A Systematic Review of the Established Triage Systems in Disaster Management

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Abstract: *Many triage systems were established worldwide. However, there was no consensus for standardized triage system. In this study, author will describe the established triage system and compared it by the parameters in each triage system. This is a systematic review study prepared in accordance with the Preferred Reporting Item for Systematic Review and Meta - analysis statement. All studies about triage, especially triage in disaster, were included. In this study, as many as 19 pre hospital triage systems and 8 in hospital triage systems were analyzed. In pre hospital triage system, the parameters used were ability ot walk, respiration, capillary filling, pulse, consciousness, and systolic blood pressure. In the hospital emergency department triage system, the case was analyzed specifically and categorized in five level triage. Many triage systems were established in worldwide. There was still no consensus about which triage system has the best accuracy.*

Keywords: triage, disaster, management

1. Introduction

In 2019, almost 97.6 million people were affected and24, 396 people were killed by disaster (1). The disaster mostly occurred unpredictably while an available healthcare resource was not prepared (2). Thus, a triage system was needed both at the disaster site and in the emergency department for disaster management.

Triage is derived "trier", a French word, which means categorizing or classifying patients and injured people within a short time to assign priorities of transfer and management (3). There are various triage systems implemented around the world, classified as pre hospital and in hospital triage. There are more than 20 pre hospital triage systems established and applied in different countries, such as START, Sieve, Careflight, Mass gathering, STM, MASS, SALT, Smart, META, Homebush, CESIRA, PTT, TEWS, ASAV, MPTT, and CRBN. (4). There were 5 hospital triage system, like Australian Triage Scale (ATS), Canadian Emergency Department Triage and Acuity Scale (CTAS), Manchester Triage Scale (MTS), dan Emergency Severity Index (ESI). However, there was no consensus for standardized triage system (5). In this study, author will describe the established triage system and compared it by the parameters in each triage system.

2. Methods

This is a systematic review study prepared in accordance with the Preferred Reporting Item for Systematic Review and Meta - analysis statement. This study will summarized the parameters analyzed in each triage system and the priority of the analyzed parameters. The literature search was obtained in PubMed with the search terms "Triage" AND "Disaster" OR "Emergency" OR "Mass casualty". All searches were completed in August 2021. Results were exported to EndNote. Titles and abstracts were screened by the first author and full text articles were retrieved if they appeared relevant or if there was some ambiguity as to whether the article was relevant. All studies about triage, especially triage in disaster, were included. A narrative synthesis method is carried out and summarized in the results section. Tables and graphs will be created to illustrate

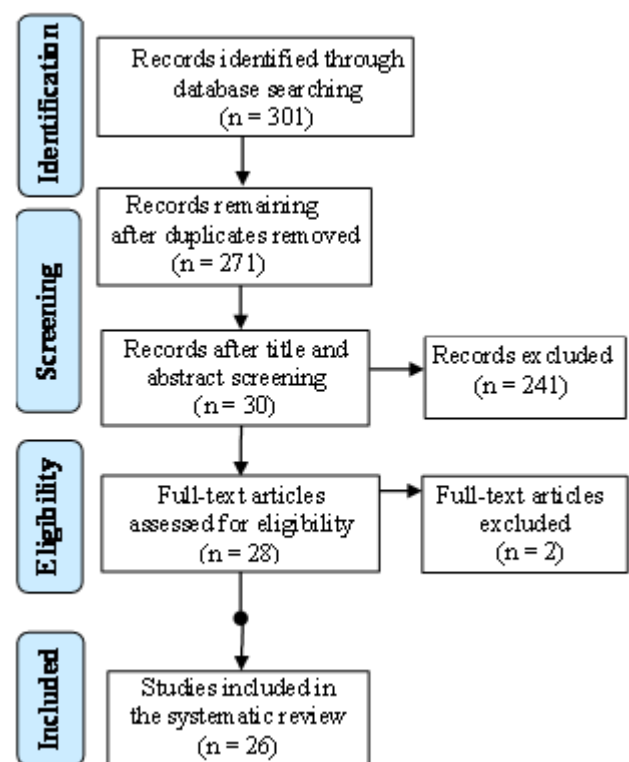the key studies, included the parameters that was analyzed in each triage system and its sequences.

Figure 1: PRISMA diagram of this study

3. Results

In this study, as many as 19 pre hospital triage systems and 8 in hospital triage systems were analyzed (Table 1). Authors analyzed each item that was included in the model to this study. The number was assigned based on the sequence of the algorithm.

