

**Pennsylvania Triage Program Demonstrates Profound Inconsistencies  
of Current Protocols and Advantages of the Sacco Triage Method**

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ThinkSharp, Inc.  
Rock Spring Road  
Bel Air, MD 21014  
[www.sharpthinkers.com](http://www.sharpthinkers.com)

Contact Information:

Mick Navin  
President  
ThinkSharp, Inc.  
410-893-5338  
[mick@sharpthinkers.com](mailto:mick@sharpthinkers.com)

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## **BACKGROUND**

In late summer of 2002, the Pennsylvania EMS and emergency medical directors met with Dr. Bill Sacco and his ThinkSharp colleagues to learn about his breakthrough evidence-based triage and resource management system, which explicitly maximizes the savings of lives in resource constrained triage situations. The Pennsylvania EMS and emergency medical directors were very interested because of Dr. Sacco's research and methodology, which identified medical concerns within current protocols and substantial life saving potential under the new system.

Since the initial meeting, Dr. Sacco and his ThinkSharp colleagues have met with the Pennsylvania Regional EMS directors, the state medical advisory committee, a representative from the Pennsylvania Emergency Management Agency (PEMA) and with the Emergency Services Office of the Pennsylvania Department of Health (DOH). They have participated in two exercises in Pennsylvania, shared their research data with the state emergency medical director and worked with two Pennsylvania hospitals interested in conducting related research and in planning demonstrations of STM. As a result of those meetings, a number of EMS Regions have expressed interest in piloting STM. In anticipation of piloting this program, the DOH has authorized ThinkSharp to conduct demonstration programs in six regions across the state. The DOH Notice for this program, attached in Appendix A, identifies two primary goals for a pilot:

1. Provide Pennsylvania citizens with an emergency preparedness system that increases survivors in natural and man-made disasters; that is, to save lives.
2. Enable EMS practitioner evaluation of a new triage system to determine implementation considerations.

Subsequently, the Pennsylvania Department of Health granted continuing education credits for all regions and the emergency responders who participated in the program.

## **THE STUDY**

ThinkSharp conducted a Mass Casualty Table Top Exercise in ten sessions across six EMS Regions in Pennsylvania representing 29 counties. Two hundred and seventy nine EMS responders participated and included First Responders, EMT Basics, Paramedics, RNs, Emergency Physicians and a few Regional and state-level EMS policy makers. The Table Top exercises used Victim Profile Cards to summarize the physiology and visual injuries of 45 victims. Teams of three to five people were formed, and a series of interactive and timed sessions were held to establish triage performance under current protocols, and post-training performance under the STM. The four-hour session included seven activities:

- Tabletop Victim “Tagging” Exercise (timed)
- Tabletop Triage Strategy Exercise (timed)
- Discussion
  - Criteria Used in Triage
  - Results of Tagging of Victims and Top Ten Priority Victims
- Formal Review of START and variations and Overview of the STM
- R, P and M Scoring Drill and Assessment using Online Training System (graded)
- Tabletop Sacco Triage Method Exercise (timed)
- Software Demonstration

ThinkSharp trainers concluded the exercises by asking what participants learned, if participants were surprised by any outcomes, and whether participants were interested in piloting this program.

## CONCLUSIONS

Application of existing protocols is inconsistent within each region, and across all regions. Some EMS personnel lack confidence in the protocols even when highly trained, relying more on their experience and “gut feel” in making triage decisions. The inconsistency in the resulting triage strategy is extraordinary. A comparison of each group’s top ten victims for transport and treatment suggest an almost random selection. In each session, none of the top ten lists had more than a single common victim among its teams, and a victim identified as being the first to leave the scene by one team, was often selected last by another team. The level of inconsistency surprised many participants, but others said this was expected. Discussions indicated that many other factors are considered by experienced EMS personnel in making triage decisions in the field, but these are done subjectively and inconsistently. These factors were recorded, and revisited during discussions of the Sacco Method.

In contrast to existing protocols, the Sacco Score was consistently viewed as simple and precise to compute in the field. Participants were tested capable of computing the score with minimal training using either a prototype mechanical scorecard or a simple display of the scoring rules. The tabletop using the Sacco Score was objective, and the score was consistently applied across all groups and all sessions. The routine use of the Sacco Score seemed to be well received and embraced by most participants, as was the concept of grouping victims during an MCI by score, and thus by survival probability ranges. The STM software was shown to explicitly address the issues that are subjectively considered when making triage decisions at a mass or multiple casualty scene, and the speed and flexibility of the software impressed nearly all. A few individuals seemed resistant to technology however, and expressed operational concerns regarding running software during the chaos of an MCI. They cited the lack of central dispatch or incident command or effective communication. Most however seemed supportive and enthusiastic regarding the technology. Rule-based triage was mentioned and supported as an alternative in rural settings, but implementation details were not provided.

All regions seem interested in piloting the Sacco Method. The decision to pilot seemed to be a “no-brainer” due to the inconsistency of current protocols, the operational advantages of the routine use of the Sacco Score and Sacco Method, and the life-saving increases during MCIs. The Sacco Score was found to be easy to implement, and shown to overcome the inconsistencies of current protocols. Computing the Sacco Score routinely on all trauma victims for outcome tracking purposes, originally suggested by Commonwealth EMS Medical Director Dr. Douglas Kupas, was embraced by participants as a way to improve EMS performance. The routine use of the Sacco Score also most assuredly enhances mass casualty preparedness. EMS personnel will quickly achieve a working mastery and will apply the same method during a mass casualty incident. Finally, STM’s ability to increase the number of survivors, while not a focus of this study, was nonetheless regarded by most participants as a tremendous advantage that must be pursued. Talks regarding pilots are ongoing with all participating regions.

Specific conclusions and data support are provided below on current mass casualty preparedness, and the Sacco Method. The first section provides feedback across regions. Final sections of this report includes data and discussion by region.

### **Problems with Current Preparedness**

Emergency Responders appear to be ill-prepared in current mass casualty protocol.

The initial table-top exercise required participants to use their current protocol to tag victims with Red, Yellow, Green and Black tags. While many regions have objective criteria for making tagging decisions, most of the 70 teams based their decisions at least in part on subjective, and sometimes lengthy discussion and debate. This subjectivity manifested itself in two ways: in the variability in the outcome of the tagging, and the variability in the time it took to determine the tagging.

1. The number of victims tagged with each color varied widely within regions, and across regions. None had any consistency in tagging. This is presented in detail later by region and is summarized in table 1. As you can see, the number of Red Tag victims -- those identified as top priority for transport and treatment -- ranged from 4 to 44 out of 45 victims. All categories showed wide variation.

Table 1. Tagging Summary by region

Region (teams)	Red	Yellow	Green	Black
Region 1 (11)	10 - 40	2 - 15	3 - 19	0 - 17
Region 2 (3)	10 - 20	7 - 20	1 - 10	3 - 10
Region 3 (13)	7 - 40	4 - 20	0 - 11	0 - 13
Region 4 (19)	4 - 44	1 - 20	0 - 29	0 - 13
Region 5 (19)	6 - 22	7 - 19	7 - 22	0 - 11
Region 6 (5)	13 - 26	13 - 18	3 - 11	0 - 11
<b>Overall Range</b>	<b>4 to 44</b>	<b>1 to 20</b>	<b>0 to 29</b>	<b>0 to 17</b>

It is interesting to note that Region 6 was one of the more consistent regions, yet they have not had any mass casualty training, nor implemented a mass casualty protocol.

