
DAMAGE CONTROL SURGERY (DCS) PROBLEMS ON SEVERE ABDOMINAL TRAUMA (SAT) IN THE EMERGENCY INSTALLATION

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ABSTRACT

Introduction: Based on the division of the anatomical region of the body, the abdominal region is the third most frequently traumatized region, which is about 8% of all trauma cases. At RSUPN CM Jakarta, abdominal trauma ranks second after the head and neck region as a cause of death due to trauma. This study aims to determine the problems in the DCS action on the SAT. Provide objective data regarding issues in DCS actions on SAT at the ER at the CM Hospital. **Method:** This study uses a retrospective study method with a descriptive study. The number of samples used is the total population observed. **Result:** 4 factors influencing mortality from severe trauma, namely; (1). The degree of severity of the trauma, (2). Host factor (host), (3). When definitive action is taken, and (4). Quality of trauma care. Of the four factors, only factors 3 and 4 can be handled in the ER of the CM Hospital, while factors 1 and 2 are factors beyond the hospital's reach. Trauma management in pre-hospital care requires a more comprehensive approach for medical personnel who assist patients and their families. Five of the 6 cases carried out by DCS died. Whereas the Ps value of the 6 cases is more than 50%. This can describe the condition of handling DCS in SAT patients at CM Hospital is not good. **Conclusion:** The condition of DCS handling in SAT cases is influenced by pre-hospital care, treatment in the ER, surgical techniques and treatment in the ICU. Pre-hospital care for the 6 cases was very slow, DCS decisions were not on site, operating techniques did not pay attention to triad of death indicators and handling in the ICU was less integrated with other departments.

Keyword: abdominal region, trauma, damage control surgery

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INTRODUCTION

In Indonesia, according to the 1991 Household Health Survey, trauma is the most common cause of death compared to infectious diseases and coronary heart disease. However, in the age group 15-25 years and 25-34 years, respectively, trauma ranks first and second (along with maternal death) as the most frequent cause of death. It is estimated that as many as 50,000 people died from trauma in 1991 (Pitt and Puspongoro 2005). Based on data from the 2007 Indonesian Health Profile, trauma cases ranked 6th, namely 347,345 cases/year in the top 10 outpatient cases in the Emergency Room (IGD) hospitals throughout Indonesia (Indonesia 2007).

According to Situmorang I's (2007) research at the CM General Hospital, 35% of the 31 trauma cases that came to the Emergency Room were found with hemorrhagic shock. The ratio of men and women is 5, 2: 1 (Situmorang I 2007). For comparison, in RSUP, dr. Sardjito, Yogyakarta (2004), 82 cases of abdominal trauma underwent exploratory laparotomy, with a male-to-female ratio of 4.47: 1, and most often found in the third decade of age (Pramugyono 2003).

Based on the anatomical division of the body, the abdominal region is the third most frequently traumatized region, which is about 8% of all trauma cases (Jurkovich and Carrico 1997). In the CM Jakarta General Hospital, according to a report by (Sidauruk M 2009), abdominal trauma ranks second after the head and neck area as a cause of death due to trauma.

The abdomen is susceptible to trauma from penetrating and blunt trauma due to compression, deceleration, and shear forces. The exposure to various energies that may be received is extensive. There are essential organs that are relatively unprotected and very rarely involved. one organ. So the speed in diagnosing will reduce the morbidity rate (Fabian And Croce 1995). The organs most commonly affected are the spleen and liver, which can cause hemorrhagic shock. Injuring a perforated organ will result in intra-abdominal contamination, which can have serious consequences. In various literature, it is often associated with severe abdominal injury (severe abdominal trauma, SAT) and damage control surgery (DCS) (Parent et al., 2005). Damage Control Surgery is part of the advanced in-room resuscitation of the Advanced Trauma Life Support (ATLS) system. The procedure is an aggressive approach to break the chain of movement patterns of physiological failure that leads to death (Kouraklis, Spirakos, and Glinavou 2002).

This study aims to determine the problems in the DCS action on the SAT. Provide objective data regarding problems in DCS action on SAT in the ER CM Hospital.

METHOD

This study uses a retrospective study method with a descriptive study. The number of samples used is the total population observed. The sample data was obtained from the morning watch report collection of the Department of Surgery FKUI/RSUPN CM which was then traced to the medical records of OK IGD, HCU, and ICU from January 1, 2007, to December 31, 2007. The data obtained were processed using the Stata 10.0 software program.

