

S.T.A.R.A. (Simple Triage Rapid Aid): A new protocol

Alexandre Sérgio de Oliveira Angelin PhD SMS-UNICAMP/SP®

Ednei Fernando dos Santos PhD UNICSUL/SP

Tiago Regis Franco de Almeida PhD UNIESP/SP

Marcelo Donizeti Silva Postdoctoral EERP-USP/SP

School of Medical Sciences

University of Campinas (Unicamp)

São Paulo- Brazil

Email alexandreangelin@yahoo.com.br / a271295@dac.unicamp.br

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Abstract

Introduction: Drowning fatalities pose a global public health challenge, particularly in Mass Casualty Incidents in Aquatic Environments (MCI-AqE). Ineffective screening victim triage is critical when there are many victims and resources are overwhelmed, and lack of planning.

Objective: This article introduces a Protocol for Simple Triage and Rapid Aid (S.T.A.R.A.). Aim is propose a theoretical triage model for aquatic environments, integrating variables like buoyancy, response time, and victim grouping. **Methods:** S.T.A.R.A.-Protocol was developed using a qualitative, descriptive method based on expert consensus and illustrative scenarios. Its formulation involved rapid scene assessment, victim observation, strategic floating equipment deployment, and prioritization of response time focusing on consciousness and aquatic mobility. The protocol uses five color-coded triage categories and a clear decision-making flow. **Results:** The simulation of S.T.A.R.A. demonstrates enhanced rapid in MCI-AqE. improved operational efficiency, structured resource allocation, and timely interventions. A protocol visual and color-coded system facilitates decision-making, optimizing rescue efforts. **Conclusion:** S.T.A.R.A.-Protocol offers a standardized, practical, and efficient framework for triage in aquatic mass casualty incidents in aquatic environments. It test is expected to improve rescue operations, reduce fatalities, and optimize resource allocation, enhancing preparedness and response capabilities. Beyond operational benefits, S.T.A.R.A. also supports rescuer mental health. By providing a clear, structured decision-making framework in high-stress MCI-AqE scenarios, it reduces uncertainty in cases for first responders, then better cognitive load. This systematic approach can mitigate the psychological impact of chaotic events that contribute to PTSD and other mental diseases in rescue personnel.

KEY WORDS: *Firefighters, Rescue, Triage, MCI, Aquatic environment.*

Introduction

Mass Casualty Incidents (MCI) or drownings involving Mass Casualty Incidents in Aquatic Environments (MCI-AqE) represent a significant challenge for rescue services worldwide. The unpredictability of catastrophic and fatal drowning MCI-AqE has drawn attention in several nations. The rapid and accurate triage is essential to prioritize care and optimize resources and many models were development and validation for MCI (Culley & Effken, 2010). In incidents, approaches and perspectives in the face of the challenges presented are emphasized by International Life Saving Federation (ILS, 2024), and in Brazil by Brazilian Water Rescue Association (SOBRASA, 2024). Despite the existence of established protocols, Bazyar, Farrokhi and Khankeh (2019) explain some types in around at world, and Culley, et al. (2014) explore five methods promise such as START by (Benson, Koenig and Schultz, 1996). However, when it comes to MCI-AqE, highlights the limited number of models tailored to water-based rescues. Recent studies by Barton, Morgan and Tipton (2024) explain this models. Others, Rescue (USAR) System (Caroline, 1992); Jump START (Romig, 2002); MCI Triage Triage (Lerner, Schwartz, & Coule , 2008); SALT (Triage (Lerner, 2008); Aircroff Chasher Into Water (Hickey, 2012); Shipwireks (Hansen, 2012); beach-related (Matthews, Andonaco & Adans, 2014). Effective response to MCI-AqE requires more than simply adapting land-based protocols. It demands a focus on frontline rescuers (Bierens, Knape & Gelissen, 2002; Quan et al., 2016), careful assessment of drowning victims, particularly those being swept away (Sempstrott et al., 2019), strategic deployment of flotation resources (Schmidt et al., 2016), and prioritization of response times (Papa, Hoelle & Idris, 2005). However, institutional preparedness often lags behind these needs. Catastrophic events can expose systemic failures and highlight the urgent need for innovative strategies that support rescuers and decision-makers in aquatic environments (Pascual-Gómez, 2011; Lopes, 2019). Catastrophes that devastate communities and modify the thinking of public institutions reflect a regression to a stage that can be characterized as a systemic failure in the response to a critical event. Case studies in Bangladesh (Rahman et al., 2009), Germany (Reijnen et al., 2018), South Africa (Saunders, Sewduth & Naidoo, 2018), and France (Castle et al., 2020) are examples. The resource allocation in chaotic aquatic environments, reducing cognitive load and mitigating post-traumatic stress among responders, and contributing to evidence-based practices, are base to offering a standardized of theory-driven triage model. Then, Study proposes as the S.T.A.R.A. (Simple Triage And Rapid Aid) protocol are a new conceptual model for triage in MCI-AqE. This reveals the level of institutional preparedness for critical events (Harichandan, 2023). Cultural changes are valid when they affect transformative epistemic structures, both of knowledge and praxis, as demonstrated by the panorama of tragedies around the world. Protocol aims to improve rescue operations and reduce fatalities by providing a structured decision-making framework, and seeks to standardize conduct and expand the operational capacity of rescuers in high-risk water rescue contexts. The proposal is contributed to the standardization of a protocol in MCI-AqE.