In pre hospital triage system, most systems analyzed ability ot walk, respiration, capillary filling, pulse, consciousness, systolic blood pressure, bleeding, and shock to make triage algorithm. Almost all triage system put the parameter of "ability to walk" as the first triage category. The logical sorting way was that if the people was able to walk, the

people was still have good mental and physical capacity to survive and mobilize by his own. The second category was respiration and pulsation. Both were a very important parameters in determining one's ability to survive, without breathing and blood pumping, life could not be saved. If those three parameters were normal, others additional parameters should be determined to further categorize the patients.

The triage system could be further categorized as algorithmic triage or numeric triage. In the algorithmic approach, the patient was evaluated based on staged criteria, if one criterion is normal, the next criterion will be evaluated. In numerical approach, based on the score of each criterion, the final score of the injured person condition determined the criteria.

The accuracy of the triage system marked by the correct classification of the injured people to receive the appropriate and best timing of medical services. If the injured people was wrongly placed, it can lead to waste of resources or disrupt the access to the services required to maintain his or her life. However, it was hard to be determined due to various parameters in various algorithmic triage system.

Table 1: Systematic review of the existing triage system[6 - 31]

Model	Ability to walk	Respiration	Capillary filling	Pulse	Consciousness	SBP	Bleeding	Shock	Other	Method	Accuracy
START	1	2	3	4	5					A	36
Jump START	1	2	3	4	5					A	57
MSTART	1	2		3	4					A	-
Medical	1	5			2	3	4		6	A	-
Sieve	1	2	3	4						A	37 - 56
Careflight	1	3		4	2					A	36 - 56
Mass gathering	1		2	3	5	4			6	A	-
STM		1		2	3					N	-
MASS	1	2		3	4					A	-
SALT	1	2		3	4					A	52 - 59
Smart	1	2	3	4	5					A	-
META		1		2					3	A	-
Homebush	1	2		3	4					A	-
CESIRA	1	5			2		3	4	6	A	-
PTT	1	2	3		6	4			5, 6	A	-
TEWS	1	2		3	6	4			5, 6	N	-
ASAV	1	3		5			4		2	A	-
MPTT	1	2		3	4					A	-
CRBN	1	2, 3			4	3				A	-
ESI		1	3	2						A	59 - 72
SATS	1	2		3	6	4			5, 7	N	-
SAVE					2				1, 3	N	-
Sort		1		4	3	2				N	-
CRAMS	3	1			4	2			5	N	-
ATS	5 categories - 1 (Red): Life threatening conditions - 2 (Orange): Imminently life threatening - 3 (Green): Potentially life threatening - 4 (Blue): Potentially serious condition - 5 (White): Less urgent									A	58
CTAS	5 categories - Level I: Resuscitation - Level II: Emergent - Level III: Urgent - Level IV: Less urgent - Level V: Non urgent									A	49
MTS	5 categories: - Level I: Resuscitation - Level II: Emergent - Level III: Urgent - Level IV: Less urgent - Level V: Non urgent									A	46 - 58

4. Discussion

In the disaster situation, the frontline emergency physicians must be able to provide care quickly and appropriately based on its urgency. Many existing triage algorithms exist, based on patients' vital signs (respiratory rate, heart rate, blood pressure, level of consciousness, and body temperature) and chief complaints (5). However, there was no general or universal consensus on how triage should be performed. This has led to the confusion of the health system staff. In

this regard, different countries have designed their own triage systems (32).

The principle of triage is sorting of patients according to the prioritization of management (33). The American College of Surgeons Committee on Trauma showed that a triage system should reach a goal of <5% under triage and 25–50% over triage to reach a better health care (34). In this systematic review, it was shown that prehospital triage system SALT and jump START had the highest accuracy while in hospital triage system, MTS had the highest accuracy. The most popular applied triage system was MTS.

In pre hospital triage system, most systems analyzed ability ot walk, respiration, capillary filling, pulse, consciousness, systolic blood pressure, bleeding, and shock to make triage algorithm. Almost all triage system put the parameter of "ability to walk" as the first triage category. The accuracy of the triage system marked by the correct classification of the injured people to receive the appropriate and best timing of medical services. If the injured people was wrongly placed, it can lead to waste of resources or disrupt the access to the services required to maintain his or her life. However, it was hard to be determined due to various parameters in various algorithmic triage system.

Triage was yet a dynamic procedure, thus there was no fixed rule for it. Triage decision must be performed continuously to determine the best response for the patient's condition. In ethical consideration, triage systems must be based on the values of autonomy, fidelity, and ownership of resources. Overall, triage system allowed the healthcare provider to allow limited resources to provide the greatest number of injured people in disasters (35).

5. Conclusion

Many triage systems were established in worldwide. There was still no consensus about which triage system has the best accuracy.

6. Acknowledgements

7. Conflict of interest

This study has no conflict of interest to be declared.

8. Funding Statement

9. Data Availability

The data used in this paper are available from the corresponding author upon reasonable request.

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