2. The time to tag the 45 victims was highly variable within all regions, and across all teams within each region. This was due to the subjective discussions within the groups.

Table 2. Time to Tag by Region

<b>Region (teams)</b>	<b>Min.</b>
Region 1 (11)	10 - 41
Region 2 (3)	14 - 30
Region 3 (13)	22 - 41
Region 4 (19)	7 - 42
Region 5 (19)	17 - 51
Region 6 (5)	9 - 42
<b>Overall Range</b>	<b>7 to 51</b>

Since all data was displayed on the victim profiles, the time needed to tag all 45 victims based on the standard START protocol, or variations as used within each region, should have been less than 15 minutes if only one participant was scoring them, and much less if profiles were distributed among the team (as was often done).

Triage Priorities Suggest an almost Random Selection of Victims for Transport and Treatment

After tagging the victims, participants sorted them by priority for transport and treatment. A comparison of the top ten victims across the teams within each region, and across regions, indicated an almost random selection of victims and a complete lack of consistency. In some cases this was extreme as a victim deemed a first priority by one team, was selected as the last priority by another team within the same region. At Region 2 for example and as shown in Table 3, victim 30 was selected first by team one, forty-fifth by team two, and forty-fourth by team three. Victim 22 was chosen as the top priority by team two, and the forty-fifth priority of teams 1 and 3. In fact, every victim that appears as one of the three lowest priorities for one team also appears as a top ten priority for another team. The implications are astounding. As a victim, get the right triager and go immediately to the hospital and likely live. Get the wrong triager, wait on scene, and you will likely die. This situation was observed at every region, not just Region 2.

Table 3. Region 2 Priority Victims for Transport and Treatment – Top 10 and last 3.

Region 2	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	...	43rd	44th	45th
Team 1	22	20	27	1	21	44	5	19	42	16		2	17	30
Team 2	30	44	1	11	13	23	45	18	39	29		2	20	22
Team 3	1	2	16	18	4	17	31	9	45	3		21	22	30

The top ten list of all teams is shown later in the regional report section. What can't be seen from these lists, but was occasionally observed, was the teams' tendency to disregard tag color when determining priority. Discussions also included suggestions that additional colors were needed to refine the prioritization. Colors such as "orange," "really red," and "yellow-green" were suggested in a tongue-in-cheek manner. One fireman from Region 2 who participated in the Region 3 sessions characterized the dilemma of prioritizing tagged victims as "there are reds, and there are REDS!"

Participants said they expected variability in the selection of the top ten, but a majority were shocked at the level of variability.

#### The Time to Establish Triage Priority Illustrates Subjectivity of Current Protocols

The process of prioritizing victims for transport and treatment was observed, in most cases, to be subjective. Formal guidelines within existing protocols of how to differentiate within a tag color do not exist. Most tend to suggest a worst-first triage strategy. The lack of decision support is illustrated by the variability of the amount of time it took to establish the triage order.

Table 4. Time to Determine Triage Strategy Using Current Protocol

<b>Region (teams)</b>	<b>Min.</b>
Region 1 (11)	9 - 23
Region 2 (3)	12 - 25
Region 3 (13)	8 - 70
Region 4 (19)	3 - 21
Region 5 (19)	8 - 35
Region 6 (5)	24 - 65
<b>Overall Range</b>	<b>3 to 70</b>

Note that a team in region 4 prioritized victims in 3 minutes. This was unusually quick, but was accomplished by simply recording the victim numbers of the sorted tags, placing red first, then yellow, then green, then black. They did not sort within a color. This is consistent with START protocol, but not consistent with the subjective ordering within Reds that occurs during field triage.

“Other Factors” Cited as Necessary Considerations When Setting Triage Priority.

After setting the triage strategy, participants stated that they consider other factors during an actual triage situation. The list of factors cited by participants was predominantly consistent across all sessions. Participants said that field triage is based on the experience of the triage and transport officers at the scene who consider many factors:

- type of trauma
- age of victims
- number of transport and treatment resources available
- type and proximity of treatment facilities
- access/egress characteristics (i.e. processing capacity) of scene
- potential that victim will survive, also mentioned as “prognosis” or “fixable”
- cycle time of ambulances to the scene
- weather (for helicopter transport)

Participants acknowledged that these further complicate field triage decision making, and expressed doubt that any protocol could consider these. We left the lists on the board in anticipation of coming discussions on the Sacco Triage Method, and showed during these discussions how the model explicitly considers most of these factors, and how the survival probability implicitly considers the rest.

**SACCO METHOD SUPPORTED AND READILY IMPLEMENTED**

Sacco Score Embraced by Participants

The Sacco Score seemed highly acceptable. Participants accepted ThinkSharp’s research that the score based on respirations, pulse and motor response (RPM) is a good predictor of survivability (with one exception<sup>1</sup>). They seemed to appreciate the impact that routine use of the Sacco Score and subsequent tracking of patient outcomes might have on improving emergency medicine. They also enthusiastically endorsed the survivability-based grouping of victims at the scene of a Mass Casualty Incident (MCI):

<u>Score Groups</u>	<u>Survival Probability</u>
0 – 4	less than 35%
5 – 8	between 49% and 85%
9 – 12	greater than 90%

Participants saw treatment advantages to these groupings and stated this would lead to more effective allocation of scene resources. For example, the first group is likely to

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<sup>1</sup> A trauma surgeon from a rural hospital expressed concern that the Pennsylvania Trauma Foundation Database was skewed toward conditions in Philadelphia and Pittsburgh and would not accurately represent the rest of the state. In response, we will make comparisons of rural data against statewide data to validate correlations, or to show a need for regional adjustments in those correlations. In either case, the methodology is still valid. In fact, this highlights the advantage of evidenced-based triage as we can continually improve the method through data analysis and performance measurement.

deteriorate rapidly if not treated immediately. The second group is probably the most volatile as they are more savable if they receive treatment before they deteriorate, but they are susceptible to falling. The third group would be expected to retain a high survival rate as initial deterioration will be slow. These groupings enable targeted medical attention. (Note that this grouping by survival probability does not define the triage strategy. The Sacco Method, which maximizes survivors, can only define the triage strategy in explicit consideration of resources. The grouping is used solely to organize victims at the scene, and has the added benefit of enabling targeted medical attention by survival probability.)

A few participants were interested in seeing the research underlying the Sacco Method, most notably the data that generates survival probability. They seemed to be satisfied that the analysis is soon to be published, and also that the Commonwealth EMS Medical Director, Dr. Douglas Kupas, has actively reviewed our process and data analysis.

Participants also felt comfortable using the Sacco Score. Two classroom assessments on the Sacco Score and a timed exercise indicated that the Score is easy to learn, readily implemented and provides an objective methodology.

Testing Indicates an Easy Transition to Sacco Score

Participants were given two assessments, and both indicate that the Sacco Score can be readily implemented, with pointed training. The first test was a classroom delivered version of ThinkSharp’s online computer-based training system that simulated computing the respiratory rate, pulse, and motor response. This was more a test of the online training technology than of participants’ ability to observe pulse, respirations and motor response. While these results are invaluable to ThinkSharp, they are not germane to and even somewhat distracting from the primary findings of this report. As such, they are excluded from distribution outside of Pennsylvania, but can be made available upon request. The second test measured participants’ ability to compute the Sacco Score from the measures. These results are provided below.