Literature Review

In the last ten years, few publications appear on work involving MCI-AqE. Discussions refer to MCI or suggest for new perspectives on aquatic safety. Many works focusing on attitudes towards drowning victims (Peden, Franklin, & Leggat, 2016) or even examining decision-making in aquatic disaster situations (Barton, Morgan & Tipton, 2024). The Terminology is a factor by analysis in these contexts.

Define for Multiple Casualty Incidents in Aquatic Environments (MCI-AqE).

Currently, there are multiple terminologies and methods for MCI Triage (Lerner, Schwartz, & Coule , 2008). New terms for casualty were developed as a management tool for emergency response. The aim is support decision makers in assessing casualty that needs based on limited information and finite resources, and minimizing disruption (Mills, et al., 2006). As example, a promissory management tools for emergency response that aimed at the Urban Aid and Rescue (USAR) System (Caroline, 1992). The author includes management tools for emergency response and many terminologies. The World Health Organization (WHO) defines MCI as an event that generates more casualties than available first responders, thus compromising the response capacity of agents (WHO, 2007). The Ministry of Health in Brazil, through the Mobile Emergency Care Service (SAMU), conceptualizes MCI as an incident involving a number greater than or equal to five victims (Brasil, 2016). And the Civil Defense of the State of São Paulo, objective of our study, defines it as *"sudden events that produce a number of victims that leads to an imbalance between available medical resources and needs, where maintaining an adequate standard of care is only possible through the mobilization of local resources"* (São Paulo, 2012, p. 4). In the context of MCI, Timbie et al. (2013) associate the response to such an incident with a service protocol that, given the limitation of resources and the slowness of actions, restricts the operational capacity of rescuers. When adding MCI with AqE, particularly in cases of drowning (Golden, Tipton , and Scott, 1997), water rescue (Szpilman et al., 2012), or near-drowning (Szpilman, 2000; Stephenson and Byard , 2023), the subject remains understudied in academia. Mass Casualty Incidents include shipwrecks (Hansen, Jepsen & Hermansen, 2012), aircraft crashes into water (Hickey, 2012) and beach-related incidents (Matthews, Andronaco & Adams, 2014). On populated beaches, factors such as shoreline length, accessibility, type of public or frequency, and user demographics should be considered to assess the probabilities of incidents (Pellicioni, 2014) as these factors may culminate in multiple drowning events. Notably, the WHO defines drowning as the process of experiencing respiratory impairment by submersion/immersion in liquid (Szpilman et al., 2012, citando OMS, 2002). Emergency response to these chaotic incidents can become dynamic and complex, requiring rescue services to demonstrate a high level of planning, resource coordination, and professional preparedness (Short & Hogan, 1994; Scott, 2007). Research indicates that the chances of survival decrease rapidly after submersion. According to the United States Lifesaving Association (USLA), field data from professional beach lifeguards suggests that a critical two-minute response window significantly increases successful rescue outcomes (USLA, 2022). Findings from the state of São Paulo emphasize a distance of 50 meters as the distance for a rescuer to reach the victim within the 3-minute intervention

limit, considered the ideal rapid response time (Pellicioni, 2014). It is important to highlight the different levels of risk, primarily from the swimmer's history, behavioral patterns, operational efficiency of rescue teams, and environmental conditions. Furthermore, most critically, submersion time remains a critical factor in the survival of a drowning victim (Suominen, et al., 2002). Considering hypoxemia and respiratory failure caused by submersion in liquid, rapid intervention becomes crucial for the victim's survival. In most cases, cardiac arrest occurs within minutes, and hypothermia reduces cerebral metabolic activity due to decreased oxygen consumption (Brooks, 2001). Therefore, an immediate and effective response is vital, with cardiopulmonary resuscitation (CPR) maneuvers proving effective in combating hypoxemia. Others details, most drownings occur in warmer aquatic environments. Particularly at beaches, and represent the largest number of high-risk incidents for both rescue and drowning. Given the importance of drowning prevention, the establishment of optimized techniques and the standardization of knowledge dissemination have led to reflection on the development of a rapid triage protocol for incidents with multiple casualties in water, specifically in populated environments. Rio Grande do Sul, in Brazil, innovative research involve alternative methods of classifying aquatic victims (Oliveira et al., 2017; Szpilman, 2019). This method does not emphasize the standardization of triage, reduced response time and ease of application through a specific method. Then, enter as challenge for rescues. Considering the importance of drowning prevention, the establishment of best practices, standardized techniques and the dissemination of knowledge have led to the development of rapid triage protocols for multiple casualty incidents in aquatic environments. At moment, the START by (Benson, Koenig and Schultz, 1996) continue being the method propose.

Simple Triage and Rapid Treatment (START) Approach Protocol

To respond quickly the incidents involving multiple victims, one of the first protocols created was START by (Benson, Koenig and Schultz, 1996). The method is triage criteria applied for the purpose of saving lives on three main criteria: breathing, perfusion (circulation) and mental status (Benson, Koenig and Schultz, 1996). It represents the main triage protocol adopted by Fire Departments worldwide, at example Rescue Aquatic Guide of São Paulo State, Brazil (SÃO PAULO, 2006). The START was developed in the 1980s in California, USA, and considered a disaster triage method designed to quickly classify. Considered simple, fast, and systematic because it does not prioritize medical diagnosis but rather the rapid triage of victims at the hot scene. It uses the mnemonic "30-2-can do", which assesses "30"; respiratory rate in one minute "2", peripheral perfusion quality in two seconds; and "Can do", the victim's level of consciousness (Bazyar, Farrokhi, & Khankeh, 2019).

