

Research Article

Arrangement of Burn Status for Emergency Management, Monitoring, and Evaluation of Burns in Saiful Anwar General Hospital in Malang, East Java, Indonesia

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ABSTRACT

The article proposes an arrangement of burn status for the management of severe based on a review of management of burns. More than 95% of burns are associated with fatal fires and occur in low to middle income countries. A coordination between health officers within health facilities is crucial to provide proper management for severe burns. There is no standard yet for burn status in Indonesia. Burn status may provide better management of patients who are admitted with burns. In this article, the set of burn status was arranged for the management of patients with burns in the Saiful Anwar General Hospital. There are 3 types of burn status in this paper each for the respective use of emergency management, burn unit monitoring, and wound care evaluation. The purpose of this burn status is to facilitate a better coordination between health officers regarding management of burns in Saiful Anwar General Hospital. This paper can also become the basis of further studies regarding burns as a tool to collect data or as a basis to pioneer the standard of burn status in Indonesia to further improve the general quality of burn care and research in Indonesia. The system of medical record for patients is generally carried out to keep a record of the patient's disease progression, including the diagnosis and treatment plans carried out by doctors and medical personnel which are involved.

Keywords: Burn status, burns, burn care, emergency

Introduction

Burn injuries present various challenges for health officers, along with severe long-term consequences for victims and will continue to be a problem affecting communities throughout the world. Other than the pain and discomfort whom the patients experience, the risk of having permanent disfigured scars that affect both appearance and function may affect the patients' future as well [1]. Therefore, it is important to perform an accurate treatment of burn injuries which can be performed rapidly. Not only this can be life - saving, but this also contributes in supporting their treatment outcome to ensure a better quality of life. In 2018, WHO reported an estimated

180.000 deaths every year are caused by burns, the majority occurred in low- and middle-income countries [2].

There has yet to be a data regarding the amount of burn victims in Indonesia, because not every hospital in Indonesia has a burn care facility. The burn victims which are recorded in Saiful Anwar General Hospital reached 202 patients in 2018, and 247 patients in 2017. An arrangement of burn status which can be followed from emergency room to burn care unit, including the form to evaluate burn wound care progress for every control may help facilitate communication and data management between health officers to provide accurate management of patients with burns.

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This article proposes this arrangement of burn status because there hasn't been a standard arrangement for burn status yet in Indonesia. The purpose of this burn status is to facilitate a better coordination between health officers to improve overall patient's management for burns. This article can also be useful as a basis of further studies regarding burns with the arrangement of burn status as a supportive tool to collect data.

Review

Preparation Diagnosis of Burns

Burns are injuries to the skin or other tissues which are caused by extreme heat, extreme cold, chemical substance, friction, or radiation [3]. A study by Jackson, Birmingham in 1950 formed the basic understanding of burn wound which we use today (Picture 1). An ongoing damage caused by burning near a heat source can cause failure in preventing the freezing of cellular protein. This leads to rapid cell death. The center of this zone is called Zone of Coagulation. The necrotic area presents a hardened skin consistency which is called eschar. Eschar is a type of wound that only

appears in burn incidences. The area outside of the Zone of Coagulation is the area where the tissue damage is less severe. Cell death does not happen immediately, but the circulation within the skin and subcutaneous tissue is disrupted because of microcirculation damage. This cause a decrease in circulation within this area, which is called the Zone of Static. Outside the area which has vascular problem, there's an area which experiences vasodilatation widely by the process of inflammation. This zone is called Zone of Hyperemia. Without proper approach to treatment, this zone will continue undergoing the inflammation process in response to injury and thus become necrotic. This theory is the reason behind the worsening condition of burn wound which doesn't receive proper treatment. A wound with a seemingly good condition may turn necrotic later. A proper team coordination regarding approach and treatment of burn wound that can be evaluated from emergency room to burn unit, including wound care evaluation is important to minimize tissue damage progression and facilitate wound healing [4,5,6].

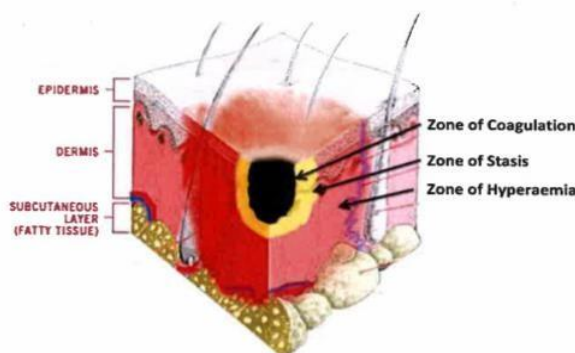


Figure 1. Burn model by Jackson

Table 1. Clinical signs of each stage of burns

Depth	Color	Blister	Capillary Refill Test	Sensation	Healing
Epidermal	Red	No	Present	Present	Yes
Superficial dermal	Pale pink	Yes	Present	Painful	Yes
Mid dermal	Dark pink	Yes	Sluggish	+/-	Usually
Deep dermal	Blotchy red	+/-	Absent	Absent	No
Full thickness	White	No	Absent	Absent	No

Source: [7]

EMSB guideline 2016 divides the body area to head, thoraco-abdominal (front), thoracolumbal (back), right upper extremity, left upper extremity, right lower extremity, left lower extremity, and genital. The guideline also divides the depth of burns which consist of epidermal, superficial dermal, mid dermal, deep dermal, and

full thickness. Each depth of burns has typical clinical symptoms and can be easily recognized, which are explained in Table 1. Along with these divisions, the area of burns is calculated by the Rule of Nines in adults and with a little modification for children [6,7].