The data taken included gender, age, mechanism of trauma, length of time in the incident until arriving at the ER, Injury Severity Score (ISS), Probability of survival (Ps), organs involved, length of time in the ER until surgery, duration of surgery, PT, aPTT, pH, temperature, amount of replacement infusion fluid given during resuscitation and surgery, the volume of blood and plasma during surgery and indications for use of Bogota bag as TAC and cause of death. The data were processed using the Stata 10.0 software program and presented in a systematic descriptive manner, structured in the form of narratives and tables.

A. Operational Limits

a. Severe Abdominal Trauma

Trauma or injury caused by mechanical agents hitting the abdomen and other organs, which can lead to death due to direct organ damage or bleeding. (AD, nd) .

b. Damage Control Surgery

A primary survey / initial assessment action was followed by stop bleeding (packing, ligation) and stop contamination (clamps, perforated bowel ligation) and the abdomen was covered with plastic (Bogota bag) (AD 2004).

c. Bogota Bag

Sterile plastic bags to cover laparoscopic surgery wounds, in this study the plastic bags used were urine bags.

d. Laparotomy

An incision through the abdominal wall into the abdominal cavity (AD, nd).

e. Hemorrhagic shock

Hypovolemic shock due to traumatic bleeding resulting in blood volume depletion, resulting in inadequate tissue perfusion. In this study hemorrhagic shock: bleeding > 30% blood volume (AD, nd).

f. Injury Severity Scale (ISS)

Scale the severity of trauma in each region (head and neck, face, thorax, abdomen, pelvis, extremities, and body surface). The ISS is calculated by squaring a maximum of 3 worst-hit regions. The higher the ISS, the more severe the trauma. The maximum ISS is $25+25+25 = 75$.

g. Probability Of Survival (PS)

It is calculated based on the TRISS (Trauma injury severity score) formula. TRISS calculator software is available from <http://www.sfar.org/scores2/triss2.html> (Situmorang I 2007).

h. Coagulopathy

Blood clotting disorders in which the PT or aPTT values are elevated by more than 50%.

i. Metabolic Acidosis

Levels of lactic acid deposits as measured by blood gas analysis (AGD); if blood pH < 7.

j. Hypothermia

The core body temperature as measured by a thermometer probe at the esophagogastric junction is below 37oC, where the temperature is 32o-36oC (mild hypothermia), 28o-32oC (moderate hypothermia), and <28oC (severe hypothermia) (AD 2004).

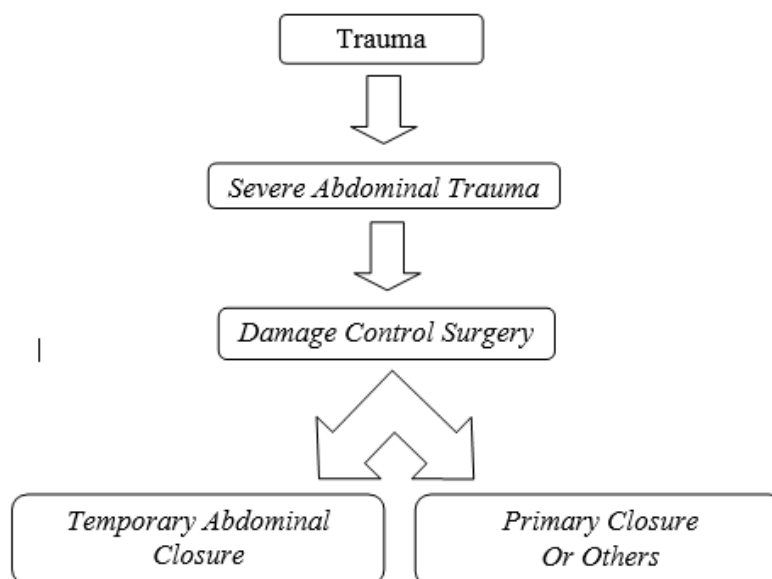


Figure 1. Systematic research flow

RESULTS AND DISCUSSION

After retrospective observation, 8 cases were found from the morning watch report collection of the Department of Surgery FKUI/RSUPN CM, then traced to the medical records section of the OK IGD, HCU, and ICU in the period January 1, 2007, to December 31, 2007. After searching, only 6 cases were obtained. with complete data, the other two cases did not obtain complete data.

A total of 6 cases evaluated consisted of 5 male patients and only 1 female patient. No penetrating abdominal trauma mechanism was found, all with a blunt trauma mechanism due to KLL on the highway. The age range is seen between 17 years to 48 years, with an average age of 32.17 years which is the productive age.