Casualties are classified using a four-color coding system: Red, seriously injured casualties with a high probability of survival if treated immediately; Yellow, moderately injured casualties who can wait up to an hour for treatment; Green, occasionally "walking casualties" with minor injuries, able to ambulate and assist in emergency operations; and Black or Gray for dead or casualties in cardiopulmonary arrest with no viable chance of immediate recovery (Kahn, Schultz, & Anderson, 2009). Although the accuracy of the START method may be debatable, it demonstrates reasonable accuracy and is comparable to other triage models. It currently serves as a standard disaster triage tool (Franc et al., 2022). The

effectiveness of the system stems from its incorporation of the intuitive mechanisms inherent in traditional victim assessment methods.

Proposed Method

In Brazil, considered necessary to develop a model capable of assessing the victim's condition even from a distance - whether on land or distant aquatic environments. This innovation allows rescuers to quickly triage victims according to the severity of the injury, thus optimizing the allocation of resources during MCI. The propose was to refining the steps by Oliveira et al. (2017), and then create the STARA protocol (Simple Triage And Rapid Aid) based on the fundamental principles of the START model status (Benson, Koenig and Schultz, 1996). Experts from Firefighters High School (FHS), Fire Department of the military in São Paulo State, Brazil and São Paulo Fire Department Commission were consulted. Considered a national reference in aquatic rescue in Brazil. Specialists of School of Nursing of São Paulo University (EN-USP), of Science Medical School of Unicamp (SMS-Unicamp) and Health Sciences from Cruzeiro do Sul University (UNICSUL/SP) were consulted yet. The contribution validates the conceptual consistency of the proposed method. It aims to provide efficient emergency management in the low time, allowing rescuers to save lives by prioritizing victims who would benefit most from rapid intervention Timbie et al. (2013). It must be emphasized that the STARA protocol is still at an idealized stage. To date, it represents a conceptual and theoretical construction and has not yet been formally validated. Practical simulations with firefighter school trainees have been carried out, which provide initial feasibility insights but do not replace real controlled operations.

Model Comparatives

In comparison with existing triage systems, among the most used, START (Benson, Koenig & Schultz, 1996) is the most recognized internationally, and prioritizes rapid categorization through basic vital signs assessment, focused on land scenarios. STARA adopts the simplicity of START but adapts it to victims located at a distance, where direct measurement of vital signs may not be immediately possible in water. Regarding flexibility and lifesaving interventions, Lerner et al. (2008) proposed the SALT (Sort, Assess, Lifesaving interventions, Treatment/Transport). It has already been used in comparisons with other systems, and Integrates lifesaving interventions during triage. STARA incorporates the structured decision logic of SALT but adjusts it for contexts where immediate interventions are not always feasible. The JumpSTART, created by Romig (2002) as a pediatric adaptation of START, was introduces rescue breaths before the final decision but otherwise follows the START logic of breathing, perfusion, and mental status. STARA not focus on age, instead adds other variables such as buoyancy, immersion time, and rescue logistics, focusing specifically on immersion-related factors. The SMART follows the same sequence as JUMP START. Created by Mawji et al. (2022) it introduces a more systematic use of structured flowcharts and the development of a rapid triage algorithm for use in low- and middle-income countries. STARA does not focus on income, but has adapted flowcharts for criteria decisions.

The SMART follows the same sequence as JUMP START. Created by Mawji et al. (2022) it introduces a more systematic use of structured flowcharts. Development of a rapid pediatric triage algorithm for

use in low- and middle-income countries. The protocol SIEVE/SORT described by Bazyar (2019), applies rapid initial screening (SIEVE) followed by detailed classification (SORT). Similarly, STARA follows a two-phase logic: a preparation phase that considers future variables, and an aquatic operation phase that emphasizes pre-rescue assessment, followed by structured categorization after removal from the water. The protocol SIEVE/SORT described by Bazyar (2019), applies rapid initial screening (SIEVE) followed by detailed classification (SORT). Similarly, STARA follows a two-phase logic: a preparation phase that considers future variables, and an aquatic operation phase that emphasizes pre-rescue assessment, followed by structured categorization in water and after removal from the water. There are other traditional methods that show limitations. Continued with these as a basis for STARA, which was designed specifically to address operational gaps in aquatic environments, does not replace existing protocols but complements them by addressing a specific gap. Access, measurement, and intervention are delayed by the nature of the incident.

Most systems are validated through simulations rather than scientific data. For this reason, international cooperation is essential to achieve more organized responses to mass casualties (Wang et al., 2022).

Table 1 summarizes the context of application, aquatic limitations, and characteristics of each protocol.

Table 1. Comparative of Triage Protocols

<i>Reference</i>	<i>Protocol</i>	<i>Application</i>	<i>Main Features</i>	<i>Limitations in Aquatic Environments</i>
	STARA (Simple Triage and Rapid Aid)	Aquatic environments, MCI with drowning risk	Two stages (preparatory/observation - structured classification); flowchart with contextual variables	Still conceptual; no empirical validation, only simulations with trainees
Benson, Koenig & Schultz (1996)	START (Simple Triage and Rapid Treatment)	Land-based, general adult population	Rapid assessment (respiratory rate, perfusion, mental status)	Requires proximity to victim for vital signs; not feasible at distance or in water
Romig (2002)	JumpSTART	Land-based, pediatric focus	Modified criteria for children's physiology (e.g., apnea management)	Not designed for aquatic rescue; relies on direct contact with victim
Lerner et al. (2010)	SALT (Sort, Assess, Lifesaving interventions, Treatment/Transport)	Mass-casualty, flexible across scenarios	Integrates lifesaving interventions during triage	Immediate interventions often not possible in aquatic settings
Mawji et al. (2022)	SMART	Major incidents, systematic	Uses tags, structured flowcharts, color-coded categorization	Tagging impractical in aquatic incidents
Jafar Bazyar (2019) *	SIEVE/SORT	Pre-hospital, UK standard	Sieve -rapid primary triage; Sort - detailed secondary triage	Requires initial proximity and vital sign measurement

* Is widely referenced in literature on emergencies and mass triage (e.g., in Systematic Reviews and Comparative Studies).