Table 2. Body division on the rows with burn severity level on the columns

	Epidermal	Superficial Dermal	Mid Dermal	Deep Dermal	Full Thickness	Total	Others
Head							
Thoraco- abdominal							
Thoraco- lumbal							
Right upper Extremity							
Right lower extremity							
Left upper extremity							
Left lower extremity							
Genital							

Source: [7]

The approach and management of burns in this article follow the structure explained in Emergency Management of Severe Burns (EMSB) guideline 2016 by Australian and New Zealand Burns Association (ANZBA) as it is shown in Picture 2. If the case occurs outside of health facility, the immediate priority is to stop the burning process. In the health facility, mainly

starting in emergency room, examiners must assess the patient by performing primary survey examination, followed by FATT (Fluid, Analgesics, Tubes, Tests), and then secondary survey before further management [8,9].

Structure of EMSB							
LOOK DO	A I R W A Y	B R E A T H I N G	C I R C U L A T I O N	D I S A B I L I T Y	E X P O S U R E	FLUIDS	A.M.P.L.E. History
						ANALGESIA	Head to Toe Examination
						TESTS	Tetanus
						TUBES	Documentation and Transfer
	C spine	O ₂	Haemorrhage control I.V.	AVPU & Pupils	Environmental Control		Support
	Primary Survey					First Aid	Secondary Survey

Figure 2. Structure of EMSB

Primary Survey

At the scene, 3 principles of first aid for burns are to stop the burning process, cool the wound, and prevent hypothermia [8]. For emergency services at the emergency room, as well as other trauma, management is done by primary survey examination which consists of airway, breathing, circulation, disability, exposure [9].

Upon arriving in the emergency department, patients with severe burns should be examined with primary survey first. On inspection, the most dangerous threat to airway that requires immediate detection and treatment is inhalation trauma. This is usually caused by swallowing hot air, charcoal, patients with more than 20% of burns, substance intoxication, and many more. In addition to installing c-spine protection and airway liberation maneuvers (chin lift / jaw thrust), the examiner must also be able to recognize the symptoms of inhalation injuries. Inhalation injuries

are divided into airway trauma above the larynx, airway trauma under the larynx, and systemic intoxication. Airway trauma above the larynx is caused by inhalation of hot air which then activates inflammatory mediators and causes upper airway obstruction. Airway trauma under the larynx is caused by inhalation of combustion products. These compounds will lead to the formation of inflammatory exudates which then lead to atelectasis, interstitial swelling and pulmonary edema, and then cause hypoxemia and then reduce pulmonary compliance [7]. Meanwhile, inhalation injury with systemic intoxication is a type of trauma accompanied by substance poisoning, mostly by cyanide or carbon monoxide. The essence of managing inhalation injuries is airway patency, high flow oxygen (15 lpm), routine and repeated monitoring, and consideration of the occurrence of systemic poisoning with toxicologists [10].

Table 3. Clinical signs of inhalation injuries⁷

Types of inhalation injuries	Duration	Clinical signs
1. Above the larynx	4 to 24 hours	Increasing stridor
		Hoarseness or weak voice
		Brassy cough
		Restlessness

			Respiratory difficulty
			Respiratory obstruction
			Death
2. Below the larynx	(i) Immediate		Restlessness
			Life threatening anoxia
			Death
	(ii) Gradual onset hours to 5 days	1	Increasing hypoxia
		2	Pulmonary edema / ARDS
			Respiratory failure
3. Systemic intoxication	Death at scene		
	Worse initially		Obtundation/Unconsciousness
			Stupor
	Improves with time		Confusion
			Drowsiness
			Poor mentation
			Visual disturbances
			Headache

On breathing examination, there are three main things that need to be examined. The examiner has to check if the respiratory rate is less than 10 or more than 30 per minute in adults. If there are circumferential burns around the thorax or abdominal area, immediate escharotomy is indicated. Examiner should also be alert of the signs of carbon monoxide intoxication which is indicated by the cherry red appearance on the skin.

In breathing examination, the examiner should observe the respiratory ratio, the depth of breath, whether there is chest asymmetry during breathing and whether the breath is accompanied by additional muscles. Installation of pulse oximetry must also be done to determine oxygen saturation.

At this examination, the examiner should be able to rule out the possibility of significant pneumothorax, hemothorax, and significant ribcage related injuries. Related the airway patency, administration of 100% high flow oxygen (15L / minute) via a non-re-breather mask is necessary. At this stage of evaluation, eschar can be found which encircles the chest (with or without abdominal involvement) which can reduce ventilation. This phenomenon occurs because of the loss of the ability of the dermis to expand in the area that becomes eschar. This is an indication for immediate escharotomy. Escharotomy is a procedure to surgically remove a burn with a burning skin incision down to subcutaneous fat [7].

In circulation phase, the examiner should be able to immediately recognize whether there is a

presenting external bleeding and / or suspicion that leads to internal bleeding, in addition to measuring blood pressure, pulse, temperature, CRT (Capillary Refill Time), and examination of jugular venous distension. Double IV line must be installed to perform fluid therapy, getting samples for blood laboratory check is possible to be done during this phase. On this examination, abnormalities such as eschar and compartment syndrome can be found. Eschar formed around the extremities can interfere with the circulation of blood due to an increase in pressure by the accumulation of edema under the eschar. If missed, this phenomenon can cause ischemia. This condition is an indication for escharotomy.