Table 1. Distribution of characteristics of sex, age, and trauma mechanism

Gender		Age			Trauma mechanism	
L	P	Min	Max	Mean $\pm$ SD	Blunt	see through
5	1	17	48	32.17 $\pm$ 5.75	6	-

In table 1, it can be seen that the minimum value of ISS is 24 while the maximum value is 41 and the average is 26. This value represents the severity score of the three worst-hit regions in each case. Supposedly that all cases can live because based on the Ps value, the minimum value is 90.7 and the average Ps value is 93. The 30-hour span was the longest time from the incident until the patient arrived at the ED, although the average was 7.5 hours. After being traced from the status data, information is obtained that the 2 longest times are; In the first case, the patient only came to the clinic and due to cost issues and the patient did not receive any complaints, it meant that the patient only came to the hospital 30 hours after the incident. In the second case, the pre-hospital time was 7 hours. This patient was referred from a hospital outside the city for reasons of limited equipment. Meanwhile, the average time between patients in the emergency room and DCS in the operating room is 3 hours and 50 minutes. Meanwhile, the average length of operation performed is 3.5 hours.

Table 2. Distribution of patient characteristics

Case characteristics	(n)	Min	Max	Mean $\pm$ SD
Injury severity score (ISS)	6	24	41	26.83 $\pm$ 0.98
Probability of survival (Ps)	6	90.7	95.4	93.45 $\pm$ 0.68
Length of time the incident arrived at the ER (hours)	6	1:00	30:00	7:30 $\pm$ 4:35
Length of time in the ED until surgery (hours)	6	1:00	10:00	3:50 $\pm$ 1:24
Operation time (hours)	6	1:30	4:30	3:30 $\pm$ 0:30

Table 2 shows the distribution of mortality rates and the time interval between events and death. Only 1 case was found alive after the DCS procedure, the remaining 5 cases died due to several causes of death

Table 3. Mortality after DCS

	Survival					
	Alive (n=1)			Off (n=5)		
	Mr. O 19 years old	Mrs. A 48 years old	Mr. T is 23 yrs old	Mr. Ag 40 th	Mr. Tu 46 th	Mr. G 17 th
Dead time (days)		H-7	H-8	H-7	H-7	H-9

Table 3 below describes the characteristics of the data regarding the length of surgery performed, and the triad of death which includes indicators of coagulopathy (PT, aPTT), acidosis, and hypothermia. In addition, data regarding the amount of fluid replacement and organ involvement were evaluated intraoperatively. Three cases used Bogota bag as TAC and the other three cases directly with primary closure. Table 4 also displays the causes of death of the 5 cases that died.

Table 4. Distribution of characteristics of the duration of operation, the triad of death, fluid resuscitation, organ involvement, TAC, and cause of death

No. (n=6)	ID	PT	PTT	pH	T ° C	K (cc)	P+F (cc)	Organs involved	TAC / indication	Dead cause
1.	Mr. O 19 th	19.6	78.2	7,208	34.4	4500	2500	Heart, lien	+ packing	
2.	Mrs. A 48 years old	26.8	148.0	7,190	33.2	6500	2500	Your retroperitoneum, ileum, colon	-	Sepsis – GOM
3.	Mr. T is 23 yrs old	24.4	136.6	7,160	34.6	6000	3000	Kidney, retroperitoneum	+ packing	SIRS – ARDS
4.	Mr. Ag 40th	25.6	152.4	7,145	34	8500	3500	Retroperitoneum, perineum	+ visceral edema	SIRS – ARDS
5.	Mr. Tu 46th	28.0	142.7	7,175	34.4	6500	3000	Pelvis, retroperitoneum, bladder	-	Sepsis – GOM
6.	Mr. G 17th	30.8	160.9	7,140	33.6	7500	3000	Pancreas, duodenum, retroperitoneum	-	DIC - SIRS

ToC : Temperature in degrees celsius

K : Amount of replacement infusion fluid during resuscitation and surgery

P+F : Total volume of blood and plasma were given during surgery

GOM : Multiple Organ Failure

SIRS : Systemic Inflammatory Response Syndrome

The completeness of the expected data variables in each study is the main requirement for the success of any study. In this study, there were 2 cases where completeness of the data was not found, even though it had been traced from various data sources in the Department of Surgery, FKUI/RSUPN CM. Problems like this have often been encountered in previous studies, especially research with retrospective case studies that used patient registration records as a data source. This is a weakness of the medical record system of RSUPN CM as a teaching and research hospital.