A New protocol

The proposed method was developed based on a national and international literature review and analysis of existing protocols. Were observed Studies focusing on drowning incidents, disaster response, and mass triage, at example, protocol START (Benson, Koenig & Schultz, 1996), and aquatic rescue protocols, especially the SOBRASA model (Oliveira et al., 2017). By a qualitative and descriptive approach, the conceptual development of a new triage protocol applied for MCI-AqE. This explained

that the authors' practical experience in aquatic rescue contexts caused the principal protocol START to become outdated, as Wang et al. (2022) describe, as the construction was only in an environment. The theoretical assessment and practical plausibility, conducted through empirical experiences of the authors and alignment with institutional references, WHO, FEMA, SOBRASA, led to the creation of the method to improve operational efficiency. For a creation, a critical analysis of operational gaps in existing triage systems was carried out, considering contextual variables of aquatic environments, such as distance, buoyancy, response time and victim behavior. Finally, a conceptual modeling of the STARA protocol, structured in two stage, preparatory stage and application stage. As a decision logic by flowchart, moving on to operational applicability in the field, classification criteria, and categorization by cores was elaborated. **Figure 1** explain the design conceptual model.

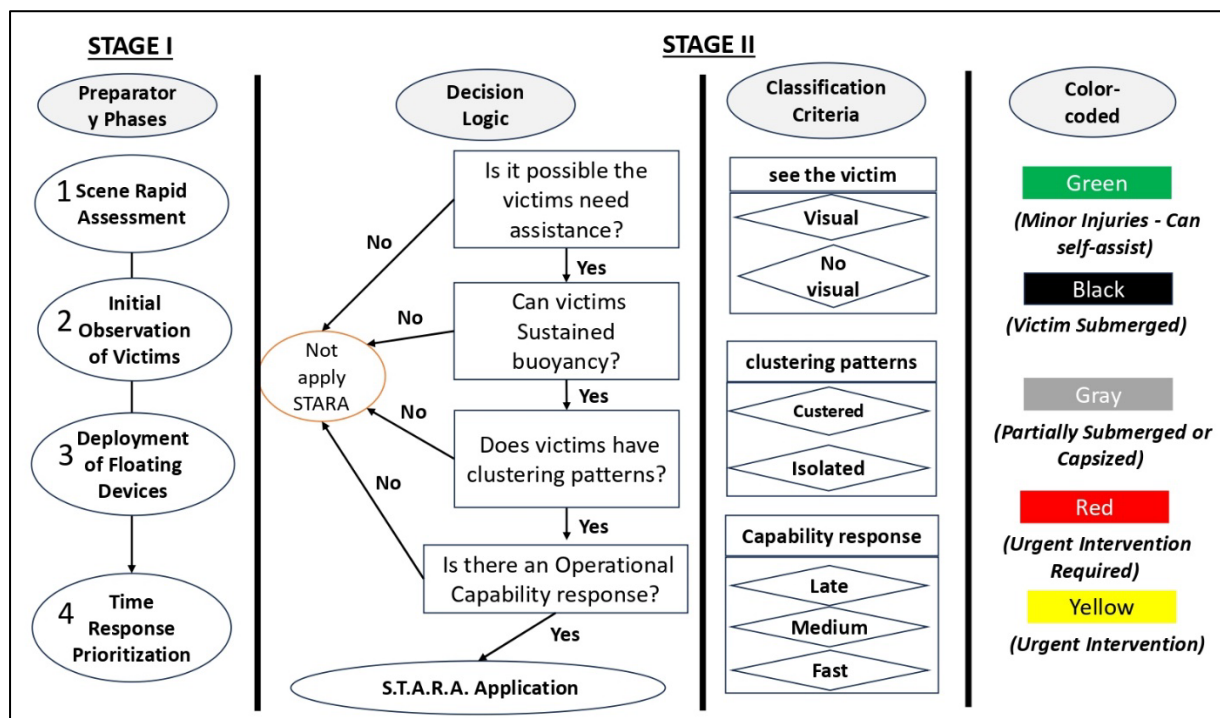


Figure 1: Design conceptual modeling of the STARA protocol

The main limitation identified concerns the absence of real empirical trials. The data does not replace controlled operational validation, then it is a conceptual proposal. Details, the STARA stages are more looking if composed of two main divisions: before and after the call for help. Regardless of the actions, Stage I is executed with the preparation of the place by a professional and the execution of the routine. It includes making a note of the observed scene, looking for potential peoples, prioritizing resources, and facilitating time responsiveness. For Stage II, after the call for help, occur application of the protocol occurs, and Stages I and II together. To learn to understand the stages after a distress call.