Besides eschar, compartment syndrome may also present, which is most commonly found in the cases of electric burns. Compartment syndrome is a condition in which there is excessive pressure towards the muscle and can cause a decrease in blood flow. Recognizing this condition as quick as possible should be done in the prima-

ry survey and if diagnosed, it is an indication of fasciotomy. Fasciotomy is a procedure performed on the fascia to reduce the pressure caused by compartment syndrome. Compartment syndrome may cause a lack of nutrients and oxygen and must be recognized quickly to save the extremities. In extensive burns, fluid sequestration occurs in the injured area and this process can become systemic when the area of burns is more than 20% of the body surface area. This process is also accompanied by systemic edema formation which causes a significant reduction in plasma volume. This loss of circulating volume is added to the presence of evaporative loss on the surface of moist burns. This will cause intravascular hypovolemia which can lead to organ system failure, especially kidney failure.¹¹⁻¹³ As mentioned previously, installation of double intravenous line must be done and the provision of fluids that are suitable for burn incidences will be discussed further in the FATT section (Fluids, Analgesics, Tests, Tubes) [7].

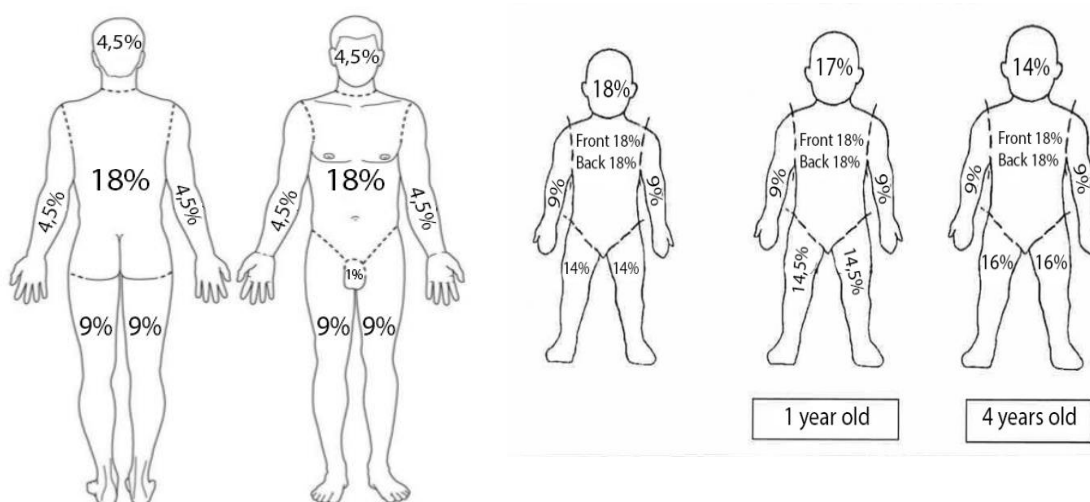


Figure 3. Staging burn injury

In disability examination during primary survey, ESMB guideline 2016 recommends using the AVPU scale, which consists of Alert, Verbal, Pain, Unresponsiveness. This scale is used to assess the patient's level of consciousness efficiently. Examine the pupils for signs of lateralization as a sign of an intracranial abnormality or eye trauma. The state of hypoxemia and shock can

cause anxiety and decreased level of consciousness [7].

Before entering the secondary survey, the stage that must be done is FATT. The FATT includes Fluids, Analgesics, Tests, and Tubes. Fluids is the stage of administration of fluids using the Parkland formula, which is 3 ml crystalloid x

body weight (kg) x TBSA (Total Burn Surface Area).

The results of the data obtained from that formula were given in half during the first 8 hours, and half of the others in the next 16 hours whose calculations began at the time of the injury, not the first time they were admitted to the hospital. In children under 16 years, the formula is modified with an intravenous maintenance fluid containing glucose at a constant rate every hour. The maintenance fluid rule for children is calculated per ml / kg / hour with "4: 2: 1" rule. Catheter installation is needed to monitor urine output [14,15].

In Analgesics, the recommended 2016 EMSB guideline is through the intravenous route. The drug recommended by the guideline is morphine 0.05 - 0.1 mg / kg. Giving the drug can be titrated according to the effects caused. Giving small doses is often safer than a large dose of administration. In Tests, the radiological examination usually needed is an x-ray examination to evaluate interventions for signs of inhalation trauma and indications of fracture. In addition, ultrasonography (USG) can be performed, Focused Assessment with Sonography for Trauma (FAST) scan, extended FAST (eFAST) scan, or other imaging as indicated. Meanwhile, the Tubes stage includes the installation of support hoses such as endotracheal intubation, urine catheter, and NGT [7].