All cases in this study were of productive age (mean age 32.17 years) with a history of traffic accidents where the ratio of men and women was 5: 1. This is following various epidemiological literature on abdominal trauma in urban areas, which often occurs in men. male, productive age, and blunt abdominal trauma due to traffic accidents.

In contrast to rural areas, low to medium-income countries, according to WHO (2005); have hospital system resources and community-based emergency care that is not ready, road transportation to the hospital is not smooth, and there are not many regulations regarding road safety driving, the imbalance between urban and rural areas in accessing pre-hospital emergency

response systems and services hospital emergencies, as well as income inequality, racial discrimination, and resource constraints. Meanwhile, developed countries and urban areas have better preparedness for dealing with trauma cases. This relates to the availability of transportation from the scene to the hospital. Medical personnel is better prepared and trained, and diagnostic, therapeutic and management instruments are more comprehensive so that morbidity and mortality rates can be reduced (Hofman et al. 2005). Preventable trauma deaths (preventable trauma deaths) decreased by 1-5% in trauma center hospitals compared to 30% in non-trauma center hospitals (Fabian & Croce, 1995).

Indonesia does not have a trauma center hospital. However, based on the 1971 American Medical Association (AMA) categorization, the Emergency Room at RSUPN CM is included in the type I 58 category, namely Comprehensive Emergency Service; The hospital shall be fully equipped, prepared, and staffed to provide prompt, complete and advanced medical care for all emergency including those requiring the most complex and specialized service for adults, infant, and children, including newborn. It shall have a capacity adequate to accommodate the direct and referred patient loads of the region served and be capable of providing consultative support to professional personnel of other hospitals and health facilities in the same region.

In providing help, the success of the ER depends on; (1). The condition of the patient when he arrived at the ER, (2). The condition of the emergency room building and (3). Quality and quantity of tools and medicines, and (4). The abilities and skills of the officers (Hidayati 2020).

Situmorang (2007) reported an unexpected death rate of trauma cases with hemorrhagic shock at RSUPN CM of 2.67%, a decrease compared to the previous study by Dadik (1997) which was 6.6% (Situmorang I 2007). In another report by Sidauruk (2009), there were 28 cases of death from all trauma cases (448 cases) found in RSUPN CM throughout 2008 with a male-to-female ratio of 4.5: 1 (Sidauruk M 2009). In the same report, Sidauruk (2009) revealed that there were 5 (1.1%) DCS cases in the period 1 January 2008 to 31 December 2008 while in the period 1 January 2002 to 30 September 2002 there were 23 (6.2%) DCS cases. There is a pattern of decline in DCS cases from 2002 and has remained relatively constant until recent years. However, when compared; in 2002 there were 14 (60%) cases alive from 23 cases and in 2008 of all cases none were alive and the current evaluation there were 1 in 6 cases of living DCS, it appears that the quantity of DCS cases decreased, as well as the quality of DCS handling has also declined. The author agrees with Sidauruk that there are two reasons to explain why the number of DCS cases in the ER of RSUPN CM has decreased. First; The number of hospitals in Jakarta in 2002 was 109 hospitals. This number increased in 2008 to 139 hospitals. This increase in the number of hospitals widens the distribution of existing cases. The second reason; in December 2006 AGD 118 in Jakarta was no longer functioning and it is likely that these patients died before arriving at the hospital. Before December 2006 the response time of AGD was 118 to 10 minutes after receiving a call for help. This is also evidenced when the number of KLL cases who died and entered the Forensic Department of the FKUI/RSUPN CM increased (Sidauruk M 2009).

Conceptually 4 factors affect mortality from severe trauma, namely; (1). The degree of severity of the trauma, (2). Host factor (host), (3). When definitive action is taken and (4). Quality of trauma care. Of the four factors, only factors 3 and 4 can be handled in the ER at RSUPN CM, while factors 1 and 2 are factors beyond the reach of the hospital. (Soenjoto DA, 1997) . The Ps value

predicts the life expectancy of trauma patients. Based on the Ps value, life expectancy is grouped into 4 categories; (1). Ps value below 50% of the final result died, is an expected death. (2). The Ps value is below 50%, but the result is unexpected survival. (3). Ps value more than 50% of the outcome of life, which is expected survival. (4). Ps value is more than 50% but the final result is an unexpected death. In the evaluation of the success of trauma treatment, the emphasis of the assessment was on patients in groups 2 and 4. Group 2 showed success and group 4 indicated a failure in the trauma management system. Here it was found that from the 6 cases the object of this study the minimum Ps value was 90.7 and the average was 95.4 while the final result was only 1 patient who remained alive, meaning that the quality of SAT treatment with DCS at CM Hospital was not good because the final evaluation results were 5 out of 6 unexpected death cases, they died.