*Sacco Score is Easy to Compute with Minimal Training*

The final assessment was a timed exercise. Participants had to score all 45 victims using the Sacco Score. Teams were given prototypes of the mechanical scoring device that will support use in the field, and also a table of the rules for computing the Sacco Score:

Table 5. Sacco Score Computation

<b>Coded Value</b>	0	1	2	3	4
R (breaths per 15 sec)	0	1 or 2	9 or more	7 or 8	3 - 6
P (beats per 15 sec)	0	1 - 10	11 - 15	More than 30	16 - 30
M (motor response)	none	Ext/flex	Withdraws From pain	Localizes pain	Obeys commands



Groups could use the mechanical scoring device, the table, or both. It was interesting to note that there was no significant difference in speed or accuracy between the two methods<sup>2</sup>, although there was a split in preference.

As shown on Table 6, even with minimal training, 59 of 68 teams who turned in their results had at least 40 correct out of 45. The detailed regional results show that 20 teams were 100% correct, and 23 teams had only one or two wrong. The average score was 42.5, an accuracy rate of 94%. Only 8 teams scored less than 40.

Table 6. Sacco Scoring Accuracy in 45 Victim MCI exercise

<b>Region (teams)</b>	<b>Range of Correct (45 max)</b>	<b>Fraction of Teams with at least 40 correct</b>
Region 1 (11)	35 - 45	8/10
Region 2 (3)	42 - 45	3/3
Region 3 (13)	42 - 45	13/13
Region 4 (19)	37 - 45	16/18
Region 5 (19)	34 - 45	15/19
Region 6 (5)	36 - 45	4/5
<b>Overall Range  Sum</b>	<b>34 to 45</b>	<b>59/68</b>

### Consistency in Computation Time of Sacco Score Illustrates Objectivity in Process

The scoring of 45 victims was a timed exercise. In contrast to tagging, there was little, if any, discussion and debate as participants focused exclusively on the physiological measures. The time to compute the Sacco Score is summarized in Table 7, and detailed within the regional reports. As shown, the distribution of times to compute the Sacco Score was much more tightly grouped than the time to tag. Times ranged from 6 to 21 minutes, versus 7 to 51 minutes for tagging. Additionally, 85% of teams completed the Sacco Scoring in 18 minutes or less, while only 18% of teams tagged victims that fast.

Table 7. Summary of Time-to-Tag and Time-to-Compute Sacco Score

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<sup>2</sup> Exception: two of the rough prototype devices at REGION 1 -- the first demonstration site -- were faulty and led to erroneous errors.

<b>Region (teams)</b>	<b>Tag (Min)</b>	<b>SACCO Score (Min)</b>
Region 1 (11)	10 - 41	12 – 21
Region 2 (3)	14 - 30	10 – 13
Region 3 (13)	22 - 41	11 – 19
Region 4 (19)	7 - 42	6 – 15
Region 5 (19)	17 - 51	9 - 21
Region 6 (5)	9 - 42	9 - 18
<b>Overall Range</b>	<b>7 to 51</b>	<b>6 - 21</b>

ThinkSharp also measured the time it took participants to determine the triage strategy, after they tagged the victims. This ranged from 3 to 71 minutes across all regions. In comparing current protocol to the Sacco Method, this time could have been added to the tagging time. During an actual incident however, the triage officer does not attempt to determine the best order for triage across all victims, he only sets priorities one at a time.

#### SACCO Model Software and Implementation Met with Guarded Enthusiasm

A demo was provided of the STM software. Set-up was shown to take less than five minutes for most regions, and scene inputs were shown to take less than 60 seconds. Participants seemed awestruck that a computer model could consider all of the factors they identified as critical in making triage decisions at an MCI (see “Other Factors...”), and determine the optimal triage strategy in only a few seconds. They seemed impressed that the patient loads are balanced among treatment facilities, and liked the flexibility that field changes could be quickly accommodated by the model. The software performance went unquestioned, but operational issues were raised. Regions without incident command centers or centralized dispatch did not see how the software could be accessed. Others expressed concern over the reliability of communication with central dispatch during a crisis. Both of these are valid concerns. A few individuals were skeptical of relying on technology, while most felt technology was inevitable and expected it to become a larger part of EMS.

There were two responses expressed regarding these concerns. First, the software cannot fix “system” problems. If communication fails during an MCI, or if the infrastructure of the emergency medical system does not provide a central point of control or central point of dispatch, then the software cannot be utilized effectively in its current form. Second, a rule-based implementation is an alternative to the software, particularly for rural applications. Rules can be provided on the Sacco Scoring Device to provide triage guidance when software is unavailable. We did not provide the rule-based protocol in the demonstration program.

## **RECOMMENDATIONS AND LESSONS LEARNED**

All regions seem interested in piloting the Sacco Method. The decision to pilot seemed to be a “no-brainer” due to the inconsistency of current protocols, the operational advantages of the routine use of the Sacco Score and Sacco Method, and the life-saving increases during MCIs. A few operational questions arose, most of which focused on “systems” issues such as communication problems or lack of central command. Based on these demonstration programs, implementation and training adjustments will be made prior to the pilots. Specifically, ThinkSharp will:

- adjust the mechanical scorecard to include the Sacco Scoring table reference for those who can and prefer to compute the score without the device.
- attempt, subject to design issues, to provide 15-second and 60-second counts on the mechanical scorecard for pulse and respiration rates. Some regions felt strongly that the device be based on a 15 second count; others were adamant that the count should be 60 seconds. Even though the latter requires them to multiply by four, “all EMS training is based on 60 second counts.”
- increase the arm size on the triage tag, make it darker, and use reflective material on the arm and circle around “12 o’clock” on the clock face for clear orientation.
- add a “decon” indication on the triage tags.
- adjust online training animations to improve respiratory and pulse assessments, and provide motor response training to differentiate alternate levels of consciousness. Classroom training will include hands-on R, P and M exercises.
- provide online assessments during all pilots to track performance and will work with regions and the Pa. State DOH to develop certification programs.
- train dispatchers to use STM software and track results during disaster drills, documenting STM communication impacts.

### **Special Thanks**

ThinkSharp would like to thank the Pennsylvania Regional EMS Executive Directors and Training Coordinators for their assistance in making this a successful program. ThinkSharp would also like to acknowledge the courage of Pennsylvania EMS Director Margaret Trimble and Commonwealth EMS Medical Director Dr. Douglas Kupas for not only allowing but encouraging a critical evaluation of EMS in Pennsylvania.

### **Pennsylvania Results Are Not Unique**

This study was conducted exclusively in six regions in Pennsylvania. Similar results were seen in small, single session studies in two other states. Those studies are not included herein.

### **Regional Reports and Data**

Brief reports are provided by region below. All data is included.

Region numbers are provided for referencing purposes only within this report and do not correspond to assigned EMS region numbers within the state.

## REGION 1

Two sessions with a total of 48 people were held in the first demonstration program. Five teams were formed in the first session; six teams in the second. Commonwealth EMS Medical Director Dr. Douglas Kupas was an observer from the DOH in the first session. The breakdown of participants, for Session 1, was as follows:

First Responders	2
EMT Basics	12
Paramedics	9
RNs	1
Physicians	1

There was not a breakdown of training levels for Session 2.