STARA Stage I – Preparatory Phase (before)

STARA consists of four preparatory phases. These are: (1) Scene Rapid Assessment (SRA); (2) Initial Observation of Victim (IOV); (3) Deployment of Flotation Device (DFD); and (4) Time Response

Prioritization (TRP). **Figure 1** illustrate the phases. The first step consists of a quick assessment of the scene. It involves a perception of the profile of victims. Figure 2 exemplifying the sea, beach, and the profile of swimmers and bathers. The professional must have active access to the operational area, a Strategic Positioning, an Environmental Analysis, and a Zone Delimitation, in which the rescuer defines a Responsibility Limit Zone (ZLR). The ZLR for MVI is an imaginary line that divides hazards into primary and secondary or surf zone (ZI), as Castelle et al. (2018) define. Primary requires rapid action by the responder; secondary requires slightly more elaborate planning, with other forces or recurs assisting. Another case, for example, a shipwreck, ZLR is within a radius of 15 to 45 meters from the vessel. In the next phase, rescuers begin to outline coordinated actions to act in prevention or rescue processes. The professional has active access to the operational area, with knowledge of the currents, channels, and profile of swimmers. In summary, the stage consists of the rescuer's perception of potential victims when observing from a distance. The next step consists of initially observing victims, if in groups or concentrated, and rescuers' perception of potential victims when observing from a distance. Try to understand the groups of people and whether they are grouped in pairs, threes, or fours. Note how many groups there are. This occurs through the analysis of the behavioral profile of potential victims, by characteristics or competence of their swimming and patterns of engagement in the water. In this situation, a mechanism of continuous assessment by visual tracking and activation of progressive response is necessary, since the assessment of the threat of drowning is in real time. The third phase involves Deployment of floating devices. Flotation Equipment Strategy for emergency response, where the provision of floating equipment is coordinated to reach more victims with less equipment. It must be prepositioned at strategic points and such flotation devices focused on response time, incident probability, and/or inserted in service units. Equipments must be allocated in a way that serves the majority of those involved. This ensures that resources are more easily accessible when intervention is necessary. (Timbie, et al., 2013). For example, on a boat, there are life jackets for the people on board. Beaches may have lifeguards carrying out prevention with boats. In an emergency, all equipment must be taken into consideration weighing the degree of risk according to the number of victims. Technological resources can also be incorporated. For example, coast of São Paulo, the Command and Special Operations Center (CCSO), a 24-hour surveillance and monitoring center, and through it, it is possible to use video surveillance of the beach to respond to the call in the event of an emergency drowning or eliminate the need for support (Botelho, 2019). The fourth stage consists of Time Response Prioritization. This phase focuses on the response to victims, through three main dimensions: distance of the rescuer for possible intervention or positioning myself, awareness of the buoyancy of the observed groups, and degree of consciousness and unconsciousness of the groups or actual buoyancy. The three dimensions affect the ability to save lives by the time responders.

STARA II Stages – Status Assessment Phases (after)

This stage involves the application of the protocol itself. The concept is widely applied in disasters related to victims of various types of drowning. The responder must have started Stage I, and make a logical drawing, asking: Is it possible the victims need assistance? If yes, Can victims sustained bourancy? If yes, Do victims have a cluster pattern? If yes, Is there an Operational capability response?

If yes, STARA Apply. If no in anywhere, not STARA Apply. After, the rescuer observes the Classification criteria. See the victims? visual or no-visual; See Clustering patterns? Clustered or isolated; Capability response? Late, medium and fast. Then it is possible to Structural System in the mind during the movement to the victims. Within, argue the Need for Assistance (NA). NA allows the rescuer to continually monitor victim groups, recognizing that they remain in a state of struggle, dealing with the lingering physiological and psychological effects of the incident, oscillating between resilience and vulnerability. When NA is "no" and "Isolated", the rescuer imagines that the victim can save himself.

After, Aquatic competence (AC) refers a situation where the rescuers have visual or no-visual of victims, based on the isolation pattern or clustering Pattern (CP). If there is no visual, there is no reason to search for the victim. If there is visual and the victim is alone or in a group, this provides the simultaneous understanding of next idea, which is Sustained Buoyancy (SB). SB refers to the active floating capacity of the victim(s) and a certain level of swimming ability. The actual buoyancy that the victim(s) have keeps them floating in the water and serves to alleviate immediate suffering until help arrives. In other words, it is a question of whether or not the victim has aquatic competence to survive. After, the Grouping Pattern (GP) refers to the dynamics or spatial organization of victims during an Adverse Drowning Event (AEA). This pattern is related to the emergent self-organization among drowning victims, highlighting social and individual needs in the context of providing mutual assistance - "clustered" or "isolated". To this end, throughout the process, rescuers continuously monitor victims to recognize whether they remain in a state of struggle and whether victims should be grouped. It is worth noting that the group's survival capacity creates collective resilience through shared situational understanding and temporary bonds (Erfurth et. al., 2021).

Finally, Response Capacity (RC), which refers to the operational factor of the rescuer, not in relation to the victim, but rather to the rescuer. Through it, a multidimensional construct is constituted that encompasses the operational skills of the rescuer during aquatic emergencies. The professional or team must be fully aware of their own ability, efficiency, and readiness to respond. It has four components: a) response capacity; b) readiness; c) speed; and d) training.