On the other hand, the average time from the scene to the emergency room was 7.5 hours and the average time from the emergency department to DCS in the operating room was 3 hours and 50 minutes. Of the 5 cases of death in this retrospective study, case I, a 48-year-old woman arrived at the ER 1 hour after the incident in a state of shock, transported by public transportation without a family, with no pre-hospital care medical records. The resuscitation was successful, the condition is stable. Then surgery was decided, and informed consent (a statement of approval for anesthesia/surgery) was given by the family 2 hours later.

Case II, a 23-year-old man arrived at the ER 2 hours after the incident in a state of shock, transported by public transportation, also without his family. Performed resuscitation and operated on 1 hour later.

Case III, a 40-year-old man arrived at the ER 2.5 hours after the incident in a state of shock driven by public transportation without a family. Resuscitation was carried out and operated on 1 hour later after receiving informed consent from the family.

Case IV, a 46-year-old man arrived at the ER 7 hours after the incident; The patient was referred from an out-of-town hospital for reasons of limited equipment, without adequate pre-hospital care medical documents. Perform resuscitation and insertion of C-clamp. Ten hours later the shock returned so surgery was decided; After a colostomy was performed, there was thrombosis of the right femoral artery and rupture of the right femoral vein, so a DCS vascular system was performed in the inguino-femoral area by ligating the right femoral vein.

Case V, a 17-year-old male arrived at the ER 30 hours after the incident. After the incident the patient did not go directly to the hospital but to the nearest clinic, then due to cost problems and not feeling any complaints, it meant that the patient did not want to go to the hospital. An abdominal CT scan was performed 4 hours after arriving in the ER (late; cost reasons) and surgery was decided. The new operation can be carried out after 1 hour because the informed consent has only been given by the family. So the total time in the ER is 5 hours.

From the data above, it is clear that pre-hospital care is very inadequate. Only one patient was brought by a medical officer, and that was because he was referred from another hospital with incomplete medical records. Next, the problem of handling in the ER is not as expected because the leading decision maker, in front of the patient is the chief resident, some of whom have not attended the DSTC course. Although the DSTC course has been held since 2000, in reality not all chief residents have attended the course before becoming chief residents. So that the content of the decisions taken is more waiting for the assessment trainee from the results of the report given by the chief resident

than the real conditions when the patient arrives at the ER when conducting the primary survey evaluation. This decision that is not on site worsens the patient's condition which is getting closer to the triad of death indicator.

In 1997, Dadik tried to collect various problems of unexpected deaths at RSUPN CM (Soenjoto DA 1997). Generally, the problems found are hospital phase problems, namely; Inadequate preparation of trauma management protocols, including diagnosis, resuscitation techniques or surgical techniques, anesthetic management, and postoperative care, or because of inadequate support systems or facilities in the ER. At the time of Dadik's evaluation, AGD 118 was still actively operating and there had not been a DSTC course for residents. On the other hand, in this study, AGD 118 was not active and a DSTC course was conducted for residents. What needs to be underlined is that the opportunity for the DSTC course is not an absolute prerequisite for becoming a chief resident, so it is not uncommon to find a resident who has become chief, but has not attended the DSTC course.

The problem in the pre-hospital phase is that all patients who arrive at the ER do not receive adequate management, this is because the AGD 118 has not functioned since December 2006. It can be seen from the decrease in the number of cases of multiple trauma arriving at the ER at RSUPN CM consecutively from 2002 to 2006. and 2007, and 2008 respectively 208, 252, and 105, and the last 96 cases (Darmawan, 2014). In this study, none of the cases used AGD 118 as a means of transportation from the scene to the ER, so it was concluded that the pre-hospital care was not good.

