CARE AND RESCUE – OUR FOCUS

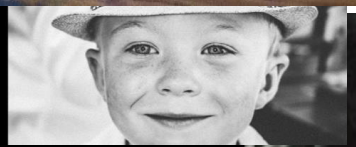


How can we reduce fatalaties
and injuries after an accident?








SAFER
VEHICLE AND TRAFFIC SAFETY CENTRE AT CHALMERS



CARE AND RESCUE – OUR FOCUS

What measures after a traffic accident are most effective in reducing mortality and injuries? This research area addresses the challenges associated with what happens after a traffic accident is a fact.

- **Incident detection, prioritizing and dispatch**
  - E-calls, ACN (Automatic Crash Notification) and incident data, also for unprotected road users
  - Incident assessment and prioritization including injury severity prediction and communications between hospitals
  - Support for emergency personnel

- **Improved care and rescue on site and safety for rescue personnel**
  - Trauma detection, such as internal bleeding that can be difficult to detect
  - Decision support and prioritization
  - Extrication
  - Fires
  - Safety for health and rescue personnel

- **Reduce secondary effects**
  - Eliminate the risk of further accidents
  - Reduce effects on the traffic system, e.g. queues
  - Understand and reduce long-term effects of traffic damage

Just over 1/3 of the deaths can be prevented!

Traffic Inj Prev. 2016 Oct 2;17(7):676-80. doi: 10.1080/15389588.2016.1149580. Epub 2016 Feb 18.

Potentially preventable prehospital deaths from motor vehicle collisions.

Ray JJ[1], Meizoso JP[1], Satahoo SS[1], Davis JS[1], Van Haren RM[1], Dermer H[1], Jill G[2], Bahouth GT[2], Blackbourne LH[3], Schulman CI[1].

Author information

Abstract

BACKGROUND: In 2011, about 30,000 people died in motor vehicle collisions (MVCs) in the United States. We sought to evaluate the causes of prehospital deaths related to MVCs and to assess whether these deaths were potentially preventable.

METHODS: Miami-Dade Medical Examiner records for 2011 were reviewed for all prehospital deaths of occupants of 4-wheeled motor vehicle collisions. Injuries were categorized by affected organ and anatomic location of the body. Cases were reviewed by a panel of 2 trauma surgeons to determine cause of death and whether the death was potentially preventable. Time to death and hospital arrival times were determined using the Fatality Analysis Reporting System (FARS) data from 2002 to 2012, which allowed comparison of our local data to national prevalence estimates.

RESULTS: Local data revealed that 39% of the 98 deaths reviewed were potentially preventable (PPD). Significantly more patients with PPD had neurotrauma as a cause of death compared to those with a nonpreventable death (NPD) (44.7% vs. 25.0%, P =.049). NPDs were significantly more likely to have combined neurotrauma and hemorrhage as cause of death compared to PPDs (45.0% vs. 10.5%, P <.001). NPDs were significantly more likely to have injuries to the chest, pelvis, or spine. NPDs also had significantly more injuries to the following organ systems: lung, cardiac, and vascular chest (all P <.05). In the nationally representative FARS data from 2002 to 2012, 30% of deaths occurred on scene and another 32% occurred within 1 h of injury. When comparing the 2011 FARS data for Miami-Dade to the remainder of the United States in that year, percentage of deaths when reported on scene (25 vs. 23%, respectively) and within 1 h of injury (35 vs. 32%, respectively) were similar.

CONCLUSIONS: Nationally, FARS data demonstrated that two thirds of all MVC deaths occurred within 1 h of injury. Over a third of prehospital MVC deaths were potentially preventable in our local sample. By examining injury patterns in PPDs, targeted intervention may be initiated.

