Prevalence and Seven-day Observation of Critically Ill Patients in Cipto Mangunkusumo Hospital, Jakarta: A Preliminary Study

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Abstract

Current medical record system in Cipto Mangunkusumo Hospital (RSCM) does not allow up-to-date identification for patients with critical condition. As an effort on improving the rapid response of the medical team, this study aims to determine the number of critically ill patients and the incidence of emergency activation (code blue) during the study period. A longitudinal study was conducted for all inpatients that were critically ill in RSCM ward from 19th to 26th April 2013. Via consecutive sampling, critically ill patients were selected based on the code blue criteria. Selected patients were then observed for seven days to determine the incidence of cardiopulmonary arrest and their 24-hour survival. Out of 428 patients who were treated in the hospital ward on 19th April 2013, 13 patients (3%) were in critical condition. Primary diagnoses of the critically ill patients varied from infections, auto-immune to malignancies. Four deaths occurred with three emergency activations; 1 central and 2 regional. Three percent of all the inpatients treated in the hospital ward were critically ill. Thirty percent of those patient experienced cardiac arrests. All four arrests resulted in deaths, including two do not resuscitate patients. Data obtained from this study are preliminary and has identified existing problems that requires further studies for confirmation. This study also illuminate the importance of integrated-electrical medical record system.
Keywords: *prevalence, critically ill, inpatients, Cipto Mangunkusumo Hospital*

Prevalensi dan Pengamatan Tujuh Hari Pasien Kritis di Rumah Sakit Cipto Mangunkusumo: Kajian Awal

Abstrak

Saat ini sistem rekam medis di Rumah Sakit Cipto Mangunkusumo (RSCM) tidak memungkinkan untuk identifikasi mutakhir pasien dengan kondisi kritis. Untuk meningkatkan upaya tim medis respon cepat di RSCM, dilakukan penelitian untuk menentukan jumlah pasien yang sakit kritis dan kejadian aktivasi darurat (kode biru). Studi longitudinal dilakukan untuk semua pasien rawat inap yang sakit kritis di bangsal RSCM pada 19-26 April 2013. Pasien kritis dipilih berdasarkan kriteria kode biru tim medis reaksi cepat (TMRC) dengan teknik sampling konsekutif. Pasien diamati selama tujuh hari untuk menentukan angka kejadian henti jantung-paru dan kelangsungan hidup pasien selama 24 jam. Dari 428 pasien yang dirawat di bangsal rumah sakit pada 19 April 2013, 13 pasien (3%) berada dalam kondisi kritis. Diagnosis primer pasien sakit kritis tersebut bervariasi dari infeksi, penyakit auto-imun dan keganasan. Empat kematian terjadi selama periode penelitian dengan tiga kejadian aktivasi darurat, 1 kasus menggunakan aktivasi pusat dan 2 lainnya aktivasi regional. Sebanyak 3% pasien rawat inap mengalami kondisi sakit kritis. Tiga puluh persen pasien kritis tersebut mengalami henti-jantung yang berakibat kematian, termasuk dua pasien yang dinyatakan do not resuscitate. Data yang diperoleh dari penelitian awal ini memerlukan studi lebih lanjut untuk konfirmasi. Penelitian ini juga menunjukan pentingnya sistem pencatatan rekam medis terpadu.
Kata kunci: *prevalensi, sakit kritis, rawat inap, Rumah Sakit Cipto Mangunkusumo*

Introduction

Tim medis reaksi cepat (TMRC) or "the code blue" team is an intra-hospital medical emergency system recently introduced in *Rumah Sakit Cipto Mangunkusumo* (RSCM). The main purpose of its establishment is to reduce inpatient mortality rate by increasing the successfulness of cardiopulmonary resuscitation.[1] This endeavour is particularly important for RSCM, being the top referral national hospital with more than 1.200 beds.

Intervention conducted by the TMRC differs from the old system or the "traditional" approach; where unstable patients are initially handled by on-the-spot resident doctors and nurses in respect to their specialty department. Lack of ALS training and the time-lag between the emergency activation and the arrival of resuscitation team contributes to the low survival rate of unstable patients in RSCM.

Initial implementation of TMRC in early 2012 was partially successful because of the lack of supporting facilities, such as inadequate program socialization and absence of integrated hospital communication system. The system has underwent continuous improvements over the past months, substantial amount of money was spent on installing numerous crash carts throughout the hospital, central emergency call center, recruitment and training of medical personnel. Despite these improvements, the TMRC system still faces several problems.

Current electrical medical record system in RSCM does not identify inpatients that are unstable with potential clinical deterioration. The information can be very useful for initial set up of rapid response team. Knowing the location of each critical patients and their medical diagnosis prior to emergency activation increases the efficiency of TMRC. Access to such information can prepare the team better before responding to the call.

Another predicament lies from the existing old "code blue" system, where different hospital areas or departments have their own areal emergency activation number. Since the introduction of the new system, each areal emergency system has been integrated into one main TMRC system. However not all medical personnel are aware of this novel system.