### Inconsistency in Tagging

As shown in Table 8, the tagging exercise showed wide variability. Reds ranged from 10 to 40, Yellows from 2 to 15, Greens from 3 to 19, and Black tagged victims ranged from 0 to 17. Note that Team 5 in Session 1 said they used START precisely in tagging 40 Reds. The web-site published START protocol yields about 25 Red tag victims.

Table 8. Region 1 Tagging Results

	Red	Yellow	Green	Black
Session 1 Team 1	21	15	4	5
Team 2	18	12	13	2
Team 3	21	13	7	4
Team 4	10	12	15	8
Team 5	40	2	3	0
Session 2 Team 1	32	7	5	1
Team 2	14	14	17	0
Team 3	12	8	15	10
Team 4	14	8	6	17
Team 5	19	15	11	0
Team 6	13	11	19	2
<b>Range</b>	<b>10 - 40</b>	<b>2 - 15</b>	<b>3 - 19</b>	<b>0 - 17</b>

### Variability in Triage Priorities

As shown in table 9, there was little consistency across the top ten priority victims. While a few patients (e.g. 1 and 4) appear in the majority of top ten lists and do not appear on any low priority lists, more than half of the patients shown as a “bottom three” priority also appear in the top ten lists. As an example, victim 19 appears five times as a low priority, and three as a top priority.

Table 9. Region 1 Triage Priority

Session 1	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th		43rd	44th	45th
Team 1	21	11	22	5	18	13	16	4	1	12		19	9	20
Team 2	2	16	22	42	21	1	17	44	4	13		23	19	20
Team 3	22	30	16	3	4	24	10	7	45	36		12	20	27
Team 4	11	17	12	16	43	7	31	45	1	18		21	2	19
Team 5	2	19	30	4	1	5	22	11	12	17		43	9	24
Session 2														
Team 1	19	2	21	5	13	18	22	11	4	30		43	44	45
Team 2	5	1	23	2	7	11	13	22	20	6		25	26	19
Team 3	21	11	4	30	45	16	1	24	42	6		19	20	21
Team 4	18	22	11	17	16	24	42	3	43	8		30	31	44
Team 5	7	20	4	9	12	16	19	18	11	17		23	28	34
Team 6	2	1	14	18	5	13	8	20	15	22		42	7	11

Other Criteria Used in Triage

Region 1 was not asked to detail the criteria they used for establishing patient priority. This discussion came up at Region 2 and was then held with all other regions.

Time Exercises Show Objectivity in Sacco Method

The Sacco Method was more consistent in duration across all teams, ranging from 12 to 21 minutes, as compared to 10 to 41 minutes for tagging. Team 5 of Session 1, using START precisely, took 20 minutes for tagging and 19 minutes for Sacco. The time to determine the triage priorities ranged from 9 to 23 minutes, with three missing data points. Data is provided below in Table 10.

Table 10. Region 1 Timing Summary

REGION 1 Session 1	Time to Tag	Triage Time: Current Protocol	Sacco Scoring Time
Team 1	32	22	20
Team 2	30	23	21
Team 3	18	17	15
Team 4	29	10	15
Team 5	20	12	19
REGION 1 Session 2			
Team 1	10	11	12
Team 2	40	18	14
Team 3	33	10	Missing data
Team 4	38	9	14
Team 5	26	Missing data	15
Team 6	41	Missing data	13
<b>Range</b>	<b>10 - 41</b>	<b>9 - 23</b>	<b>12 - 21</b>

### Sacco Scoring is Highly Accurate and Readily Implemented

Six of ten teams in Region 1 computed at least 42 of 45 Sacco Scores correctly. Two teams had perfect scores, and two teams had only one error. Two of the teams had surprisingly low scores of 35 and 36, and both were found to have mechanical prototype scoring devices with wheels that tended to slide too freely. This led to errors. New prototype wheels were used in all other regions. Nonetheless, the results, summarized below in Table 11, were favorable, as the average score was 41.5 correct out of 45, or 92%.

Table 11. Region 1 Sacco Scoring Results

Region 1 Session 1	Sacco Scoring Results (out of 45)
Team 1	45
Team 2	41
Team 3	40
Team 4	36
Team 5	42
Region 1 Session 2	
Team 1	35
Team 2	43
Team 3	No sheet
Team 4	44
Team 5	45
Team 6	44
<b>Range</b>	<b>35 - 45</b>

### Pilot Recommendations

Both sessions reacted favorably to the Sacco Method and the idea of a pilot. One participant in the second session was a police chief who said after the meeting that the Sacco Score is so simple that he could see his police officers scoring victims while the EMS providers administer medical care. This is a significant observation, the implication of which is a higher survival rate as scene medical resources could be better utilized. Another provider suggested a pilot this across the counter-terrorism task force region. Overall, the participants seemed to embrace the Sacco Method, but there were a few who seemed resistant to change. In a follow up email, an enthusiastic provider apologized for his colleagues' resistance to change and offered his help and support in moving this forward. Overall, the result was overwhelmingly favorable and we expect a pilot in Region 1.

## REGION 2

Region 2 was our second demonstration site and the only region not to offer ConEd credits. Only 12 people participated in Region 2, but several attended the Region 3 sessions. Participants included EMT Basics, Paramedics, and an EMS Chief.

### Inconsistency in Tagging

Participants knew START, but made triage decisions based on the experience of their triage officer. This loose protocol is reflected in the range of tagging results. As shown in Table 12, the three teams ranged from 10 to 20 for Red tags, 7 to 22 for Yellow tags, 1 to 10 for Green tags, and 3 to 14 for Black tags.

Table 12. Region 2 Tagging Summary

Region 2	Red	Yellow	Green	Black
Team 1	10	22	10	3
Team 2	20	7	4	14
Team 3	15	19	1	10
<b>Range</b>	<b>10 - 20</b>	<b>7 - 22</b>	<b>1 - 10</b>	<b>3 - 14</b>

### Variability in Triage Priorities

As shown in Table 13, victim 22 was the top priority of team 1 but was the forty-fourth and forty-fifth priority of teams 2 and 3, respectively. Likewise, victim 30 was selected as the highest priority for transport by team 2 but was chosen as the lowest priority by teams 1 and 3. The implication -- get the right triage officer and you go first, get a different triage officer and you go last and most likely die. This result has led to discussions in subsequent demonstration programs and outside meetings of the liability and defensibility of making such random selections.

Table 13. Region 2 Triage Priority

Region 2	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	...	43rd	44th	45th
Team 1	22	20	27	1	21	44	5	19	42	16		2	17	30
Team 2	30	44	1	11	13	23	45	18	39	29		2	20	22
Team 3	1	2	16	18	4	17	31	9	45	3		21	22	30

### Other Criteria Used in Triage

After being challenged to sort victims in order of triage priority, the participants initiated a discussion of criteria that they used for making these decisions. As this was a valuable



exercise, this discussion was then included in all other regions at our prompting. Following are the criteria region 2 said they use in triaging at the scene:

- availability of resources
- type of incident
- cycle time of ambulances back to scene
- experience and ability to assess victim prognosis (i.e. survival probability)
- knowledge and training and experience of providers
- age of victims
- # of access lanes
- weather

This list was recorded on the blackboard, and revisited during the software demonstration. All of these factors except “experience level of provider” are explicitly accounted for within the software. The evidence-based analysis of 102,000 victims implicitly addresses the “experience” factor.

