

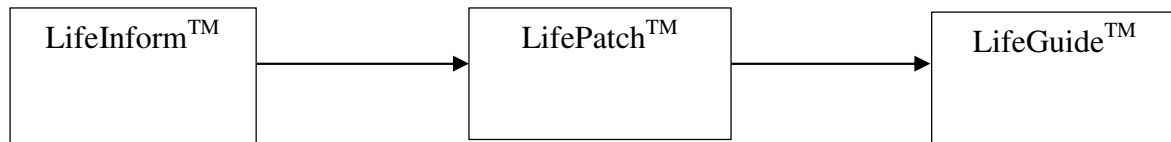
The LifeSystem™

When Every Second Counts™

Inventor: Salva Bambini

## Executive Summary

### The LifeSystem™ - When Every Second Counts™



The three parts of the LifeSystem™ (LifeInform™, LifePatch™, and LifeGuide™) work together to maximize the survivability of a school shooting incident. First Responders are rapidly informed of the incident using LifeInform™. Also, they are not just informed of the general presence of an emergency – or misinformed as to the nature of the emergency such as when a fire alarm is pulled. Instead they are specifically informed that the emergency is a school shooting and they can immediately begin planning a targeted response.

Additionally, emergency treatment for those with injuries is immediately available using the LifePatch™, which is simple to use by staff or students– even simpler than the AEDs already in place in nearly all High Schools. The LifePatch™ buys precious minutes to preserve the lives of the wounded until professional treatment can be administered.

Finally, the LifeGuide™ allows First Responders to immediately know the location of the wounded upon arrival at the scene by tracking the locations of LifePatches™ in use so that a treatment and/or extraction strategy can be developed immediately.

## The LifeSystem™

A powerful force to help preserve the lives of our children

## Background

We wish that there were no school shootings, but they are an unfortunate reality in today's world. However, we believe that by reframing school shootings so that we are prepared to address them as a public safety issue (with pre-planned strategies in place rather than solely a reactive criminal response issue) using our LifeSystem™ we can save the lives of more children when these horrible events occur.

For perspective, about a century ago, school fires were an unfortunate reality that claimed the lives of hundreds of kids each year, including a large percentage of fires that were intentionally set (criminal acts). However, instead of merely reacting to school fires as they occurred, by recognizing and addressing school fires as a public safety issue and planning appropriately, we were able to lower their lethality and save lives. For example, building codes were put in place with regard to school construction. Additionally, fire alarms became mandatory in schools – allowing faster notification and response time from First Responders. Also, sprinklers became standard – which provided limited fire fighting capability to slow the spread of the fire and allow First Responders more time to arrive and fight the fire.

The effectiveness of these efforts is clear. For example, in 2014-2018 U.S. fire departments responded to an estimated average of 3,230 structure fires in schools each year. However, these fires only caused annual averages of one civilian death, 39 civilian injuries, and \$37 million in direct property damage. Fires that were intentionally set remained the leading cause of school fires, accounting for almost two of every five fires.<sup>1</sup>

Comparing this data to school shootings, school shootings happen much less frequently than fires, but the cost in loss of life is currently considerably greater. In 2022 there were 51 school shootings in which 40 people were killed and 100 people were injured.<sup>2</sup> Thus, although school shootings only happen 1.5% as often as school fires, the lethality of school shootings is 40 times that of fires and their injury rate is about 250% annually. We also note that 2022 was a relatively tame year for school shootings<sup>3</sup> and that 2021 was considerably worse<sup>3</sup> with almost 250 school shootings.

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<sup>1</sup> <https://www.nfpa.org/News-and-Research/Data-research-and-tools/Building-and-Life-Safety/Structure-fires-in-schools>

<sup>2</sup> <https://www.edweek.org/leadership/school-shootings-this-year-how-many-and-where/2022/01>

<sup>3</sup> <https://www.campussafetymagazine.com/safety/k-12-school-shooting-statistics-everyone-should-know/>

Additionally, in a school shooting, those that are killed may generally be divided into two groups. First, relatively instantaneous deaths taking place immediately or in less than two minutes. Direct wounds to the cranial, cardiac, or aortic regions fall in this category. The second group of fatalities takes place through blood loss, often over several to 10s of minutes. This second group includes a significant majority of all lethal incidents occurring on an annual basis, representing as much as 65% in some years. The majority of civilians are surprised to learn, that unlike the movies, the overwhelming majority of gunshot injuries are non-fatal, especially if bleeding can be controlled. For example, even in cases of criminal assault with a firearm, the fatality rate is only approximately 1 in 6.<sup>4</sup>

Thus, if the blood loss responsible for the majority of fatalities in school shootings could be even partially managed, it would give First Responders more time to arrive and administer more effective treatments and reduce fatalities. We wish we could cause fatalities to drop to zero, but if we could decrease the current fatality rate for school shootings of ~30% to match the 17% fatality rate of criminal assaults, it would represent a significant preservation of life.)