The main purpose of this study is to acquire the prevalence of inpatients in RSCM regarded to be in "code blue" and to identify the clinical pre-arrest predictors. Selected subjects were then followed for 7 days to determine the incidence of cardiopulmonary arrests. Data acquired from this preliminary study will provide better insights for implementation and improvements of the TMRC system.

Method

Subjects

The primary subjects of this study were in patients treated in *Gedung A,* RSCM on April 19th to 26th 2013. Through consecutive sampling, patients that fulfilled the inclusion criteria will be recruited as subjects in this study. Subjects were divided into three groups with each corresponding inclusion criteria. The inclusion criteria used in this study is analogous to the "code blue" or response activation criteria used by TMRC (Table 1), and therefore mentioned synonymously with "critical" or "unstable" patients in this literature.

Data Collection

Data were collected by direct measurement of consciousness, airway, breathing and circulation of the patient. Primary diagnosis, co-morbid and pre-existing condition of the patient was also noted. Each subject was clinically assessed directly by the researchers. Variables measured were consciousness (Glasgow coma scale), heart rate (HR), respiratory rate (RR), oxygen saturation (O_2Sat), and blood pressure (BP). Critical patients were followed for 7 days and those that underwent cardiopulmonary resuscitation were observed for additional 24 hours. Emergency activations for arrests were differentiated to central activation, regional activation or no activation.

Results

Out of the total of 428 patients treated in *Gedung A,* RSCM on April 19th 2013, fourteen patients were identified to be critically ill. Most critically ill patients (n=8) were treated in the internal medicine ward, followed by pediatrics (n=2), surgery (n=2), and obstetric gynaecology oncology (n=1). One critically ill patient was excluded because she was transferred to another hospital. Three emergency activations were conducted; one central activation and the other two regionally. Four deaths occurred during the 7-days observation.

Table 1. Inclusion "Code Blue" and Exclusion Criteria

Age group	Inclusion Criteria	Exclusion Criteria
Neonates	- Impending airway obstruction - Respiratory arrest or increased RR according to age: • 0-3 months > 60x/min • 4-12 months > 50x/min - Cardiac arrest or change in HR according to age: • 0-3 months <100 bpm or >180 bpm • 4-12 months <100 bpm or > 180 bpm - Sudden decrease of consciousness (GCS > 2 points) or prolonged seizure	- Refusal towards participation into the study - Transferred to another hospital or health care facilities - Transferred into higher level wards without clinical indications (HCU/ICU/ICCU)
Children (1-12 yo)	- Impending airway obstruction - Respiratory arrest or SatO2 < 90% or increased RR according to age: • 1-4 yo > 40x/min • 4-12 yo > 30x/min - Cardiac arrest or decreased HR according to age: • 1-4 yo < 90bpm • 4-12 yo < 80bpm Decreased systolic BP according to age: • 1-4 yo < 70mmHg • 4-12 yo < 80mmHg - Sudden decrease of consciousness (GCS > 2 points) or prolonged seizure	
Adult (>12 yo)	- Impending airway obstruction - Respiratory arrest or RR>30x/min or SatO2 < 90% - Cardiac arrest or HR < 60 or > 130 bpm or systolic BP < 90mmHg, or urine production <50cc/4hrs - Sudden decrease of consciousness (GCS > 2 points) or prolonged seizure	

The primary diagnoses of the critically ill patients varied from infection, autoimmune and malignancy. Four patients who died were diagnosed with systemic lupus erythematosus, acute lymphoblastic leukemia, end-stage colon cancer, and sepsis. No particular disease category is identified to be the significant causation of critical illness or death (Table 3), although most critically ill patient were diagnosed with malignancies (n=5), followed by infections (n=3), gastrointestinal disorders (n=2), autoimmune diseases (n=2) and blood disorder (n=1). By the end of the study (26th April 2013), 5 patients were still admitted without arrests and the other four were discharged.

Three critically ill patients had consented to do not resuscitate (DNR), including 2 patients who had died. During cardiopulmonary arrests, attending nurses of patient number 1 and 3 activated the blue code for procedural rigor; no cardiopulmonary resuscitation was attempted for both patients. Patient number 4 died without emergency activation.

Discussion

During the study time approximately 3% (n=13) out of the total inpatients in *Gedung A* hospital ward were critically ill with risks of cardiopulmonary arrest. There were 4 occurrences of arrests within one week. All 4 arrests resulted in death with only

Table 2. Number of Inpatients, Critically Ill Patients Emergency Activations and Deaths

Department	Inpatients	Critically ill patients	Emergency activation (central)	Emergency activation (regional)	Deaths
Pediatrics	43	2	0	0	0
Internal Medicine	174	8	1	2	4
Obsgyn	45	0	n/a	n/a	0
Oncology Obsgyn	8	1	0	0	0
Neurology	26	0	n/a	n/a	0
Stroke Unit	6	0	n/a	n/a	0
Surgery	89	2	0	0	0
Neurosurgery	11	0	n/a	n/a	0
Ophthalmology	11	0	n/a	n/a	0
ENT	12	0	n/a	n/a	0
Dermatology	3	0	n/a	n/a	0
Total	**428**	**13**	**1**	**2**	**4**

n/a, not available or not applicable

one attempt of resuscitation by the emergency response team. Resuscitation for two DNR patients was not attempted. Regardless, TMRC was summoned during the arrests. We assessed this event to happen based on procedural rigor, where attending nurses and doctors relied on the rapid response team to "confirm" the assessment of cardiopulmonary arrest. We consider this approach to be unnecessary and should be avoided in the coming future.