Time Exercises Show Objectivity in Sacco Method

In examining results across all timed activity, you can see in Table 14 a range of 14 to 30 minutes to tag victims, and a tight 10 – 13 minutes to score victims using the Sacco Method. The time to determine a triage strategy, presented as the middle column, showed a wide range from 12 to 25 minutes.

Table 14. Region 2 Timing Summary

Region 2	Time to Tag	Time to Triage: Current Protocol	Sacco Scoring Time
Team 1	23	21	12
Team 2	14	25	13
Team 3	30	12	10
<b>Range</b>	<b>14 - 30</b>	<b>12 - 25</b>	<b>10 - 13</b>

Sacco Scoring is Highly Accurate and Readily Implemented

Region 2 was very accurate in computing the Sacco Score. As you can see in Table 15, team 3 was perfect, team 2 missed only one, and team 1 missed three.

Table 15. Region 2 Sacco Scoring Results

Region 2	Sacco Score Results (out of 45)
Team 1	42
Team 2	44
Team 3	45

Pilot Recommendations

Overall Region 2 was receptive, although not as enthusiastic as other regions. Group dynamics were influenced by one fairly vocal dissenter. Another person, supportive of the concept questioned the advantages in rural settings. Based on this concern, we added a discussion in subsequent regional demonstrations that highlighted the advantages of the routine use of the RPM score. He also mentioned that “Fire has unified/uniform chain of command, while EMS does not,” and therefore there are dispatch and control issues in using the Sacco Triage Method. This concern was not voiced in other regions.

### REGION 3

Region 3’s management enthusiastically supported this demonstration, provided support to all regions for marketing the demonstration, and arranged for ConEd credits for participants from all regions. Two sessions were held at Region 3 and included 63 participants:

First Responders	3	
EMT Basics	16	
Paramedics	28	
RNs	8	
Physicians	2	
Other/Unknown	6	(arrived after we polled participants)

#### Inconsistency in Tagging

START is the Region 3 protocol and this group seemed very familiar with it. Nonetheless the inconsistency in tagging was dramatic as Reds had a range of seven to forty, and as shown in Table 16 below, all tag colors showed wide disparity.

Table 16. Region 3 Tagging Summary

Session 1	Red	Yellow	Green	Black
Team 1	7	20	11	7
Team 2	38	6	1	0
Team 3	19	15	2	9
Team 4	37	18	6	9
Team 5	40	4	1	8
Team 6	38	6	0	1
Team 7	12	11	10	12
Team 8	21	16	3	5
<b>Session 2</b>				
Team 1	11	12	10	12
Team 2	17	7	8	13
Team 3	23	8	1	13
Team 4	16	14	8	7
Team 5	30	13	2	0
<b>Range</b>	<b>7 - 40</b>	<b>4 - 20</b>	<b>0 - 11</b>	<b>0 - 13</b>

It is interesting to note that the Region 3 Chairman of the Board was in attendance. He is a trainer for START and was in total agreement on its problems and limitations.

### Variability in Triage Priorities

An examination of the triage priority, shown in Table 17, indicates that there were no common victims in the top ten in either session. Victims 1 and 11 occur most often, and both appear on seven of thirteen lists. Victim 30 is noteworthy for appearing as both a first and last priority. Victims 1 and 4 also have this distinction. There are many victims that appear in the top ten lists and the bottom 3 lists.

Table 17. Region 3 Triage Priority

Session 1	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th		43rd	44th	45th
Team 1	1	3	17	11	16	10	12	21	42	22		13	5	2
Team 2	19	21	13	18	5	11	4	16	9	1		17	22	12
Team 3	9	14	6	1	18	36	23	35	45	17		3	19	20
Team 4	42	27	6	7	1	18	5	37	40	24		2	20	30
Team 5	13	24	11	5	43	18	35	17	36	30		2	19	33
Team 6	5	42	12	19	17	4	11	21	16	45		44	9	22
Team 7	1	16	6	11	23	15	9	3	45	7		21	22	30
Team 8	42	44	4	3	16	27	1	21	17	6		19	20	2
Session 2														
Team 1	21	16	10	40	22	1	13	31	36	43		30	42	44
Team 2	11	13	16	12	14	31	24	17	6	18		7	5	4
Team 3	4	22	6	13	36	18	24	45	31	42		20	21	30
Team 4	15	13	16	12	5	3	11	17	9	45		4	2	1
Team 5	30	19	3	17	7	2	9	21	20	44		37	28	36

### Other Criteria Used in Triage

Region 3 also stated that they use other criteria when tagging, and making triage decisions. Their criteria include:

- is the patient “fixable”?
- number of EMS personnel on scene
- transport resources
- hospital resources including type of facilities
- age of victim
- weather (can helicopters be used?)
- type of event
- season
- type of treatment facilities
- experience level of providers on scene
- time of day (i.e. traffic considerations)
- injury severity
- expected decompensation
- assessment at secondary triage
- blood pressure

These criteria, assembled across both sessions, were put on the blackboard and revisited during the software demonstration. Most are considered explicitly by the software, and the others are considered implicitly within survival probability.

### Time Exercises Show Objectivity in Sacco Method

The time to tag ranged from 22 to 41 minutes, but more than half of the teams took 30 minutes or more. The time to then order victims by triage priority ranged from eight to thirty-seven minutes, and nine of thirteen teams took 20 minutes or more. The time needed to compute the Sacco Score on the 45 victims was tightly grouped and ranged from 11 to 19 minutes.

Table 18. Region 3 Timing Summary

Session 1	Time to Tag	Time to Triage: Current Protocol	Sacco Scoring Time
Team 1	38	12	18
Team 2	34	37	12
Team 3	41	28	18
Team 4	32	20	16
Team 5	22	22	19
Team 6	30	27	13
Team 7	Missing data	70	11
Team 8	Missing data	28	12
Session 2			
Team 1	31	12	12
Team 2	40	22	13
Team 3	34	8	12
Team 4	24	26	15
Team 5	29	17	11
<b>Range</b>	<b>22 - 41</b>	<b>8 - 37<sup>3</sup></b>	<b>11 - 19</b>

### Sacco Scoring is Highly Accurate and Readily Implemented

As shown in Table 19, region 3 by far achieved the highest accuracy in computing the Sacco Score. More than half of the teams were 100% accurate, the range of correct answers across all teams was 42 to 45, and the average was 44 (98%). Even though this method is simple to learn, these results are astounding given that minimal training was provided.

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<sup>3</sup> for analysis purposes, we use the upper range of 37, rather than team 7s' result of 70 minutes as this time is an anomaly

Table 19. Region 3 Sacco Scoring Results

	Number Correct (out of 45)
Session 1 Team 1	43
Team 2	45
Team 3	45
Team 4	43
Team 5	45
Team 6	42
Team 7	45
Team 8	45
Session 2 Team 1	43
Team 2	45
Team 3	45
Team 4	42
Team 5	44
<b>Range</b>	<b>42 - 45</b>

Pilot Recommendations

Both Region 3 sessions were lively and interactive. One of two physicians in attendance stated that a prospective study (i.e. pilot) was an obvious next step. The Chairman of the Region 3 Board strongly agreed that current protocols are flawed, but expressed operational concerns with a software solution without central dispatch. There was also a group of emergency room nurses, either from Region 2 or a county that borders Region 2, who suggested that this model could be used for ED triage. We agreed and told them that this has been suggested before, notably at Children’s Hospital in Washington, DC. An emergency physician from a rural hospital raised questions about the accuracy of applying the survivability data in rural areas, given his view that the Pennsylvania Trauma Foundation database is dominated by data from Philadelphia and Pittsburgh. The aforementioned supporting physician didn’t feel this was an issue given the advance that the STM offers for pre-hospital medicine. Nonetheless, rural research will be conducted as we move forward.