Primary Secondary survey

The secondary survey phase is carried out after the primary survey has been completed and evaluated, and the patient's condition is stable. This stage includes history and physical examination head to toe, which is then continued in the process of documentation and re-evaluation. Important points in the history are in AMPLE, namely Allergies (history of allergies), Medication (medical history), Past Illness (past medical history), Last Eaten (what and when it was last eaten), and Leading to Injuries Events (history of events leading to illness). The important thing that needs to be explored in the history is the mechanism of injury, especially in the event of burns. In the event of burns, it is important to know about the duration of exposure to heat sources, open / closed events, type of clothing used, type of heat source, composition and con-

centration of chemicals in the event of chemical burns, voltage and type of electric current in electric burn cases, and an assessment of the adequacy of whether first aid is done. Physical examination is done completely from head to toe, to detect other abnormalities such as hidden wounds, lesions, bruises, and other abnormalities. In the event of burns, it is important to know about the duration of exposure to heat sources, open / closed events, type of clothing used, type of heat source, composition and concentration of chemicals in the event of chemical burns, voltage and type of electric current in electric burn cases, as well as an assessment of the adequacy or failure of first aid if done. As a precaution to Tetanus infection, a prophylaxis may be given if required [16,17].

Material and Methods

The system of medical record for patients is generally carried out to keep a record of the patient's disease progression, including the diagnosis and treatment plans carried out by doctors and medical personnel which are involved. A compiled arrangement of burn status representing treatment in emergency room, burn care, and wound care evaluation is expected to facilitate the handling and data record of patients with burns, because burns require observation and management that must be followed by developments starting from the emergency room, when transferring to the Burn Unit, monitoring the Burn Unit, and evaluating wound care of the burns.

The following attachment is a set of burn status that was arranged with consideration based on EMSB guideline 2016 by ANZBA and also adjusted to the availability of other forms that are already available in the patient's medical record folder of Saiful Anwar General Hospital.

1. Burn Status for Emergency Room (ER)

- a. The front page of the burn status for the ER includes the patient's identity and the list for primary survey data with details of certain symptoms which are important points in the severity of the burn and also the various interventions that can be performed by the doctor. The list contains small boxes that can be marked along with several blank columns if there are additional notes. Airway, breathing, circu-

lation, disability and exposure columns are designed in a larger box and bigger font size to make it easier for the examiner to record patient's progress and for examiners or other medical personnel to read patient data in accordance with the main aspects of the primary survey. done at the emergency room. Every aspect of

primary survey is accompanied by other related information. This information come with small boxes to minimize the time needed to write and to improve accuracy of patient's clinical signs in ER. Every aspect of primary survey comes with 12 columns to monitor vital signs progression per hour.

I. Primary Survey											
AIRWAY	Patent : Yes ☐ No ☐ , others :										
	Jaw thrust ☐										
	Signs of inhalation injuries :										
	Yes ☐ , signs :										
	No ☐ , signs :										
	Airway trauma : above the larynx ☐ below the larynx ☐ systemic intoxication ☐										
	C-spine control ☐ ETT :Yes ☐ No ☐ , other :										
	Time on ETT removal :										
	Other :										
Vital signs and Intervention Monitoring											
Time											
Airway patency											
Adventitious breath sounds											
Other : ...											

Figure 4. Airway check list of the primary survey on the front page of burn status for ER

- b. The back page of burn status for ER includes follow-up management after primary survey, such, such as FATT (Fluid, Analgesics, Tests, Tubes) and secondary survey that includes AMPLE and physical examination from head to toe.

II. Secondary survey	
Allergies	
Medication	
Past illness	
Last eaten	
Events leading to injuries	

Figure 5. AMPLE checklist on the back page of burn status for ER

Head		
Facial		
Nexk		
Chest		
Abdomen		
Perineum	Vagina	
	Rectum	
Extremity	Upper	
	Lower	

Figure 6. Head to toe examination

2. Burn status for burn unit
 - a. The front page of burn status for Burn Unit includes the identity of patients with some other information such as allergies and comorbidity factors obtained from the AMPLE of secondary survey. This sheet is prepared for the purpose of trans-

fer and monitoring of patients at the Burn Unit. The front sheet is arranged horizontally because of the limited paper size and includes two parts of the checklist that are identical in contents. The first is a checklist to record the installed devices and the vital information of the patient

during transfer and below it is the same checklist to record whether there is a device that will be removed, maintained, or added at the Burn Unit or changes in the patient's condition when it arrives at the Burn Unit.

Next to the checklist is another room to record items that are taken by the patient and 3 signature columns for the physician in charge, the person in charge of the transfer, and the person in charge of receiving the patient.

DURING TRANSFER (give checks on circles)					
AIRWAY Installed : ☐ ETT, size ... ☐ Tracheostomy, size ... ☐ OPA, ukuran ... ☐ NPA, ukuran ... ☐ C-spine protection ☐ Others ... ☐ Adventitious breath sounds, which are ... ☐ Secrete, characteristics ... Inhalation injuries : ☐ Above larynx ☐ Below larynx ☐ Systemic Intoxication Substance :	BREATHING Installed : ☐ CPAP ; FiO ₂ ... % ☐ NRBM ; FiO ₂ ... % ☐ Nasal canule ; FiO ₂ ... % ☐ O ₂ administration : ... lpm ☐ Circumferential eschar around the chest ☐ Escharotomy Ventilator : Yes / No Control : Pressure control mmHg Volume control mmHg RR ... x/minute SIMV : Pressure support mmHg RR ... x/minute Back-up apnea	CIRCULATION Installed : ☐ Double IV Line, Access ... Size ... ☐ Urinary catheter, size ... ☐ NGT, size ... ☐ Escharotomy, on ... ☐ Fasciotomy, on ... ☐ Others ... Blood pressure : mmHg Heart rate : ... x/minute (regular / irregular) CRT : ... Urine colour : ... ☐ Distended jugular veins CVP : cmH ₂ O ☐ Extremity oedema : ☐ Temperature :	DISABILITY Alert ☐ Verbal ☐ Pain ☐ Unresp. ☐ Pupillary reflex : ☐ / ☐ ☐ Isochor : ...mm/ ...mm Fall Risk (Morse) : Pressure ulcer : I. Intact skin, reddish, or edema II. Damage to epidermis and dermis III. Skin damage, necrotic subcutaneous tissue/fascia IV. Skin damage, necrotic muscles, bones, and up to joints	EXPOSURE	