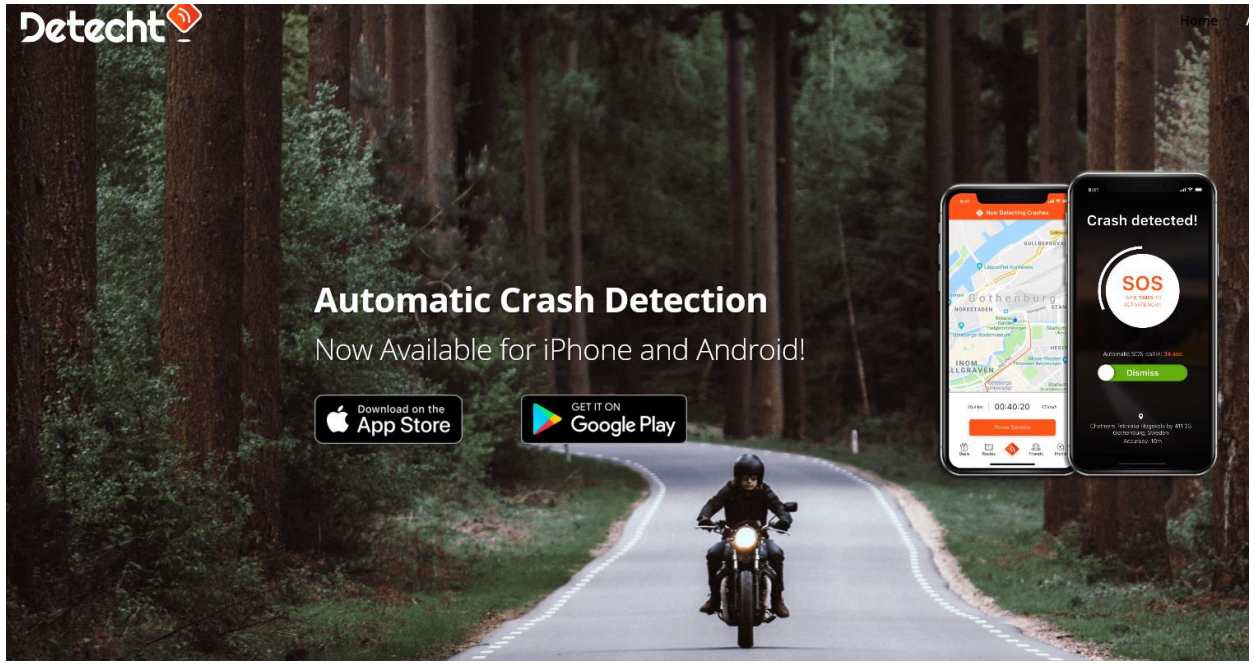
- 2/3 of the deaths occur within 1 hour
- 1/3 can be prevented

Reduce delays and improve precision in the initial diagnosis.

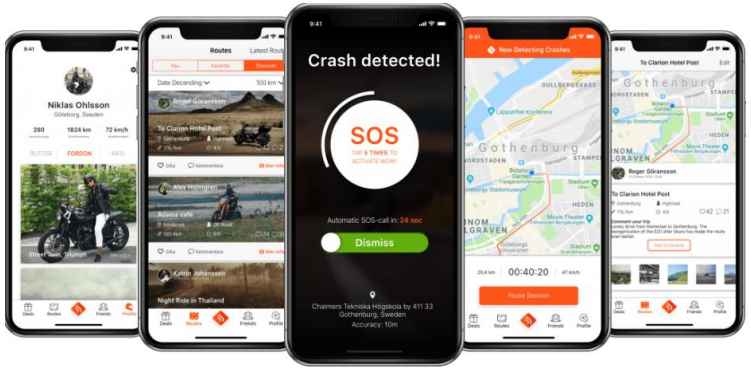
Can 100 fatalaties in Sweden be avoided?

FROM RESEARCH TO INNOVATION
DETECHT – AN eCALL FOR MC

The smartphone-based invention *Jalp!* developed to save lives of cyclists and All-terrain vehicle-drivers, and originated from SAFER, has been further developed for MC at Chalmers Ventures Entrepreneurship School. A company is now established under the name Detecht and an app is available for both IOS and Android.



DETECHT



Crash Detection

The app detects accidents through analyzes of driving data and changes in the smartphone's accelerometer, gyroscope, magnetometer and GPS.

Emergency contacts

Chose your personal in case of emergency contacts (ICEs), that will be notified with relevant information in case of an accident.

Emergency center (PSAP)

Detecht will alert the nearest emergency center 60 seconds from the moment of an accident, informing them about the location and injury level of the rider. Allow the rescue team to arrive sooner and better prepared to the place of the accident.

Medical Data

By providing relevant medical information, such as blood type, allergies and other medical history, the emergency service will know what kind of medical treatment that could be needed already before arriving to the crash scene.