Group dynamics in the first session, and a concluding lengthy discussion of the accuracy of the data for use in rural areas, seemed to temper positive concluding remarks. A number of participants, however, approached us afterwards and voiced support for implementation. One man in particular stated that “this will save lives, and that’s why we are here!” The comments of the second session were overwhelmingly positive, and one participant came up after the meeting and exclaimed: “I teach MCIs. Now I wonder what I’ve been teaching all this time.”

## REGION 4

Seventy EMS professionals participated from Region 4 across two sessions.

First Responders	0
EMT Basics	35
Paramedics	33
RNs	2
Physicians	0
Other	0

### Inconsistency in Tagging

START is not the mass casualty protocol in Region 4, and they had very little knowledge of it. In fact, we polled the second session and found that none “really knew START,” 11 “kinda knew START,” and 18 “never heard of START.” Region 4 does however use a color tagging system in triage. The results of the tagging exercise were the most inconsistent yet. Region 4 had the widest range of any region for Red tags (4 to 44), yellow (1 to 20), and green (0 to 29) tags.

Table 20. Region 4 Tagging Summary

Session 1	Red	Yellow	Green	Black
Team 1	9	6	18	12
Team 2	24	14	4	3
Team 3	36	7	0	2
Team 4	14	11	8	12
Team 5	17	6	11	12
Team 6	44	1	0	0
Team 7	24	11	0	10
Team 8	18	9	5	13
Team 9	20	8	13	4
Team 10	11	19	15	0
Session 2				
Team 1	21	17	7	0
Team 2	10	13	12	10
Team 3	16	11	11	7
Team 4	11	20	9	5
Team 5	6	12	25	2
Team 6	12	18	7	8
Team 7	9	16	14	6
Team 8	26	15	4	1
Team 9	4	12	29	0
<b>Range</b>	<b>4 - 44</b>	<b>1 - 20</b>	<b>0 - 29</b>	<b>0 - 13</b>

Variability in Triage Priorities

Ranking victims in priority order again shows a wide disparity and complete inconsistency. As shown in Table 21, victim 19 appeared as the first priority for three teams, and as the forty-fifth priority for five teams. Victim 30 appears multiple times as a top ten priority and a bottom priority and also appears as both the first and forty-fifth priority. There were no victims common to all teams in the top ten lists, in fact, no victim was observed to be in more than half of the top ten lists.

Table 21. Region 4 Triage Priority

Session 1	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	43rd	44th	45th
Team 1	11	9	12	25	15	31	10	6	8	44	21	2	19
Team 2	2	21	44	5	13	18	22	4	17	9	20	30	19
Team 3	19	15	5	16	4	12	21	14	31	9	30	22	20
Team 4	1	3	5	6	7	11	12	15	17	24	30	44	45
Team 5	13	22	4	17	30	11	36	24	12	16	21	45	18
Team 6	1	5	6	8	9	10	29	40	32	34	41	31	33
Team 7	11	16	17	18	22	31	36	4	6	14	21	2	19
Team 8	3	16	4	8	10	12	13	1	5	38	37	42	44
Team 9	2	9	5	13	1	17	18	22	11	4	20	21	19
Team 10	19	21	20	1	30	2	12	16	4	5	35	40	39
Session 2													
Team 1	30	2	1	44	20	19	22	42	21	13	33	32	34
Team 2	22	17	12	11	13	1	18	24	3	15	20	21	30
Team 3	16	45	24	18	13	11	12	5	4	6	21	20	19
Team 4	5	1	15	22	35	31	12	3	10	8	15	24	34
Team 5	1	44	14	26	10	24	30	20	12	43	17	36	15
Team 6	11	24	13	31	45	35	6	16	10	1	2	21	20
Team 7	18	4	17	45	16	1	3	14	44	9	20	21	30
Team 8	19	21	22	30	1	20	9	16	45	36	33	2	7
Team 9	24	35	6	1	8	36	14	25	27	10	20	21	30

Other Criteria Used in Triage

Region 4 EMS uses other criteria in making tagging and triage decisions, outside of their protocol:

- “fixable” victims
- type of trauma
- who can survive (prognosis) and quality of life
- who can survive first 20 minutes and who can survive first hour
- experience level of providers
- transport and treatment resources

All of these factors, with the exception of “experience level”, were shown to be considered explicitly within the Sacco Method.



### Time Exercises Show Objectivity in Sacco Method

Perhaps motivated by Monday night football involving the local professional football team, the first Region 4 evening session was the quickest to perform the tagging and triaging compared to other regions. As shown below, the first session time ranged from 7 to 26 minutes, while the second session was consistent with other regions and ranged from 14 to 42 minutes. The Sacco Score was computed more quickly and in a tighter grouping across both sessions, ranging from 7 to 15 minutes. The time to triage, shown in the middle column, ranged from 3 to 21 minutes. Region 4 was the only region observed to uniformly sort tags by color prior to determining triage order.

Table 22. Region 4 Timing Summary

Session 1	Time to Tag	Time to Triage: Current Protocol	Sacco Scoring Time
Team 1	22	6	6
Team 2	16	7	9
Team 3	7	17	8
Team 4	20	3	6
Team 5	19	4	10
Team 6	15	16	12
Team 7	21	9	11
Team 8	24	20	10
Team 9	19	16	8
Team 10	26	20	15
Session 2			
Team 1	38	20	8
Team 2	35	9	11
Team 3	17	15	10
Team 4	42	15	11
Team 5	28	13	Missing data
Team 6	35	8	7
Team 7	32	21	11
Team 8	14	14	10
Team 9	28	14	14
<b>Range</b>	<b>7 - 42</b>	<b>3 - 21</b>	<b>6 - 15</b>

### Sacco Scoring is Highly Accurate and Readily Implemented

As shown in Table 23, Region 4 was proficient at computing the Sacco Score. While scores ranged from 37 to 45, 12 of 18 teams scored 43 to 45 (out of 45). Only two teams scored less than 40, and the overall average was 42.5 (94%). Again, this was despite minimal training.

Table 23. Region 4 Sacco Scoring Results

Sacco Scoring Results	Number Correct (out of 45)
Session 1 Team 1	43
Team 2	43
Team 3	45
Team 4	43
Team 5	37
Team 6	42
Team 7	43
Team 8	41
Team 9	45
Team 10	43
Session 2 Team 1	44
Team 2	45
Team 3	44
Team 4	44
Team 5	No Sheet
Team 6	39
Team 7	43
Team 8	41
Team 9	40
<b>Range</b>	<b>37 - 45</b>

Pilot Recommendations

Region 4 very enthusiastically embraced the Sacco Score and Sacco Method. In a follow up meeting with the EMS Regional Director, he said the response has been overwhelmingly positive, and he is willing to pilot this in Region 4. Subsequent meetings have been held to move this forward, and we anticipate that Region 4 will be the first pilot site in Pennsylvania.