Figure 7. Patient transfer checklist on the front page of burn status for Burn Unit

3. The front page of burn status for Burn Unit

- The back page of the burn status for Burn Unit has an almost identical design to burn status for front page ER with the aim to ease the transition of patient information from ER to the Burn Unit. The number of observation columns provided is more than 24 columns compared to the

12 columns of ER status. Because of the addition of this column, the airway, breathing, circulation, disability, and exposure writing boxes are slightly smaller, but this does not change the function and usage that are identical to the front page of the ER status.

I. Primary Survey	
AIRWAY	Patent : Yes ☐ No ☐ , others : ☐
	Jaw thrust ☐
	Signs of inhalation injuries : Yes ☐ , signs : No ☐ , signs :
	Airway trauma : above the larynx ☐ below the larynx ☐ systemic intoxication ☐
	C-spine control ☐ ETT : Yes ☐ No ☐ , other : ☐ Time on ETT removal : ☐
Other : ☐	
Vital signs and Intervention Monitoring	
Time	
Airway patency	
Breath sounds	
Other : ...	

Figure 8. Patient observation checklist on the back page of burn status for Burn Unit

3. Burn Status for wound care evaluation in Burn Unit.

- This status has only one page which consists of dividing the body area and classifying the type of burn depth which is divided into 5 columns representing the wound status of each patient undergoing wound dressing procedure (dressing 1, dressing 2, etc.). Under this column there

is a wider empty space to make it easier for the physician to provide important notes about the patient's wound condition, for example whether the wound has undergone epithelialization, become raw surface, or there is a bone exposure. This status is useful for evaluating the development of a patient's wound during treatment.

Results and Discussion

BURN STATUS (Emergency Room)		Medical Record Number			
		Name			
		Address			
		Place, date of birth			
I. Primary Survey					
AIRWAY	Patent : Yes ☐ No ☐ , others : ☐				
	Jaw thrust ☐				
	Signs of inhalation injuries : Yes ☐ , signs : No ☐ , signs :				
	Airway trauma : above the larynx ☐ below the larynx ☐ systemic intoxication ☐				
	C-spine control ☐ ETT : Yes ☐ No ☐ , other : ☐ Time on ETT removal : ☐				
Other : ☐					
Vital signs and Intervention Monitoring					
Time					
Airway patency					
Adventitious breath sounds					
Other : ...					
BREATHING	Spontant : Yes ☐ No ☐ , information : ☐				
	Circumferential eschar around the chest : Yes ☐ , info : ☐ No ☐				
	Performed escharotomy : Yes ☐ , info : ☐ No ☐				
	NRBM : Yes ☐ No ☐ , information : ☐				
	Others : ☐				
Vital signs and Intervention Monitoring					
Respiratory rate					
O ₂ saturation					
O ₂ administration					
Other : ...					
CIRCULATION	External bleeding : Internal bleeding : Eschar ☐ : Compartment syn. ☐ : Others ☐ :				
	Management Escharotomy ☐ : Fasciotomy ☐ : Others ☐ :				
	Double IV line : Yes ☐ , information : ☐ No ☐ , information : ☐				
	Blood lab. check : Urinary catheter : Yes ☐ , keterangan : ☐ No ☐ , keterangan : ☐				
	Others : ☐				
Vital signs and Intervention Monitoring					
Blood pressure					
Heart rate (regular/irregular)					
Temperature					
CRT					
JVP					
CVP					
Fluid line 1 (ml)					
Fluid line 2 (ml)					
Urine output (ml)					
Urine color					
Peripheral SaO ₂					
Others : ...					
DISABILITY	Alert ☐ Verbal ☐ Pain ☐ Unresponsive ☐				
	Pupillary reflex : ☐ / ☐ Isokor : ☐ , ...mm / ☐ , ...mm Lateralization : right / left				
	Other : ☐				
Vital signs and Intervention Monitoring					
AVPU					
Pupillary reflex					
Other : ...					
EXPOSURE	Take off clothes & accessories ☐ Log roll ☐ information : ☐				
	Signs of hypothermia ☐ , management : ☐				
	Epidermal	Superficial Dermal	Mid Dermal	Deep Dermal	Full Thickness
Head & Neck					
Thoraco-Abdominal					
Thoraco-Lumbar					
Right Upp. Extremity					
Left Upp. Extremity					
Right Low. Extremity					
Left Low. Extremity					
Genital					
Total Burn Surface Area (TBSA %)					