Response Capacity - involves the ability to organize, plan and execute the necessary and available resources at the work site (Liu, Z., & Tian, H., 2025). *Readiness* - refers organization's ability to keep professionals positioned or ready to act in emergency situations. It stands out in situations involving professionals at strategic points or situations involving boats in matrix support (White, 2012). *Speed* - is related to the real time of your response and should be understood as between 2 to 4 minutes for fast time, 4 to 6 minutes for medium time, and more than 6 minutes for late time (Pellicioni, 2014). *Training* - refers to the professional's performance training in the face of the impositions that the organization orders or to which professionals are subject. It is up to the professional to align their own well-being, their physical, mental and intellectual health to respond to emergencies in different critical scenarios as a first responder (Rooke, A., & de Terte, I., 2024). It is clear that all actions are closely related to technical preparation, and based on the interval between the rescuer's visualization and arrival at the victim's position. And, when aiming at performance, the color-coded triage system was created in order to bring efficiency to the emergency response, with the aim of ensuring that victims receive fast, efficient and humane care (FEMA, 2021).

Color-coded sorting systems

As previously reported, current ground casualty triage methods employ color-coding as a mechanism to facilitate impact for the incident (Benson, Koenig & Schultz, 1996). Although Color is personal and subjective, the use of color as a visual guide determines the appropriate course of action and increases the efficiency and clarity of the response. It is used for situational and behavioral analysis. FEMA highlights that color-based systems not only speed up the processing for rescue victims but also maximize survival rates (FEMA, 2021) and can be used in aquatic environments. Is a universal communication that allows the severity of each victim's condition to be recognized and the rescuer to quickly assess the scene. The process occurs dynamically and responders are guided by decision-making (visual processing of ≤ 3 seconds) and by optimizing the priority sequencing of the entire response process (De Medeiros Dantas, et. al., 2022). In STARA, the victim's status is organized into five priority categories, represented by the colors Red, Yellow, Green, Gray and Black. Based in START by (Benson, Koenig & Schultz, 1996), category Green (Priority One) is a stable condition with a high probability of survival. Victims demonstrate excellent swimming ability. They are close to safety and show no signs of distress. They are able to escape the danger zone without immediate assistance. Others who require rapid support are instinctive fighters. For example, an individual or group of experienced amateur swimmers in areas far from the surf zone who are successfully escaping the area. Category Yellow (Priority Two) is a moderate condition requiring assistance. Victims have noticeable difficulty swimming, remain conscious, and maintain basic water skills. They may be isolated, but mobile victims require immediate assistance. If not rescued, they should await rescue, especially in isolated cases. In groups, mutual support may allow continued floating. Evidence of a level of cooperation allows delayed intervention in some cases. For example, one person or a group in deep water helping each other stay afloat. Category Red (Priority Three) is the critical state with risk of drowning. Although victims are grouped together, they are actively drowning, with severe difficulty in staying afloat and ineffective mutual assistance. Urgent, rapid/medium intervention by a rescuer is required. Alternate between submersion and attempts to keep the head above water. Immediate rescue is required due to compromised buoyancy and uncoordinated movements. There is clear motor disorganization among them. The risk is compounded by the fact that one victim may involuntarily pull others underwater. For example, victims clinging to each other while repeatedly submerging.

As previously reported, Color action and increases the efficiency and clarity of the response, and current ground casualty triage methods employ color-coding as a mechanism to facilitate impact for the incident (Caroline, 1992); (Benson, Koenig & Schultz, 1996); (Romig, 2002); (Lerner, Schwartz, & Coule , 2008); (Hickey, 2012); (Hansen, 2012); (Matthews, Andonaco & Adans, 2014).

The Gray Category (Reduced Priority) is the Critical State with life-threatening conditions, since victims are found face down, without motor activity and with their face submerged. It represents an extreme emergency with imminent risk to life, requiring immediate intervention and advanced life support. Entangled victims may be considered. For example, victims lying face down in the water. There may be respiratory arrest in these cases, without motor activity. The Black Category (Priority Zero) is when the victim is not visually located or initially sighted, with visual loss after contact with water, or victims

lost sight of. These are cases resulting from complete submersion or based on indirect reports. This classification applies to situations with a total absence of visual reference at the time of rescue (Lerner, et al., 2011). For example, sudden submersion witnessed without return to the surface, and the last known position becomes the epicenter of the search. By combining the color-coded sorting systems and Status Assessment Phases, we can create a flowchart for a quick explanation of the method. **Figure 2** illustrates the application of the phases of assessing the condition of the victims and the application of the color system by STARA Protocol Structural.