Also, anything that can help First Responders physically locate injured persons would help them administer treatment faster and save lives.

The bottom line is that to more effectively address school shootings as a safety issue, wishful thinking that it “won’t happen here” is not effective. Neither is the thinking that a reactive response law enforcement is all that can be done. Instead, we propose that lethality for school shooting victims can be reduced when:

- First Responders are informed more rapidly when an event happens.
- First Responders are able to locate the injured and provide treatment more rapidly.
- Emergency treatment to help stabilize victims is immediately available in order to give First Responders more time to arrive and provide stabilization.

All of these are provided by our LifeSystem™

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<sup>4</sup> <https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2688536>

## The LifeSystem™ - When Every Second Counts™

The LifeSystem™ includes three main parts: LifeInform™, LifePatch™, and LifeGuide™.

### LifeInform™

The intent of LifeInform™ is that First Responders are informed more rapidly when a school shooting event happens. Currently, First Responders are typically informed of a school shooting event by a phone call to 911. Unfortunately, this requires someone on the scene to have access to a phone, to have the presence of mind to dial the phone, and to be able to speak coherently with the 911 operator. This wastes precious minutes. Additionally, even if the 911 operator is informed, other persons at the scene are not immediately informed of the event – and in some cases are only informed by the arrival of law enforcement at the scene, which further wastes precious minutes.

However, LifeInform™ improves upon the present situation by adopting several technological advances that were put in place to address school fires. More specifically, it is now mandatory to equip schools with a multitude of Fire Alarm Pull Stations at many locations throughout the school. When the Fire Alarm is pulled, an audible alarm is immediately heard throughout the entire school and everyone can take action right away. Additionally, the alarm is immediately sent to the local Fire Department, which is informed that there is a fire and can respond with utmost speed. Further, it is noted that there have been some school shooting events where persons at the school pulled the fire alarm. Although that can establish immediately that an alarm situation exists, the protocol for a fire alarm situation is different from an active shooter situation and the fire alarm pull can result in confusion both at the school and with First Responders, who may respond under the assumption of a fire situation and may not be prepared to address a shooting situation. Regardless, the use of Fire Alarm pulls is a standard technology that has been implemented in our schools for decades and students and teachers are very familiar with it. Consequently, a similar alarm system such as LifeInform™ should be readily understood and adopted.

More specifically, LifeInform™ provides a physical Pull Station similar to a fire alarm. It is intended that the LifeInform™ Pull Station be co-located near present Fire Pull Stations. The LifeInform™ Pull Station is based on the Grainger Fire Pull Station shown below<sup>5</sup>-except the LifeInform™ Pull Station is white and reads “Pull in Case of Active Shooter”



Our LifeInform™ Pull Station includes a cellular transceiver that reports the alarm to our central monitoring service. Upon sign-up, each LifeInform™ Pull Station is associated with one or more police department communication systems so that when the alarm is pulled the selected police stations are automatically alerted of the shooter situation. – and can them immediately respond appropriately. For example, the police department can immediately dispatch a heavily armored SWAT team complete with ballistic shields, as opposed to unarmored patrol officers who are not equipped to address an active shooter situation. Because most SWAT teams are equipped with personal armored vests and ballistic shields providing protection up to Level III+ (and absolutely zero school shootings in the last 10 years involved a weapon capable of breaching Level III+) entry to the school can begin immediately upon arrival. This minimizes the ability of the offender to further injure others – and also provides faster access to the wounded once the offender is neutralized.

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<sup>5</sup> <https://www.grainger.com/product/1DPD7?gucid=N:N:PS:Paid:GGL:CSM-2295:4P7A1P:20501231&gclsrc=ds&gclsrc=ds>

## LifePatch™

Today's students are no strangers to peer-administered emergency health care. For example, according to a 2013 study<sup>6</sup>, over 82% of U.S. High Schools already had one or more Automated External Defibrillators (AED), with the average school having 2.8. The use of AEDs was effective in reducing the fatalities of Sudden Cardiac Arrest (SCA) among students - yielding a 64% survival rate after SCA.