The mechanism of trauma in all cases in this study was blunt trauma due to KLL (table 1). Traffic accidents that can result in shock, involve a lot of energy. The most organ involvement in this study was retroperitoneum, which was present in 5 of 6 cases (table 4). The kinematics of retroperitoneal blunt trauma are grouped into 3 namely; (1). The rapid deceleration can result in the avulsion of major blood vessel branches and intimal tears. (2). Direct anterior crush, can cause total tearing of large blood vessels. (3). Fall from a height, multiple decelerations, and crush type. Bach (2008) reported that in Denmark few surgeons have experience in performing retroperitoneal packing in cases of massive bleeding because most are reluctant to do so. Based on these considerations, they conducted training on how to do retroperitoneal packing and the results can increase the effectiveness of DCS success (Bach et al. 2008). At RSUPN CM, retroperitoneal packing is part of the DSTC course that has been conducted since 2000.

From table 4, it can be seen that the triad of death indicators has been found in all cases. In the first case, Mr. O has been found coagulopathy, acidosis, and hypothermia. Intraoperative packing was done and TAC was done with a Bogota bag. The patient can live. Compared to the other 5 cases, the administration of fluid replacement as resuscitation, in the case of Mr. The minimum O is 7,000 ml. The other five cases received higher mean fluid resuscitation, which was 10,000 ml. The amount of fluid and blood for resuscitation is difficult to predict in the initial evaluation so it is more important to assess the resuscitation response and oxygenation of the end-organs. At the cellular level, anaerobic metabolism occurs when perfusion and oxygenation are inadequate and produces lactic acid as an end product. Lactic acid will cause metabolic acidosis and lead to damage to the integrity of cell membranes. The ultimate goal of resuscitation is to achieve adequate organ perfusion, tissue oxygenation, and good cellular function, i.e. when oxygen deficiency is met, acidosis is corrected and aerobic metabolism occurs again. In ATLS the success of fluid resuscitation is

assessed by urine production. If the resuscitation fluid is given in excess, the fluid will come out of the capillaries because of the increased capillary permeability due to the inflammatory reaction of the trauma response. The excess fluid received will cause a shift of intravascular fluid to extravascular and occupy loose connective tissue such as lungs and soft tissues. Furthermore, pulmonary edema occurs, cardiac preload will decrease, splanchnic hypoperfusion, kidney and liver gain weight and will fall in GOM conditions. (Sagraves et al., 2006) .

Higher PT and aPTT elevations and lower acidosis rates, although the temperature in all cases was classified as mild hypothermia. It can be seen that the higher the increase in PT and aPTT and the lower the acidity level, the worse the patient's condition. Aoki (2001) predicts that if you are unable to correct the pH to more than 7.21 and the aPTT is more than 78.7 at the initial DCS, the mortality rate will increase to 100% (Sugrue, D'Amours, and Joshipura 2004). According to the DSTC concept, before the above laboratory parameters appear, the operation must be stopped and the patient brought to the ICU to restore physiological conditions to prepare for the next stage of definitive surgery. But what has happened is that only 2 cases were discontinued within 90 minutes, the rest over 2 hours. The average length of operation time is 3.5 hours. Two factors stand out in this regard, namely; human factors and non-human factors (facilities and infrastructure) as previously described which are summarized in Dadik's research (1997). Next in ICU treatment, the thing that must be done is correcting acidosis, which is to return anaerobic metabolism to aerobic metabolism by providing replacement fluid resuscitation that is warmed until tissue perfusion is achieved and oxygen delivery reaches the cellular level. Simultaneously rewarming is carried out to increase the core temperature. To treat coagulopathy, blood clotting components can be given. The problem in the ICU is that it cannot intervene in such a way because the ICU care authority is controlled by the anesthesiologist team. Meanwhile, the anesthesia team of FKUI/RSUPN CM has not participated in the DSTC course. So sometimes there are different perspectives on the handling of DSTC in stage II (ICU stage). In practice, replacement fluid resuscitation in the ICU is never warmed and rewarming is rarely attempted. The deaths in the five cases above occurred in the ICU after the third phase of DCS. The optimization of the second phase in the ICU has not met the standards expected by the DSTC, because the authority of the surgical team cannot fully reach the management in the ICU.

If the quality of pre-hospital trauma management improves, death will no longer occur in the pre-hospital and emergency department, but more trauma cases die in the ICU or post-ICU ward due to multiple organ failure (GOM). According to the literature, this figure can reach 30% to 100% and the cause is delayed or incomplete resuscitation. Hestitoto (1996) found that the mortality rate of trauma patients due to GOM in RSUPN CM reached 67% in 1995. Yadi (1997) reported excess fluid after surgery in trauma patients at RSUPN CM. Patients were divided into 2 groups. Group I received excess fluid of more than 10,000 ml (24 patients) and group II received excess fluid of fewer than 10,000 ml (18 patients). Of all the patients, eighteen died. Group I had a 6 x higher risk of death than group II. And if there are 2 or 3 indicators of the intraoperative triad of death, the risk of death increases to 28 times higher (AD 2004).

