexpected deaths in surgical patients before and after implementation of a rapid response system. *Ann Intensive Care*. 2012;2(1):1-12.
- Mackintosh N, Rainey H, Sandall J. Understanding how rapid response systems may improve safety for the acutely ill patient: learning from the frontline. *BMJ Qual Saf* [Internet]. 2012;21(2):135-44. Available from: <http://qualitysafety.bmj.com/lookup/doi/10.1136/bmjqs-2011-000147>
- Ludin SM, Basri MN, Ali, NM & Mohamad S. The needs for implementation of ICU outreach services at hospitals in East Coast Malaysia: Comparison between ICU and ward nurses' knowledge, attitude and perception. 2013; Unpublished Undergraduate Thesis.
- Ritchie, J., & Spencer, L., *Analysing qualitative data. Qualitative data analysis for applied policy research*. Bryman A, Burgess RG (ed): Routledge, London, 1994, 173-94. /doi.org/10.4324/9780203413081_chapter_9
- NICE Clinical Guidelines. Acutely ill adults in hospital: recognising and responding to deterioration. 2007;(July):1-30. Available from: <https://www.nice.org.uk/guidance/CG50>
- Andrews T, Waterman H. Packaging: A grounded theory of how to report physiological deterioration effectively. *J Adv Nurs*. 2005;52(5):473-81.
- Royal College of Physicians. National Early Warning Score (NEWS): Standardising the assessment of acute illness severity in the NHS. (2012). Report of a working party. London: Royal College of Physicians.
- So SN, Ong CW, Wong LY, Chung JYM, Graham CA. Is the Modified Early Warning Score able to enhance clinical observation to detect deteriorating patients earlier in an Accident & Emergency Department? *Australas Emerg Nurs J* [Internet]. 2015;18(1):24-32. Available from: <http://dx.doi.org/10.1016/j.aenj.2014.12.001>

18. Chandu A, Smith ACH, Rogers SN. Health-related quality of life in oral cancer: A review. *J Oral Maxillofac Surg.* 2006;64(3):495-502.
19. Ansell H, Meyer A, Thompson S. Facing Nursing Assessment. 2015;24(17):886-90.
20. National Institute for Health and Clinical Excellence (NICE). National Clinical Guideline No 1. Dublin: Royal College of Physicians of Ireland. 2013.
21. Lydon S, Byrne D, Offiah G, Gleeson L, O'Connor P. A mixed-methods investigation of health professionals' perceptions of a physiological track and trigger system. *BMJ Qual Saf.* 2016;25(9):688-95.
22. Jones DA, DeVita MA, Bellomo R. Rapid-Response Teams. *N Engl J Med* [Internet]. 2011;365(2):139-46. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/21751906><http://www.nejm.org/doi/abs/10.1056/NEJMr0910926>
23. Peris A, Zagli G, MacCarrone N, Batacchi S, Cammelli R, Cecchi A, et al. The use of Modified Early Warning Score may help anesthetists in postoperative level of care selection in emergency abdominal surgery. *Vol. 78, Minerva Anestesiologica.* 2012. p. 1034-8.
24. Considine J, Currey J. Ensuring a proactive, evidence-based, patient safety approach to patient assessment. *J Clin Nurs.* 2015;24(1-2):300-7.
25. Barfod C, Lauritzen MMP, Danker JK, Soletormos G, Berlac PA, Lippert F, et al. The formation and design of "The Acute Admission Database"- a database including a prospective, observational cohort of 6279 patients triaged in the Emergency Department in a larger Danish hospital. *Scand J Trauma Resusc Emerg Med.* 2012;29(April):29.
26. Ram CVS. Hypertension guidelines in need of guidance. *J Clin Hypertens.* 2014;16(4):251-4.
27. Snyder BD, Polasek TM, Doogue MP. Drug interactions: principles and practice. *Australian Prescriber.* 2012; 35: 85-88.
28. Duncan EM, Francis JJ, Johnston M, Davey P, Maxwell S, McKay GA, et al. Learning curves, taking instructions, and patient safety: Using a theoretical domains framework in an interview study to investigate prescribing errors among trainee doctors. *Implement Sci.* 2012;7(1):1-13.
29. Alan S, Ozturk M, Gokyildiz S, Avcibay B, Karataş Y. An evaluation of knowledge of pharmacovigilance among nurses and midwives in Turkey. *Indian J Pharmacol* [Internet]. 2014;45(6):616-8. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3847254&tool=pmcentrez&rendertype=abstract>
30. Al-Dhawali AA. Inpatient prescribing errors and pharmacist intervention at a teaching hospital in Saudi Arabia. *Saudi Pharm J* [Internet]. 2011;19(3):193-6. Available from: <http://dx.doi.org/10.1016/j.jsps.2011.03.001>
31. Alsulami Z, Conroy S, Choonara I. Medication errors in the Middle East countries: A systematic review of the literature. *Eur J Clin Pharmacol.* 2013;69(4):995-1008.
32. Ludikhuizen J, Smorenburg SM, de Rooij SE, de Jonge E. Identification of deteriorating patients on general wards; measurement of vital parameters and potential effectiveness of the Modified Early Warning Score. *J Crit Care* [Internet]. 2012;27(4):424.e7-424.e13. Available from: <http://dx.doi.org/10.1016/j.jcrc.2012.01.003>
33. Seward E, Greig E, Preston S, Harris RA, Borrill Z, Wardle TD, et al. A confidential study of deaths after emergency medical admission: Issues relating to quality of care. *Clin Med (Northfield Il).* 2003;3(5):425-34.
34. Cameron A, Millar J, Szmids N, Hanlon K, Cleland J. Can new doctors be prepared for practice? A review. *Clin Teach.* 2014;11(3):188-92.
35. Duffield C, Diers D, O'Brien-Pallas L, Aisbett C, Roche M, King M, et al. Nursing staffing, nursing workload, the work environment and patient outcomes. *Appl Nurs Res* [Internet]. 2011;24(4):244-55. Available from: <http://dx.doi.org/10.1016/j.apnr.2009.12.004>
36. Dean B, Schachter M, Vincent C, Barber N. Causes of prescribing errors in hospital inpatients: A prospective study. *Lancet.* 2002;359(9315):1373-8.
37. Razalee S. Relationship between Body Composition, Smoking and Physical Fitness of Malaysian Armed Forces Naval Trainees. *Open Access Sci Reports Bergqvist* [Internet]. 2012;1(11):1-5. Available from: <http://www.omicsonline.org/scientific-reports/srep548.php>