Additionally, as a selling point for our products, we note that according to this study<sup>7</sup> the rate of death due to SCA was approximately 9 collegiate NCAA athletes per year, with estimates of about 100/year for all ages highschool to 39 according to this study.<sup>8</sup> This indicates that fatalities from SCA are likely considerably fewer annually than deaths from school shootings, but even in the face of lesser risk, educational institutions have overwhelmingly opted to purchase AEDs. Recognizing that AEDs are not a perfect solution (there is still a 36% fatality rate even with AED usage), we believe that the use of our LifePatch™ can provide a similar reduction in fatality rate to AED usage. Consequently, we believe that the market will readily adopt the LifePatch™ because consumers are familiar with peer-administered health care through the use of AEDs and the LifePatch™ will likely provide a similar survivability improvement in the event of a school shooting – as an AED did in the event of a similarly infrequent emergency such as SCA. Additionally, the LifePatch™ is even easier to administer than an AED.

The LifePatch™ is a vented occlusive chest seal<sup>9</sup>, which is an adhesive dressing that is applied directly to the skin. Although it is called a chest seal, it may be used to seal a wound on any part of the body. Chest Seals are specifically designed with a medical grade hydrogel adhesive strong enough to adhere to skin that is exposed to blood, sweat, hair, sand, or water. The chest seal is simple to use and vastly diminishes blood loss while preserving respiration. The use of chest seals can greatly extend the time-to-death due to bloodloss for many gunshot victims.

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<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3600927/#:~:text=Of%20the%20participating%20public%20schools,0.99%2C%201.10%2C%20P%20%3D%20>

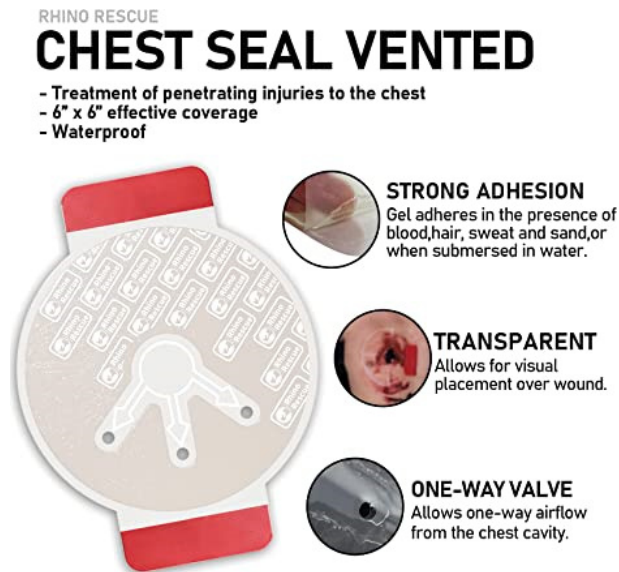
<sup>7</sup> <https://www.ahajournals.org/doi/full/10.1161/CIRCULATIONAHA.110.004622>

<sup>8</sup> <https://www.ahajournals.org/doi/full/10.1161/CIRCULATIONAHA.108.804617>

<sup>9</sup> <https://www.verywellhealth.com/how-and-when-to-use-chest-seals-4121050>

We have partnered with Rhino Rescue, a premiere manufacturer of chest seals for military and trauma use<sup>10</sup> to develop the LifePatch™ based on their vented chest seal. The Rhino Rescue chest seal has been used for years by military and law enforcement personnel, has been validated under combat medic conditions, and has a 98% approval rating.

The LifePatch™ attaches a cellular transmitter to the back of the chest seal so that the location of gunshot victims can be readily ascertained using the LifeGuide™.



A set of LifePatches™ is placed in a secure container near each LifeInform™ Pull Station. Once the LifeInform™ Pull Station alarm is triggered the secure containers open and provide access to the LifePatches™. Each LifePatch™ is individually sealed and removal of the liner to expose the adhesive also removes the separator so that the cellular transmitter is powered by the battery. The cellular transmitter then transmits a unique ID signal along with its GPS location to our servers. The GPS location is shown to First Responders using the LifeGuide™.

<sup>10</sup> <https://rhinorescuestore.com/collections/out-door/products/chest-seal-quick-useful-chest-wound-emergency-occlusive-dressing-bandage-first-aid-kit-accessories-with-vent-trauma-kit?variant=42389083390133>



## LifeGuide™

The LifeGuide™ is a smartphone app that we make available only to First Responders that can display an overview of the location of all LifePatches™ currently transmitting a GPS signal, as well as their respective spatial displacements from the viewer's location. By using the LifeGuide™, First Responders that arrive on the scene can instantly know the location of all wounded individuals that have been treated with a LifePatch™ and can instantly begin working on an extraction or treatment plan – which should further increase survivability of the emergency.