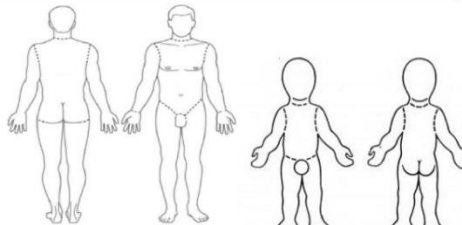


Figure 9. Front page of burn status of emergency

Fluids	Adult : ☐ Children : ☐ Weight (kg) :
	3 ml x ... BB (kg) x ... TBSA (%) = ... ml
	First 8 hours :
	Maintenance 4 : 2 : 1 (for children) :
	4 ml/kg/hour x (max 10kg)
	2 ml/kg/hour x (11 - 20kg)
1 ml/kg/hour x (extras beyond 20kg)	
	_____ +
	Total :
	Fluid : Dosage :
	Additional fluid : Dosage :
Analgesics	Drug 1 (access) : Time : Dosage :
	Drug 2 (access) : Time : Dosage :
	Drug 3 (access) : Time : Dosage :
Tests	X-ray ☐ Information :
	CT Scan ☐ Information :
	USG FAST ☐ Information :
	Others ☐ Information :
Tubes	ETT ☐ Information :
	Urinary cath. ☐ Information :
	NGT ☐ Information :
	Others ☐ Information :

II. Secondary survey

Allergies	
Medication	
Past illness	
Last eaten	
Events leading to injuries	

Head					
Facial					
Nexk					
Chest					
Abdomen					
Perineum	<table border="1"> <tr> <td>Vagina</td> <td></td> </tr> <tr> <td>Rectum</td> <td></td> </tr> </table>	Vagina		Rectum	
Vagina					
Rectum					
Extremity	Upper				
	Lower				

Wound problem	Management

Assessment :
 Planning diagnosis :
 Planning treatment :

Prognosis :

Malang,

Manager on Duty

ER Nurse

Doctor in charge

Figure 10. Back page of burn status emergency management in emergency room

TRANSFER STATUS (Burn Unit)					
Medical Record Number : Name : Address : Gender : Weight : Place, date of birth : Time of transfer : Type of arrival in Burn Unit : Type of Burns : Doctor in charge : Allergies : Comorbidities :					
DURING TRANSFER (give checks on circles) AIRWAY Installed : ☐ ETT, size ... ☐ Tracheostomy, size ... ☐ OPA, ukuran ... ☐ NPA, ukuran ... ☐ C-spine protection ☐ Others ... ☐ Adventitious breath sounds, which are ... ☐ Secrete, characteristics ... ☐ Inhalation injuries : ☐ Above larynx ☐ Below larynx ☐ Systemic Intoxication Substance : BREATHING Installed : ☐ CPAP : FIO₂ ... % ☐ NRBW : FIO₂ ... % ☐ Nasal cannule : FIO₂ ... % ☐ O₂ administration : ... lpm ☐ Circumferential around the chest ☐ Escharotomy Ventilator : Yes / No Control : Pressure control : ... mmHg Volume control : ... mmHg RR : ... x/minute SIMV : Pressure support : ... mmHg RR : ... x/minute Back-up apnea : CIRCULATION Installed : ☐ Double IV Line, Access ... Size ... ☐ Urinary catheter, size ... ☐ NGT, size ... ☐ Escharotomy, on ... ☐ Fasciotomy, on ... ☐ Others ... Blood pressure : ... mmHg Heart rate : ... x/minute (regular / irregular) CRT : ... Urine colour : ... ☐ Distended jugular veins CVP : ... cmH₂O ☐ Extremity oedema : + Temperature : ... DISABILITY Alert ☐ Verbal ☐ Pain ☐ Unresp. ☐ Pupillary reflex : ☐ / ☐ ☐ Ischior : ... mm / ... mm Fall Risk (Morse) : Pressure ulcer : V. Injct skin, reddish, ordena VI. Damage to epidermis and dermis VII. Skin damage, necrotic subcutaneous tissue/fascia VIII. Skin damage, necrotic muscles, bones, and up to joints EXPOSURE					
ARRIVAL IN BURN UNIT (give checks on circles) AIRWAY Installed : ☐ ETT, size ... ☐ Tracheostomy, size ... ☐ OPA, ukuran ... ☐ NPA, ukuran ... ☐ C-spine protection ☐ Others ... ☐ Adventitious breath sounds, which are ... ☐ Secrete, characteristics ... ☐ Inhalation injuries : ☐ Above larynx ☐ Below larynx ☐ Systemic Intoxication Substance : BREATHING Installed : ☐ CPAP : FIO₂ ... % ☐ NRBW : FIO₂ ... % ☐ Nasal cannule : FIO₂ ... % ☐ O₂ administration : ... lpm ☐ Circumferential around the chest ☐ Escharotomy Ventilator : Yes / No Control : Pressure control : ... mmHg Volume control : ... mmHg RR : ... x/minute SIMV : Pressure support : ... mmHg RR : ... x/minute Back-up apnea : CIRCULATION Installed : ☐ Double IV Line, Access ... Size ... ☐ Urinary catheter, size ... ☐ NGT, size ... ☐ Escharotomy, on ... ☐ Fasciotomy, on ... ☐ Others ... Blood pressure : ... mmHg Heart rate : ... x/minute (regular / irregular) CRT : ... Urine colour : ... ☐ Distended jugular veins CVP : ... cmH₂O ☐ Extremity oedema : + Temperature : ... DISABILITY Alert ☐ Verbal ☐ Pain ☐ Unresp. ☐ Pupillary reflex : ☐ / ☐ ☐ Ischior : ... mm / ... mm Fall Risk (Morse) : Pressure ulcer : V. Injct skin, reddish, ordena VI. Damage to epidermis and dermis VII. Skin damage, necrotic subcutaneous tissue/fascia VIII. Skin damage, necrotic muscles, bones, and up to joints EXPOSURE					
Other items/belongings during transfer : (Medical record, radiographs, personal belongings, etc) : Signature & Name Signature & Name Doctor in Charge, Signature & Name Received by, Signature & Name					