However, the case in Jakarta is different. Where only a few cases of trauma due to KLL arrive at the ER. Pusponegoro report (1993), in 1991 at the FKUI/RSCM morgue there were 1000 deaths due to KLL. At the same time, according to data from the Traffic Police (Plants), there were 268

deaths due to KLL. 732 patients died on the way to the hospital or in the hospital due to inadequate management (Puspongoro and Sujudi 2016).

The most deaths in DCS cases handled in this study occurred on H-7 due to SIRS and GOM. In a study at RSUPN CM from December 1995 to November 1996, it was found that hemorrhagic shock had an important role in the onset of the systemic inflammatory response syndrome (SIRS) and both were associated with death due to GOM. Djan (1997), in his research also found that the time factor between the incident and the time of arrival at the ER, resuscitation with blood and fluids, ISS and duration of surgery were significant risk factors that could lead to GOM (AD 2004).

In this study, the Bogota bag was used as TAC in 3 cases. Two of them died. Two cases of using the Bogota bag indicated the presence of intra-abdominal packing for the need for a "re-look laparotomy", a plan to return to the operating room to evaluate the DCS management that had been carried out, and definitive surgery and in one other case to avoid the increase in intra-abdominal pressure caused by edema. visceral.

The choice of TAC with Bogota bag by the operator is rational because it is very effective and safe (Kirshtein et al. 2007). Taviloglu (2003) recommends the Bogota bag for DCS because it is inexpensive, practical, easy to obtain and fast in the application, transparent so that it can monitor the condition of intra-abdominal organs during the resuscitation phase, and can be periodically exchanged if needed (Myers & Latenser, 2002) (Kaplan et al. 2005). The function of the Bogota bag also retains body heat, protect visceral organs from evaporation ("entero-atmospheric-fistulas"), protect from direct mechanical injury, infection, and fluid loss, and is non-irritating (MacLean et al., 2008). (Myers and Latenser 2002). Another advantage of the Bogota bag is that the volume of the abdominal cavity can be controlled to prevent an increase in intra-abdominal pressure and thus ACS can be avoided (Kaplan 2004).

CONCLUSION

Indonesia does not yet have a trauma center hospital. However, based on the categorization of the American Medical Association (AMA) in 1971, the Emergency Installation of RSUPN CM is included in the type I 58 category, namely Comprehensive Emergency Services; Homes are fully equipped, groomed and staffed to provide prompt, complete and state-of-the-art medical care for all emergencies including those requiring the most complex and specialized services for adults, infants and children, including newborns. Therefore, trauma management in pre-hospital care requires a more comprehensive approach, both for medical personnel who provide assistance, patients, and their families. Five of the 6 cases carried out by DCS died. While the Ps value of the 6 cases is more than 50%. This can describe the condition of DCS handling in SAT patients at CM Hospital which is not good even though it is included in. The condition of DCS handling in SAT cases is influenced by pre-hospital care, treatment in the ER, surgical techniques, and treatment in the ICU. Pre-hospital care for 6 cases was very slow, DCS decisions were not in place, surgical techniques did not pay attention to the triad of indicators of mortality and ICU management was not integrated with other departments.