Additionally, difficulties of information sharing among First Responders are eliminated because all First Responders on the scene have access to the location information through the app. All First Responders can simply refer to their phones instead of having to contact a central information source on their radios.

Further, the location information is updated in real time so that any movement of the wounded can be tracked. This allows First Responders to track down the injured even if they are moving. Additionally, all First Responders can immediately verify when all wounded have been extracted from the school by monitoring the locations on the app.

## Upcoming LifeSystem™ Improvements

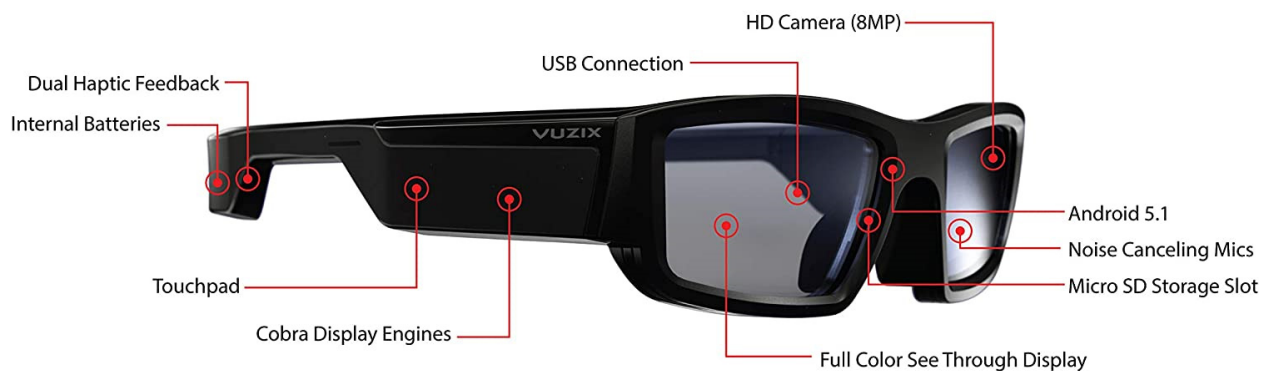
### School GPS Mapping

The LifeGuide™ is useful because it provides the distance and elevation of each LifePatch™ relative to the First Responder, but it would be of even more benefit if the First Responder could immediately identify which room of the school the victim is located in. However, in order to identify which room, we would need to have the school pre-upload a detailed floor plan and take several GPS measurements to correlate school structures with later victim GPS readings.

We are currently developing a system to provide this GPS correlation, but it requires pre-uploading a detailed structural map, and then directing the mapping personnel to take GPS readings along all six surfaces of each interior room.

### Augmented Reality

Vuzix Blade® Smart Glasses are the world's first Augmented Reality (AR) smart glasses with Wave-Guide technology.<sup>1112</sup> Here are some videos of the Vuzix Blade® in action<sup>1314</sup>



<sup>11</sup> <https://www.vuzix.com/products/blade-smart-glasses-upgraded>

<sup>12</sup> <https://www.amazon.com/Vuzix-Glasses-Amazon-Built-Voice-Controls/dp/B07TKBKTH4?tag=softtesthelp-20&geniuslink=true>

<sup>13</sup> <https://www.youtube.com/watch?v=tziACJVqwUI>

<sup>14</sup> <https://www.youtube.com/watch?v=fgoSZz7uiVw>

The Vuzix Blade® includes a full-color see-through display that we use to stream real-time data through the embedded wi-fi connection. The display superimposes on the real world, as shown in the sample display below.



We are currently developing an improved version of the LifeGuide™ that displays the position information for the activated LifePatches™ using the Vuzix Blade® AR display. This can allow First Responders to have their hands free (not holding a smart phone) and to be less distracted by having to glance at a smartphone while implementing entry to the school.

## Other Patents

The CEO passed on your recommendation to search the PTO's website, so I did. I made a list of the patents that I found below. The CEO says that all of these patents look pretty close to what we came up with. However, the CEO says that you are the best patent attorney around and that you will be able to find a way to get us our patent without infringing on these other patents.

Patents:

US 20220114905 A1

US 20200187860 A1

US 20180053394 A1

US 10270899 B2