Figure 11. Front page of burn status of patient monitoring in Burn Unit. This page is to be utilized during transfer and patient retrieval

RE-ASSESSMENT & MONITORING (Burn Unit)		Medical Record Number			
		Name			
		Address			
		Place, date of birth			
I. Primary Survey					
AIRWAY	Patent : Yes ☐ No ☐ , others :				
	Jaw thrust ☐				
	Signs of inhalation injuries :				
	Yes ☐ , signs :				
	No ☐ , signs :				
Airway trauma : above the larynx ☐ below the larynx ☐ systemic intoxication ☐					
C-spine control ☐ ETT : Yes ☐ No ☐ , other :					
Time on ETT removal :					
Other :					
Vital signs and Intervention Monitoring					
Time					
Airway patency					
Breath sounds					
Other : ...					
BREATHING	Spontant : Yes ☐ No ☐ , information :				
	Circumferential eschar around the chest :				
	Yes ☐ , info :				
	No ☐				
	Performed escharotomy :				
Yes ☐ , info :					
No ☐					
NRBM : Yes ☐ No ☐ , information :					
Keterangan lain :					
Vital signs and Intervention Monitoring					
Respiratory rate					
O ₂ saturation					
O ₂ administration					
Other : ...					
CIRCULATION	External bleeding :				
	Internal bleeding :				
	Eschar ☐ :				
	Compartment syn. ☐ :				
	Others ☐ :				
Double IV line :					
Yes ☐ , information :					
No ☐ , information :					
Blood lab. check :					
Urinary catheter :					
Yes ☐ , keterangan :					
No ☐ , keterangan :					
Others :					
Management					
Escharotomy ☐ :					
Fasciotomy ☐ :					
Others ☐ :					
Size :					
Access :					
Dosage :					
Size :					
Access :					
Initial urine (ml) :					
Urine color :					
Vital signs and Intervention Monitoring					
Blood pressure					
Heart rate					
Temperature					
CRT					
JVP					
CVP					
Fluid line 1 (ml)					
Fluid line 2 (ml)					
Urine output (ml)					
Urine color					
Peripheral SaO ₂					
Others : ...					
DISABILITY	Alert ☐ Verbal ☐ Pain ☐ Unresponsive ☐				
	Pupillary reflex : ☐ / ☐ Isokor : ☐ , ...mm / ☐ , ...mm				
	Lateralization : right / left				
Other :					
Vital signs and Intervention Monitoring					
AVPU					
Pupillary reflex					
Other : ...					
EXPOSURE	Take off clothes & accessories				
	Log roll ☐ , information :				
Signs of hypothermia , management :					
Head & Neck	Epidermal	Superficial Dermal	Mid Dermal	Deep Dermal	Full Thickness
Thoraco-Abdominal					
Thoraco-Lumbar					
Right					
Upp. Extremity					
Left					
Upp. Extremity					
Right					
Low. Extremity					
Left					
Low. Extremity					
Genital					
Total Burn Surface Area (TBSA %)					

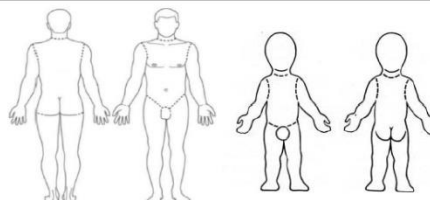


Figure 12. Back page of burn status of patient monitoring in Burn Unit. This page is to be utilized during evaluation and monitoring and patient's condition, continuing from emergency room evaluation

WOUND CARE EVALUATION FOR BURNS (BURN UNIT)																									
MEDICAL RECORD NUMBER																									
NAME																									
AGE																									
ADDRESS																									
TYPE OF BURNS																									
COMORBIDITIES																									
ALLERGIES																									
	EPIDERMAL					SUPERFICIAL DERMAL					MID DERMAL					DEEP DERMAL					FULL THICKNESS				
	I	II	III	IV	V	I	II	III	IV	V	I	II	III	IV	V	I	II	III	IV	V					
HEAD & NECK	Note :					Note :					Note :					Note :					Note :				
THORACO-ABDOMINAL	Note :					Note :					Note :					Note :					Note :				
THORACO-LUMBAL	Note :					Note :					Note :					Note :					Note :				
RIGHT UPPER EXTREMITY	Note :					Note :					Note :					Note :					Note :				
LEFT UPPER EXTREMITY	Note :					Note :					Note :					Note :					Note :				
RIGHT LOWER EXTREMITY	Note :					Note :					Note :					Note :					Note :				
LEFT LOWER EXTREMITY	Note :					Note :					Note :					Note :					Note :				
GENITAL	Note :					Note :					Note :					Note :					Note :				
TOTAL																									
OPERATOR																									
SUMMARY :																									

Figure 13. A separate one page form of burn status ro be used in monitoring the progress of wound healing after everycare or examination. This page can be doubled on the front and back