There was an additional 1 arrest-death that occurred on a patient that was not previously identified to be critically ill. This death case was not included in our data (Table 3) because the patient does not fit in the inclusion criteria at the time of initial recruitment. Unexpected cardiac arrests like this are bound to happen in hospital setting. [2,3] Carrying high mortality rate, managing unexpected cardiac arrest relies mainly on preventive measures, such as with rigorous monitoring.[4,5]

One out of the three emergency activations was directed to the central system. Arrests were observed by attending nurses when they activated the code. Most of the nurses are aware of both the existence of the new TMRC central call system and the older, now considered to be regional TMRC. Their reasoned that regional TMRC may respond to the call faster since they are located within the same building. Additionally, the code will be announced throughout *Gedung A* by the building speaker that does not exclusively alert the rapid response team members.

One of the main goals of the new TMRC system is to integrate all emergency activation throughout the hospital only through the central number. Subsequently, the central TMRC will further notify regional team members who are closest to the site of emergency. The "one phone number" policy will facilitate simplicity that will be easier for every hospital employee to follow. Currently there is no data that compares the efficiency of central and regional TMRC. Therefore, there is not enough ~~to~~ evidence to only promote either one.

Four patients were discharged during the course of study due to the either clinical improvement or financial restraints. Five patients were still admitted during the course of the study due to no improvement or worsening general condition. In this case, they need more intensive monitoring because their general condition may worsen and lead into cardiac arrest. To prevent mortality, early detection and management of the problem is the first attempt that should be done.

In the result, the amount of critically ill patients who died, still admitted, and discharged were similar (n=4, n=5, n=4, respectively). This result may demonstrate the effectiveness of management of physician in charge of the patients. However, TMRC was not involved in managing patient's condition thus this data could not represent the effectiveness

of TMRC to influence the outcome. Further study, after the implementation of integrated approach, should be done to assess this problem.

This pilot study does not attempt to assess the quality of resuscitation or study the clinical profile of the critically ill patients. Thus, data extrapolation regarding resuscitation quality from this manuscript is not possible. Future works have large potential to explore these aspects of the novel intra-hospital emergency team.

Table 3. Medical Profile of Thirteen Critically Ill Patients

Critically ill	Department	Emergency activation	Do not resuscitate	Outcome	Primary Diagnosis
Patient 1	Internal Medicine	Central	DNR	Died (day 6)	Systemic lupus erythematosus
Patient 2	Internal Medicine	Regional		Died (day 7)	Acute lymphoblastic leukemia
Patient 3	Internal Medicine	Regional	DNR	Died (day 0)	Colon cancer stadium IV
Patient 4	Internal Medicine	n/a		Died (day 2)	Sepsis
Patient 5	Internal Medicine	n/a	DNR	Still admitted	Cholecystitis
Patient 6	Internal Medicine	n/a		Still admitted	Haemophillia
Patient 7	Obsgyn	n/a		Still admitted	Cervix cancer stadium IIB
Patient 8	Pediatric	n/a		Still admitted	Leukemia
Patient 9	Surgery	n/a		Still admitted	Intestinal obstruction
Patient 10	Internal Medicine	n/a		Discharged (day 4)	Eritroderma
Patient 11	Internal Medicine	n/a		Discharged (day 2)	Tuberculosis
Patient 12	Pediatric	n/a		Discharged (day 4)	Diverticulitis
Patient 13	Surgery	n/a		Discharged (day 3)	Squamous cell carcinoma of the tongue

Patient 5, 6, 7, 8 and 9 (outcome: still admitted) did not experience cardiopulmonary arrest or any other significant emergency by the end of the study (26th April 2013). In the outcome section, “day 0-7” denote the number days of observation

The incidence of cardiac arrests was still considered to be manageable by the regional TMRC. However, more analysis is needed to confirm this, since working forces of TMRC might be preoccupied with existing clinical practice work. It must be noted that data acquired from this preliminary study is limited and cannot be generalized into a conclusion.

Further studies may explore these areas:

1. The efficacy of TMRC in reducing mortality rate from cardiopulmonary arrests in non-intensive care unit. Comparison of resuscitation outcome with and without the collaboration of TMRC.
2. The use of formal TMRC socialization for medical personnel.
3. Comparison of resuscitation outcome between the central and regional emergency system.
4. Quality assessment of TMRC system; equipments, logistics, communication system, emergency activation response time and the clinical competence of team members.

Conclusion

Approximately 3% of all the inpatients treated in hospital ward were critically ill. Thirty percent of those patient experienced cardiac arrests. All four arrests resulted in deaths, including two DNR

patients. This preliminary study has identified key issues within the hospital emergency activation system and illuminates the importance of integrated-electrical medical record system that is capable to identify in patients with critical condition.

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