## REGION 5

Region 5 held a single large session in a hospital auditorium. Sixty seven EMS professionals participated:

First Responders	0
EMT Basics	49
Paramedics	15
RNs	3
Physicians	0

### Inconsistency in Tagging

Region 5 has a well defined disaster plan. Participants seemed well aware of their plan and their mass casualty protocol. The protocol combines START-type physiologic measures with observable injury type and severity information. The criteria are much more exhaustive than typical START protocol, but also seem more subjective. The results of the tagging exercise were more consistent in comparison to other regions in Red tags (range of 6 to 22), although Yellow (7 – 19), Green (7 – 22) and Black (0 – 11) were highly variable. As a region, this group had considerably less “reds” than others.

Table 24. Region 5 Tagging Summary

Region 5	Red	Yellow	Green	Black
Team 1	9	14	15	7
Team 2	15	18	11	1
Team 3	11	7	16	11
Team 4	14	13	13	5
Team 5	6	11	22	6
Team 6	13	13	10	9
Team 7	18	10	16	1
Team 8	14	9	21	1
Team 9	22	14	7	2
Team 10	19	15	11	0
Team 11	14	18	13	0
Team 12	13	16	8	8
Team 13	15	12	12	6
Team 14	12	12	12	9
Team 15	10	15	14	6
Team 16	14	13	17	1
Team 17	15	19	11	0
Team 18	21	15	9	0
Team 19	20	18	7	0
<b>Range</b>	<b>6 - 22</b>	<b>7 - 19</b>	<b>7 - 22</b>	<b>0 - 11</b>

Variability in Triage Priorities

Region 5 had the least overlap of any region between their top 10 priorities and bottom three. As shown below, the three victims appearing most frequently in the top ten lists were victims 1, 4 and 16. Victim number 1 appeared in the top ten of 16 of 19 teams, and never appeared in the bottom 3. Victims 4 and 16 appeared in 14 top ten lists, and also never appeared at the bottom. Likewise, victim 20 appeared in the bottom three on seven lists, and only appeared once as a top ten. Nonetheless, there were significant inconsistencies. Thirty nine different victims appear at least once in a top ten list; exceptions are 20, 31, 36, 38, 39 and 40. Also, 18 different victims appear as a low priority on at least one list. Victim 30 appears twice as the highest priority, and twice as the lowest priority. Victim 44 appears as a first and second priority, yet also appears three times as a last priority.

Table 25. Region 5 Triage Priority

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	43rd	44th	45th
Team 1	3	16	42	30	1	4	5	12	11	6	2	19	9
Team 2	10	14	24	6	45	7	33	1	23	3	39	40	19
Team 3	44	3	12	10	4	17	35	11	13	18	20	21	42
Team 4	1	44	4	24	3	9	30	22	16	11	21	20	42
Team 5	3	4	16	10	41	1	21	8	27	13	9	19	44
Team 6	1	11	18	17	42	4	12	16	44	45	--	--	--
Team 7	1	3	24	10	25	15	16	44	4	18	42	2	19
Team 8	16	6	30	1	19	13	5	9	11	3	32	33	20
Team 9	30	2	17	12	15	11	3	43	13	16	32	20	19
Team 10	2	9	1	43	12	14	17	18	20	16	32	23	33
Team 11	2	22	8	10	42	35	24	27	6	44	34	11	38
Team 12	14	4	16	6	3	1	8	17	18	45	20	21	30
Team 13	5	1	30	15	21	16	17	12	13	4	20	27	44
Team 14	30	22	18	13	16	1	12	11	4	36	20	27	42
Team 15	24	18	1	12	16	11	4	45	44	2	19	15	3
Team 16	16	3	12	5	21	17	18	9	1	4	20	19	2
Team 17	1	28	2	29	3	32	4	33	5	34	36	43	44
Team 18	1	2	4	5	6	9	12	13	15	16	36	38	41
Team 19	6	28	2	35	14	29	1	24	37	26	22	27	30

Other Criteria Used in Triage

Region 5’s Disaster Operating Guideline has an exhaustive list of criteria used to tag victims. Eleven observable criteria can mandate a Red tag. Most of these are injury specific. In discussing how triage decisions are made in the field, participants cited the following:

- injury severity
- ABCs

- head trauma
- “fixable” or “savable”
- transport resources available
- treatment resources available
- transport time – ground versus air
- weather

This list is fairly consistent with other regions, although not as extensive. We did demonstrate how the software accounts for resources and transport time, and how the survival probability and deterioration information addresses severity and “fixability.”

Time Exercises Show Objectivity in Sacco Method

Thirteen of nineteen teams took longer than 30 minutes to tag the 45 victims, and only two teams tagged victims in 21 minutes or less. All 19 teams, however, completed the Sacco scoring in 21 minutes or less. Additionally, the time to compute the Sacco Score was tightly bunched as 14 of 19 teams completed the scoring within the 5 minute time frame of 14 to 18 minutes. The time to triage, represented as the middle column of table 26, shows that while one team set triage priorities in 8 minutes, all other teams took at least 15 minutes, and most took more than 20 minutes.

Table 26. Region 5 Timing Summary

	Time to Tag	Time to Triage: Current Protoco	Sacco Scoring Time
Team 1	32	17	16
Team 2	34	22	11
Team 3	36	19	18
Team 4	44	29	18
Team 5	34	35	9
Team 6	40	35	15
Team 7	34	16	14
Team 8	32	34	19
Team 9	25	28	14
Team 10	32	23	18
Team 11	34	19	14
Team 12	48	28	16
Team 13	20	23	16
Team 14	51	34	16
Team 15	28	25	18
Team 16	28	16	18
Team 17	17	8	14
Team 18	47	16	21
Team 19	24	15	20
<b>Range</b>	<b>17 - 51</b>	<b>8 - 35</b>	<b>9 - 21</b>

### Sacco Scoring is Highly Accurate and Readily Implemented

The majority of the teams -- 13 of 19 -- had at least 42 correct. Overall though, Region 5 had the largest range of any in computing the Sacco Score. One group was only correct on 34 of 45 victims, and three teams had less than 40 correct. Nonetheless, the average was 41.9 out of 45, which is 93% correct. Again, this was with minimal training.

Table 27. Region 5 Sacco Scoring Results

Sacco Scoring Results	Number Correct (out of 45)
Team 1	42
Team 2	45
Team 3	43
Team 4	44
Team 5	45
Team 6	39
Team 7	42
Team 8	41
Team 9	45
Team 10	44
Team 11	45
Team 12	41
Team 13	42
Team 14	44
Team 15	35
Team 16	43
Team 17	45
Team 18	34
Team 19	37
<b>Range</b>	<b>34 - 45</b>

### Pilot Recommendations

Region 5 was the most demonstrably excited region, and all feedback during the concluding discussion was positive. This group seemed to view the pilot as a “no-brainer.” Private discussions with individuals as they left the room confirmed this positive reception.

## REGION 6

Region 6 was our final demonstration site. A total of 19 EMS professionals participated:

First Responders	1
EMT Basics	13
Paramedics	3
RNs	1
Other	1 (1 untrained new hire)

### Inconsistency in Tagging

The participants have not been trained in MCIs, and have no mass casualty protocol, although they have just adopted their first mass casualty disaster plan one month prior to this program. In spite of this, their results were surprisingly the most consistent of any region. Reds were tightly grouped, ranging from 16 to 26, yellows ranged from 11 to 18, Greens from 1 to 13, and blacks from 0 – 8.