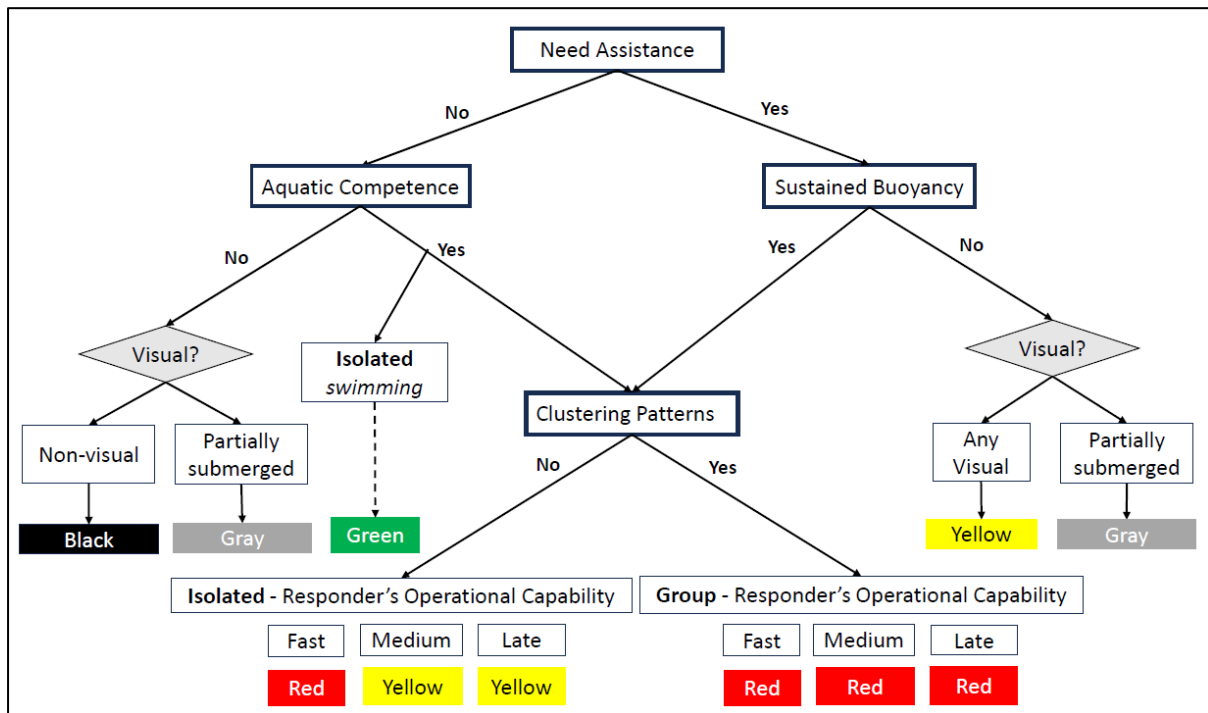


Figure 2: STARA Protocol Structural

Considerations about the Protocol

STARA relies on the integration of theory and practice, mainly for its adaptability to dynamic variations, taken from other methods. Applicability of the STARA method must be through an intuitive decision-making flowchart designed for high-pressure and complex situations. By understanding and memorizing, and training, the logic of the flowchart guides responders step-by-step, for a better rescue. As described in **Figure 1**, the construction of the STARA protocol resulted in a systematization divided into four preparatory phases preceding the method. Rescuer identifies the degree of urgency based on visual and assessments, and uses STARA as tool for fast and efficient decision-making in complex situations, which enhances the emergency operations. As mentioned, its application is based on prioritizing care according to the severity of the situation (group or isolated) and the probability of survival of the victims (Sustained Buoyancy). It uses the final categorization of the color system, such as green, yellow, red, gray, and black. Potential for diverse applications, which can be on beaches, dams, shipwrecks, and even flooded urban settings. Something that differs from protocols already consolidated in the academic and professional environment is incorporates innovative concepts, such as the need for intervention, Aquatic competence, Sustained Buoyancy, and clustering Pattern analysis

assessment. Highlighting that the model does not substitute the START, whose application in aquatic environments still presents limitations (Benson, Koenig and Schultz, 1996).

Practical Application

Two simulated in MCI-AqE scenarios are presented. These examples are based on situations frequently faced by rescue teams and demonstrate how the application of the protocol can guide quick and effective decisions.

Scenario 1 – Urban beach on the weekend

Situation: Sunday, 2pm, urban beach with a large flow of bathers. A group of 7 teenagers is swept away by a rip current. The rescuer identifies from a distance three victims actively struggling, close to each other, and another two trying to swim far away from each other out of the danger zone.

Preparatory acts: Stage I had been prepared because the Lifeguard was already close to the scene.

STARA application: the rescuer approaches the scene, and the victims are observed. First, triaged with a quick response time (1 to 2 min); Equipment is deployed directly with the entry of three floats into the area of greatest risk. There are three victims with loss-visible of buoyancy and grouped together (Red Category), and two others are swimming approximately 10 meters away (Yellow Category). Target red victims. Second, providing immediate support for the yellow victims who can await secondary rescue or wait for the priority of response.

Decision principle: The decision was based on the grouping and the observed buoyancy rate to rescue of victims.

Scenario 2 – Urban flooding with multiple victims

Situation: Monday, 14pm, A Flood suddenly hits a riverside neighborhood as least 12 people seen on rooftops, others on improvised buoys.

Preparatory acts: Operations Center relaying information and moving teams.

STARA application: Phase I in action. Team observes the scene from a high point. The professionals end up knowing the location and identifying victims. Get driving floating equipment to the scene. Organizing themselves in priority of action according to the ZLR. First, the condition out of the Responsibility Limit Zone (ZLR) imposed by the team commander serves as a base for the rescue of victims. Observation of the victim group. Three adults centered on a buoy with their feet in the water (Red Category). Conscious adults and children organized in groups on the roof (Red Category). The other five are near the security area in a backwater area (Yellow Category). Two children visibly capsized, partially submerged (Gray Category). Second, there must be a request for immediate support for every victims. Third, A main responder observes the victims who can be removed. Another focuses on the equipment to be used, such as rafts, floats, and life jackets for everyone. Team A focuses on deploying equipment whose essence is on the victims with the buoy and those on the roof. The response priority, in which Red Victims are triaged with a quick response time (2 to 4 min) because the risk of being swept away is high. Team B Yellow victims. Removal with use of the equipment to accommodate everyone. Finally, after everyone has been removed, the focus is on capsized victims or victims missing in the water, with emergency diving teams.

Decision principle: The team is directed to the victims categorized as red. The decision was based on the grouping and risk of death due to the current carrying the buoy to another point that is distant. And the second team prioritizes the rescue of the largest number of victims from the roof. After, the victims were categorized as yellow. People groups in a backwater area. Subsequently, after removing all the living victims, start being guided by radio and a response strategy focused on the search for victims capsized or missing in waters, categorized as gray or black.