Live-Tracking & Routes

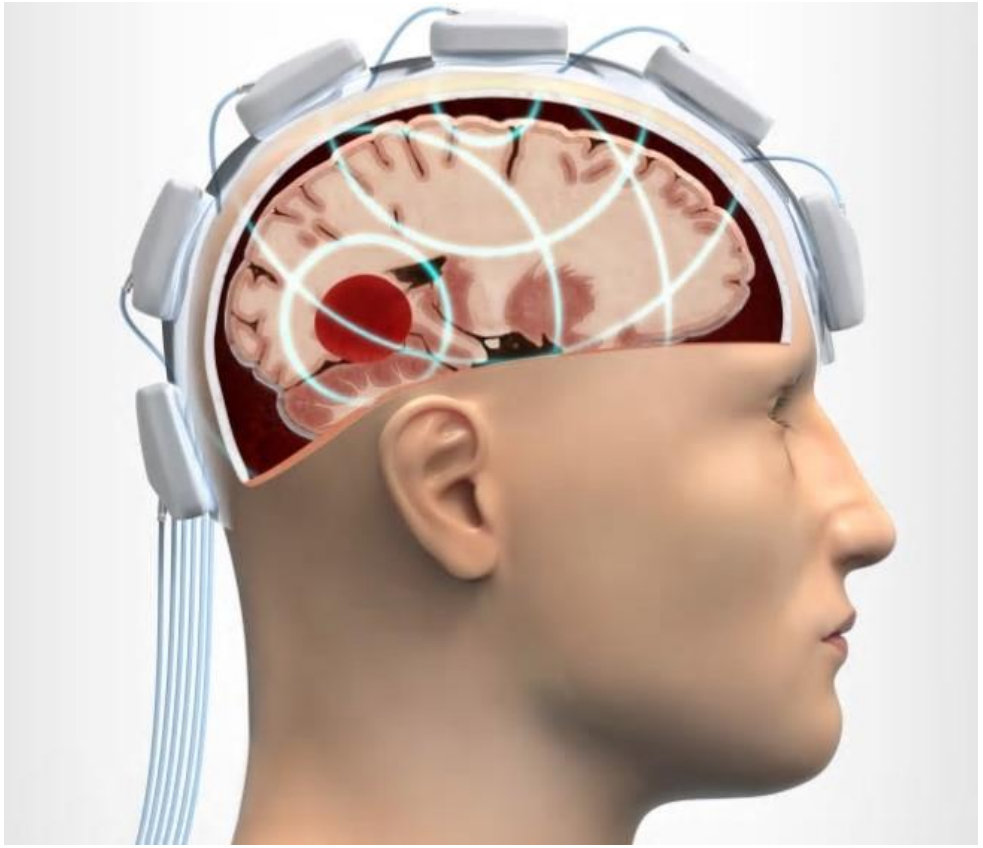
From now on, your loved ones will never need to worry for you. Show them exactly where you are once you turn on your live-tracking feature. Share your favorite routes and rank others, to find the best motorcycle routes near you!

Trip Statistics

With our interactive app you will be able to go back and track and revise your driving data. Discover 1000's of inspirational routes and plan for places to rest and refuel. Estimate what speed, lean angle and the routes you really appreciated.

SAFER
VEHICLE AND TRAFFIC SAFETY CENTRE AT CHALMERS

MICROWAVE HELMET CAN HELP SUPPORT RESCUE STAFF

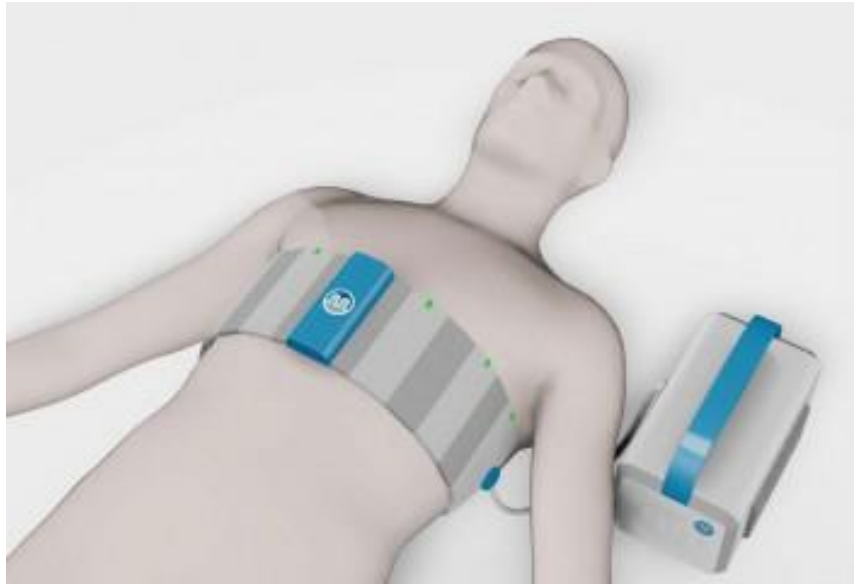


A project initiated from SAFER has stimulated ground breaking research on how a microwave “helmet”, including AI-algorithms, can yield fast and safe evaluation of head injuries (intra-cranial bleedings). The project has passed its first clinical study and the second is now running. The project has also gained significant attention in various media.