Table 28. Region 6 Tagging Summary

	Red	Yellow	Green	Black
Session 1 Team 1	16	11	13	5
Team 2	18	18	1	8
Team 3	17	17	11	0
Session 2 Team 1	23	13	3	6
Team 2	26	15	3	1
<b>Range</b>	<b>16 - 26</b>	<b>11 - 18</b>	<b>1 - 13</b>	<b>0 - 8</b>

### Variability in Triage Priorities

There was one common victim – victim number 5 -- among the top ten list of all five teams, although the three teams of session one had three common victims. Results here are similar to other regions. As shown in Table 29, victim 20 appears as first priority for team 1, and the forty-fifth priority for team 2. Likewise, victim number 19 is the first priority of team 3, and the last priority of team 1. Victim 30 appears as a second and forty-fifth priority.

Table 29. Region 6 Triage Priority

Session 1	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	....	43rd	44th	45th
Team 1	20	27	4	12	7	2	5	16	13	42		21	30	19
Team 2	43	27	16	1	37	18	5	9	4	24		17	2	20
Team 3	19	2	21	9	5	30	4	17	20	16		32	34	23
Session 2														
Team 1	27	22	24	18	5	1	2	35	8	13		44	20	30
Team 2	1	30	20	19	5	18	22	4	31	23		16	7	2

Other Criteria Used in Triage

After being challenged to sort victims in order of triage priority, participants explained how they make triage decisions. Possibly since these teams routinely face limited resources in their rural region, they more quickly and effortlessly identified other factors that guide triage decisions.

- “general impression” of victim (used to tag) and visible injuries
- resources – treatment, transport, and scene resources
- proximity of incident to hospital
- weather
- processing rate of victims at scene
- is it an open or closed scene
- access/egress characteristics
- ambulance cycle time (often an issue in this large, rural Region)
- outcome potential of victim, “savability,” prognosis, severity
- type of trauma
- safety of scene, that is, has scene been secured? Is it an ongoing event?
- hospital capacity
- experience level of providers
- deterioration en route (hospitals are often more than 45 minutes from an incident)
- victim age
- communications and incident command

This list was recorded on the blackboard, and revisited during the software demonstration. All factors except “experience level of provider,” “security of scene,” and “open or closed event” are explicitly accounted for by the software.

Time Exercises Show Objectivity in Sacco Method

In examining results across all timed activity, you can see in Table 30 a range of 9 to 42 minutes to tag victims, and a tight range of 9 to 18 minutes to score victims using the Sacco Method. The time to triage, shown as the middle column, showed a range of 24 to



65 minutes. The group with 65 minutes kept stressing that they wanted to make sure to make the best decisions.

Table 30. Region 6 Timing Summary

Session 1	Time to Tag	Time to Triage: Current Protocol	Sacco Scoring Time
Team 1	42	65	16
Team 2	9	36	9
Team 3	27	33	11
Session 2			
Team 1	16	24	11
Team 2	13	25	18
<b>Range</b>	<b>9 - 42</b>	<b>24 - 65</b>	<b>9 - 18</b>

Sacco Scoring is Highly Accurate and Readily Implemented

Region 6 teams all used and liked the mechanical scoring device. As shown on Table 31, they were very accurate in scoring the victims. With little training, two teams were correct on 45 of 45, and two teams scored 42 and 41 respectively. Each of the teams divided up their victims and scored them individually. One man on team 2 in the second session didn't understand the device, and scored all of his victims incorrectly. One of his team members corrected some, but not all of his mistakes, with the resulting score of 36. Still, the average score was 41.8, which is 93%.

Table 31. Region 6 Sacco Scoring Results

Sacco Scoring Results	Number Correct (out of 45)
Session 1 Team 1	45
Team 2	41
Team 3	45
Session 2 Team 1	42
Team 2	36
<b>Range</b>	<b>36 - 45</b>

Pilot Recommendations

Region 6 was enthusiastic and supportive and expressed interest in piloting this program. One paramedic, who has some industrial engineering background, said “it’s about time someone has brought some mathematics to EMS.” Another participant recognized an advantage from the simplicity of computing the Sacco Score. Due to the rural setting, it is not uncommon for a long lag time to occur between the arrival of the first and second

EMS unit. She suggested that policemen and firemen could score victims while the EMS officers provided medical assistance.

Participants questioned whether software is needed in this very region as their incidents are small and their resources are not only routinely limited but are very dispersed throughout the two rural counties -- in other words, it seemed that there are not often many choices. The upcoming deployment of four new mobile incident command centers was discussed in this context and considered as a location for using the software effectively.

Region 6 has had three MCIs within the past 12 months, and have been therefore motivated to prepare their first regional disaster plan. This was adopted in December and includes the START triage method for MCIs, as this was the only system known at the time the plan was drafted. The architect of the plan and coordinator of this demo program was opening supportive and said they can readily change to the STM if it is deemed more effective. We anticipate a pilot in Region 6.



## Appendix A

# Triage of Mass Casualties

*(A Pilot Program)*

Triage is the process of sorting many seriously injured persons into categories of severity to utilize resources according to priority of need and likelihood of survival. The method used presently has been used since early times and began in situations of war. Although many advances have been made in battlefield and civilian medicine, the triage process has not been updated to any great extent.

The Emergency Medical Services (EMS) Office of the Pennsylvania Department of Health plans pilot testing a method developed by an expert in trauma scoring, Dr. William Sacco, with the assistance of six Regional EMS councils. Dr. Sacco's scoring systems and tools have been applied to trauma patients for injury severity assessment, both in hospital and in the field, for many years. The tool for a refined triage of mass casualties has the potential to save significantly more lives than the decades old method presently in use, but the implementation by EMS personnel needs to be evaluated.

The Sacco Method is the first developed triage and resource management system that is evidence-based and outcome-driven. It explicitly maximizes the savings of lives in a resource constrained situation. When compared to using existing triage mass casualty protocols, outcomes from one disaster exercise indicated a 40% increase in lives saved when resources were unconstrained, and an even greater increase when comparing the two methods under conditions of severely restricted resources.

An innovative case-study based training program will be used for the pilot. It supports the triage methodology by using video and animation for EMS responders to respond to simulated terrorist and other mass casualty incidents.

The goals of the pilot program are to advance emergency preparedness and response and achieve the following benefits:

1. Provide Pennsylvania citizens with an emergency preparedness system that increases survivors in natural and man-made disasters; that is – to save lives.
2. Enable EMS practitioner evaluation of a new triage system to determine implementation considerations.

Six Regional EMS councils will participate in pilot testing programs between November 2003 and January 2004.

<names excluded>

The following persons are invited and encouraged to observe and participate in the pilot programs:

- \* Emergency Medical Technicians, Paramedics, PHRNs
- \* Regional Counter Terrorism Task Force chairpersons
- \* RCTTF Medical Committee chairpersons and participants
- \* Regional EMS Council Medical Directors
- \* County Emergency Management Agencies
- \* EMS Service Medical Directors
- \* EMS Training Institute Representatives

For additional information contact the State EMS Office at (717) 787-8740; or call the Regional EMS council to register for one of the events.