Wound problem	Management

Figure 14. Short table to record wound findings during physical examination

Fluids	Adult : ☐ Children : ☐ Weight (kg) :	
	3 ml x ... BB (kg) x ... TBSA (%) = ... ml	
	First 8 hours :	Next 16 hours :
	Maintenance 4 : 2 : 1 (for children) :	
	4 ml/kg/hour x (max 10kg)	
	2 ml/kg/hour x (11 - 20kg)	
	1 ml/kg/hour x (extras beyond 20kg)	
	Total : _____ +	
	Fluid :	Dosage :
	Additional fluid :	Dosage :
Analgesics	Drug 1 (access) :	Time : Dosage :
	Drug 2 (access) :	Time : Dosage :
	Drug 3 (access) :	Time : Dosage :
Tests	X-ray ☐	Information :
	CT Scan ☐	Information :
	USG FAST ☐	Information :
	Others ☐	Information :
Tubes	ETT ☐	Information :
	Urinary cath. ☐	Information :
	NGT ☐	Information :
	Others ☐	Information :

Figure 15. FATT (Fluids, Analgesics, Tests, Tubes) table

These burn status forms are meant to be parts of a patient's medical record to keep the data related to the patient's condition at the emergency room, Burn Unit, and wound development during wound care. Each page has a utility that complements the others.

Picture 9 and Picture 10 represent the first form of burn status whose role is to be utilized in emergency room. Every aspect of primary survey holds important information within the columns with enough space in case the examiner needs to add other details as previously explained in Picture 4. For example, the airway section (Picture 4) contains information regarding inhalation injuries should the examiners find the need to make it known for other health officers that the patient came with signs of inhalation injuries. Instead of a completely blank space to write, examiners must check the small boxes which are provided in the forms. There are also boxes to represent mandatory managements during the airway examination, such as the application of cervical

spine protection in airway section, examining circumferential burns in breathing section, double intravenous fluid line in circulation section, and determining the total burn surface area (TBSA) with the Rule of Nines.

In Picture 9, we provide the section for FATT (Fluid, Analgesics, Test, and Tubes), secondary survey which include AMPLE section for history taking and a section for head to toe physical examination (Picture 5 and Picture 6). There is an additional table below physical examination to record wound problems that may or may not be related to the burn incidence and the patient's past illnesses, such as diabetic foot or other acute or chronic wounds.

The FATT section includes the fluid resuscitation formula based on EMSB guideline 2016. It also provides additional formula for pediatric patients. This functions not only to record fluid administration (also in conjunction with front page of emergency burn status), but also as a constant reminder for examiners to provide the

accurate fluid administration for the patients. Other sections of FATT also provide details for efficient data management.

Picture 11 and Picture 12 represent the burn status for management and monitoring in Burn Unit. Immediately before transfer to Burn Unit, the health officer in charge has to fill the front page which consists of patient transfer checklist (Picture 7) and upon arrival, the health officer in charge in Burn Unit has to fill the identical checklist directly below the patient transfer checklist to record if there is any indication to remove, add, or replace existing tools that aid patient's stabilization, like replacing the an intravenous line if it is obstructed during transfer, removal of ETT (endotracheal tube), replacement of urine catheter or nasogastric tube, and others. This will record a responsible transfer where both the health officer in charge of transfer and the health officer who receives the patient in Burn Unit know the patient's condition. The boxes next to these checklists are provided for the health officers to give their signatures and if there are any additional patient's belongings.

Picture 12, the back page of Burn Unit status is designed for observational purpose. As it is explained before, the design is almost identical to the front page of emergency burn status (Picture 9). This design is intentional to help the health officers move the data from emergency burn status to burn unit status easily. The only difference is shown in Picture 8 where the monitoring section has more columns (24 columns) compared to the front page of emergency burn status (12 columns) to provide at least for 24 hours of patient's vital sign observation (1 hour per column). This is based on the fluid resuscitation formula by Parkland as explained in EMSB guideline 2016, where the formula is divided in two sections, which are the first 8 hours and the next 16 hours. If the initial fluid administration was given in emergency room, the data in burn unit can easily follow up with the continuing administration according the time, vital signs, and urine output.

The last form shown in Picture 13 is for wound care. This form helps the health officers to record the wound healing progress which will also be utilized in Burn Unit. The columns and rows are designed based on the body parts divi-

sion and classification of the depth of burns which were explained in the Review section of this article. The health officers can record any decrease or increase in wound's severity based on the clinical signs. They can also write down any findings such as necrotic wounds that were not previously apparent, bone expose, and other signs that may disrupt the wound healing process. This wound care form only has one page, so it is possible the print out this page on both sides of a paper.

These forms must be filled completely and accordingly for all health officers to be able to immediately comprehend the patient's overall condition. This design is intended to provide accurate data record of a patient with burns. This accuracy can be helpful for physicians in charge, nurses, and other health officers who are directly involved with the patients even when they change shifts to keep a consistent perception of the patient's condition. In short, whoever and whenever a health officer checks the patient's condition with this set of burn status, they are expected to be able to perceive the accurate data of the patient and thus capable of continuing the management accordingly.

Conclusion

There has yet to be a standard burn status for management of burns in Indonesia. This article proposes this arrangement of burn status as a tool to provide data management efficiency for patients with burns in Saiful Anwar General Hospital. This arrangement of burn status is designed to provide accurate data record of a patient with burns to facilitate better communication and coordination between health officers. This may help improve the overall management of burns in Saiful Anwar General Hospital, Malang, Indonesia. However, this burn status hasn't entered experimental studies to determine the effectiveness. Further trials and studies are recommended to assess the impact of this arrangement of burn status for clinical use to allow improvement and hopefully become the basis of standard burn status to provide better management of burns and as a tool for further studies regarding management of burns in Indonesia.

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