Expected results

The practical application of the STARA protocol was illustrated through two simulated scenarios, one involving an incident on an urban beach and the other in a flooded area.

In both cases, the rescuers approached the scene and began the triage of the victims by STARA. In case two there was a preparation of Phase I on-site.

In the first scenario, adolescents are at risk of drowning due to rip currents. The buoyancy assessment allowed the identification of victims actively struggling and at imminent risk (rapid response and red category as priority). Others as the presence of isolated victims, conscious, and visual were categorized as yellow priority.

In the second scenario, an urban flood that exposes multiple victims on rooftops and floating objects. The triage observed the formation of spontaneous groups. The first was on a buoy, potentially exhausted, at risk of being swept away by the current. These were categorized as immediate priority, red. The second, those kept on the rooftop and isolated, at risk of the building collapsing or worsening the flood situation, were categorized as immediate priority (red). Others were categorized yellow.

Finally, partially submerged children were categorized as gray. These require action after the rescue of the living or the use of an emergency diving team (additional team activated via radio).

In both contexts, the responders applied core tasks of the STARA protocol. Assessing observable buoyancy (yes/no), identifying clusters (yes/no), and determining response capacity based on estimated time to intervention (fast, medium, or late).

Then, prioritization decisions can be guided by a logical flowchart coded by clusters, which allows victims to be quickly categorized according to risk. Action based on this protocol demonstrated the potential to increase the efficiency of visual tracking and direct available resources to victims, minimizing the risk of death by drowning.

Conclusion

Currently, operations involving MCI-AqE face four main challenges, namely accurate assessment of victims, professional performance in the field, availability of flotation equipment, and prioritization of response time. The gap in standardized protocols in the context of incidents involving multiple victims makes it difficult to implement effective and practical actions at the aquatic scene. Therefore, STARA emerges as a new perspective on triage in MCI-AqE responding to a specific gap in life-saving practices. By considering factors such as buoyancy, equipment, and response time, STARA enhances the decision-making capacity of first responders in critical situations, where seconds define individuals'

lives. Rapid categorization of victims using color-coded systems and objective urgency criteria, with a focus on increasing the effectiveness of rescue efforts while mitigating the psychological impact on victims, families, and rescuers, has a particular impact on reducing the risk of emotional distress. Include the emotional distress and this reduction of cognitive load and uncertainty can mitigate the psychological impact of chaotic events. This help visual behavioral analysis of rescuers supporting post-traumatic stress disorder (PTSD) prevention among rescue personnel and promoting a healthier, more resilient emergency workforce.

Future Research

Encourage researchers, educational institutions, and rescue agencies to test, adapt, and improve STARA protocol. In order to ensure that faster and more efficient rescues can result from the collaboration between theory and practice, so that lives can be saved , we suggest that future research explore the integration of STARA with surveillance and tracking technologies, as well as its impact on response times and victim survival rates. Furthermore, there is a need for empirical validation of the model. Therefore, new on-site applications are recommended in order to evaluate the adaptability of the protocol. Variables such as distances, environmental conditions and resource allocation can be observed. Future research and effective interventions, aligned with international experience, promote significant advances, then the STARA can strengthen as a significant protocol in the management of aquatic emergency response systems. The theoretical construction and conceptual modeling presented in this article provide a solid basis. The STARA proposal goes beyond its potential application in the aquatic environment, making it an invitation to create responsive, intuitive and adaptable systems to the new emergencies of the 21st century.

Limitations

The S.T.A.R.A. protocol remains at a conceptual and theoretical stage. Although its design was informed by international literature and practical experience of rescue professionals, it has not yet undergone formal empirical validation or testing in real-world scenarios with actual victims. The current evidence derives mainly from simulations with firefighter school trainees and controlled training exercises, which provide only preliminary feasibility insights. In the comparative analysis with established protocols such as START (Benson, Koenig & Schultz, 1996) and the Brazilian SOBRASA models (Oliveira et al., 2017), the START remains the international reference for land-based triage but requires direct access to victims and vital signs, which is not feasible in water environments, and the protocol by Oliveira et al. (2017) provides a national perspective on aquatic rescue but does not emphasize standardized triage or reduced response time. The STARA aims to complement these approaches by adapting their principles to aquatic scenarios, filling an identified operational gap. However, until STARA is validated with empirical data, its comparative advantages remain hypothetical. Field studies in different aquatic settings and collaboration with international agencies should be necessary to confirm its reliability, safety, and adaptability under real conditions. This lack of operational validation introduces potential biases in the assessment of its effectiveness and applicability. Any

conclusions about its impact on response times, victim outcomes, and rescuer safety should be interpreted with caution. This protocol should be viewed as an initial proposal, a structured model, rather than as a validated or definitive standard for aquatic mass casualty triage.

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ABOUT THE AUTHOR

Alexandre Angelin is a PhD candidate in Public Health at the University of Campinas (UNICAMP), Brazil. His research focuses on occupational mental health, post-traumatic stress disorder (PTSD), and suicide prevention, specifically among emergency responders such as firefighters and police officers. He is currently developing and implementing a pilot project on MCI-AqE at São Paulo Firefighters College, Brazil, combining theoretical models with practical field strategies to improve emergency response outcomes. For correspondence, please contact the Department of Epidemiology, School of Medical Sciences, University of Campinas, São Paulo, Brazil; SP or mail: Phone: +55 16 9963 0303. Email address: alexandreangelin@yahoo.com.br; alexandreangelin@policiamilitar.sp.gov.br a271295@dac.unicamp.br.

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