REFERENCES

- AD, Pusponegoro. n.d. *Hubungan Antara Suhu Kulit Dengan Perubahan Histopatologik Serta Fungsi Hati Dan Usus Pada Trauma Berat Dengan Syok Hemoragik*. Jakarta: Universitas Indonesia.
- AD, Pusponegoro. 2004. "Tingkat Kerusakan Histopatologik Hati Dan Usus Merupakan Tanda Prognostik Utama Pada Trauma Dengan Syok Hemoragik," April 2004.
- Bach, Allan, Jørgen Bendix, Keld Hougaard, and Erika Frischknecht Christensen. 2008. "Retroperitoneal Packing as Part of Damage Control Surgery in a Danish Trauma Centre—Fast, Effective, and Cost-Effective." *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine* 16 (1): 1–4.
- Darmawan, Arief. 2014. "Analisis Pelaksanaan Triase Di Instalasi Gawat Darurat Rs Pku Muhammadiyah Yogyakarta." Universitas Muhammadiyah Yogyakarta.
- Fabian, T C, and M A Croce. 1995. "Abdominal Trauma, Including Indication for Celiotomy. Trauma." Ed. DV. Feliciano, EE. Moore, KL. Mattox, A. Appleton Lange, Stamford.
- Hidayati, Afif Nurul. 2020. *Gawat Darurat Medis Dan Bedah*. Airlangga University Press.
- Hofman, Karen, Aron Primack, Gerald Keusch, and Sharon Hrynkow. 2005. "Addressing the Growing Burden of Trauma and Injury in Low-and Middle-Income Countries." *American Journal of Public Health* 95 (1): 13–17.
- Indonesia, Departemen Kesehatan Republik. 2007. "Profil Kesehatan Indonesia." 2007. http://www.depkes.go.id/downloads/publikasi/profil_kesehatan_Indonesia_2007.
- Jurkovich, G J, and C J Carrico. 1997. "Trauma: Management of the Acutely Injured Patient." *Textbook of Surgery: The Biological Basis of Modern Surgical Practice* fifteenth Edition. WB Saunders Company, 296–340.
- Kaplan, Mark. 2004. "Managing the Open Abdomen." *Ostomy/Wound Management* 50 (1A Suppl): C2-1.
- Kaplan, Mark, P Banwell, D P Orgill, R R Ivatury, D Demetriades, F A Moore, P Miller, J Nicholas, and S Henry. 2005. "Guidelines for the Management of the Open Abdomen." *Wounds-a Compendium of Clinical Research and Practice*, 1–24.
- Kirshtein, Boris, Aviel Roy-Shapira, Leonid Lantsberg, and Solly Mizrahi. 2007. "Use of the 'Bogota Bag' for Temporary Abdominal Closure in Patients with Secondary Peritonitis." *The American Surgeon* 73 (3): 249–52.

- Kouraklis, Gregory, Spiros Spirakos, and Andromachi Glinavou. 2002. "Damage Control Surgery: An Alternative Approach for the Management of Critically Injured Patients." *Surgery Today* 32 (3): 195–202.
- MacLean, A A, T O'Keeffe, and J Augenstein. 2008. "Management Strategies for the Open Abdomen: Survey of the American Association for the Surgery of Trauma Membership." *Acta Chirurgica Belgica* 108 (2): 212–18.
- Myers, Jonathan A, and Barbara A Latenser. 2002. "Nonoperative Progressive" Bogata Bag" Closure after Abdominal Decompression." *The American Surgeon* 68 (11): 1029.
- Pitt, E, and A Pusponegoro. 2005. "Prehospital Care in Indonesia." *Emergency Medicine Journal* 22 (2): 144–47.
- Pramugyono. 2003. "Penerapan POSSUM/P-POSSUM Pada Pasien Trauma Abdomen Yang Dilakukan Laparatomi Eksplorasi Di Instalasi Rawat Darurat RSUP Dr. Sardjito Jogjakarta Januari 2000 – April 2004." *Jurnal Bedajh Indonesia*.
- Pusponegoro, D R Dr Aryono D, and Achmad Sujudi. 2016. *Kegawatdaruratan Dan Bencana: Solusi Dan Petunjuk Teknis Penanggulangan Medik & Kesehatan*. PT. Rayyana Komunikasindo.
- Sagraves, Scott G, Eric A Toschlog, and Michael F Rotondo. 2006. "Damage Control Surgery—the Intensivist's Role." *Journal of Intensive Care Medicine* 21 (1): 5–16.
- Sidauruk M, Pusponegoro AD. 2009. "Komparasi Pola Pasien Bedah Trauma Antara 1 Januari – 30 September 2002 Dan 1 Januari – 31 Desember 2008 Di Instalasi Gawat Darurat Bedah RSUPNCM/FKUI." *Departemen Ilmu Bedah FKUI/RSCM Jakarta*, 2009.
- Situmorang I, Pusponegoro AD. 2007. "Penanganan Dan Outcome Pasien Trauma Dengan Syok Hemoragik, Dengan Probability of Survival Diatas 50% Di RSCM, 1 Januari 2007 – 30 Juni 2007." *Departemen Ilmu Bedah FKUI/RSCM*.
- Soenjoto DA, Pusponegoro AD. 1997. "Evaluasi Kualitas Penanggulangan Trauma Abdomen Di RSUPN DR. Cipto Mangunkusumo Menggunakan Metode TRISS." Jakarta.
- Sugrue, M, S K D'Amours, and M Joshipura. 2004. "Damage Control Surgery and the Abdomen." *Injury* 35 (7): 642–48.



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