PREHOPITAL DIAGNOSIS FOR TRAUMATIC THORACIC INJURIES

Traumatic injuries cause about six million deaths per year worldwide, and many survivors suffer life-long disabilities. Traffic accidents are a common cause.

- In the project “Prehospital Diagnostics for Traumatic Thoracic Injuries” the intent has been to evaluate the use of microwave technology combined with electrical bioimpedance to diagnose and monitor presence of air and blood in the pleural space.
- Thoracic (related to chest) account for over a quarter of fatal and severe injuries. Two common thoracic severe injuries are presence of air and blood in the pleural space (between the membranes surrounding the lungs). These conditions can be life threatening and a diagnostic tool in the prehospital setting, i.e. in road and air ambulances can save lives.
- Initial tests with promising results have been carried out in animals together with among others the University of Stavanger, Norway.



PREHOSPITAL INJURY PREDICTION FOR TRAFFIC ACCIDENTS

based on machine learning algorithms and "Big Data"

BACKGROUND

- Main and thorax trauma constitute the majority of serious injuries as a result of traffic accidents.
- These injuries are often occult (hidden) and difficult to diagnose on the site / ambulance.
- Undertaking is common, treatment may be delayed.

THE PROJECT

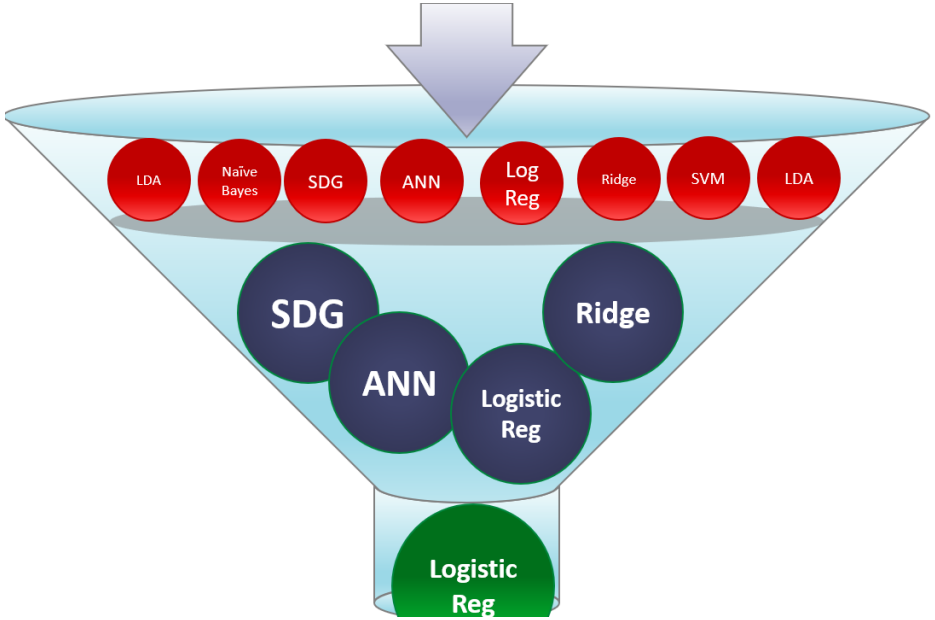
In a previous study the value of accident characteristics for field triage is evaluated by developing an **on scene injury severity prediction (OSISP) algorithm** using only accident characteristics that are feasible to assess at the scene of accident. This new project aimed to find out if the results could be improved through "**Big Data" methodology and advanced machine learning**?

PREHOSPITAL INJURY PREDICTION FOR TRAFFIC ACCIDENTS

based on machine learning algorithms and "Big Data"

WHAT WE DID

- By merging Swedish and American accident databases, we can create larger and more diversified data sets
- The first algorithm used the mathematical logistic regression method - can other machine learning methods provide improvements?



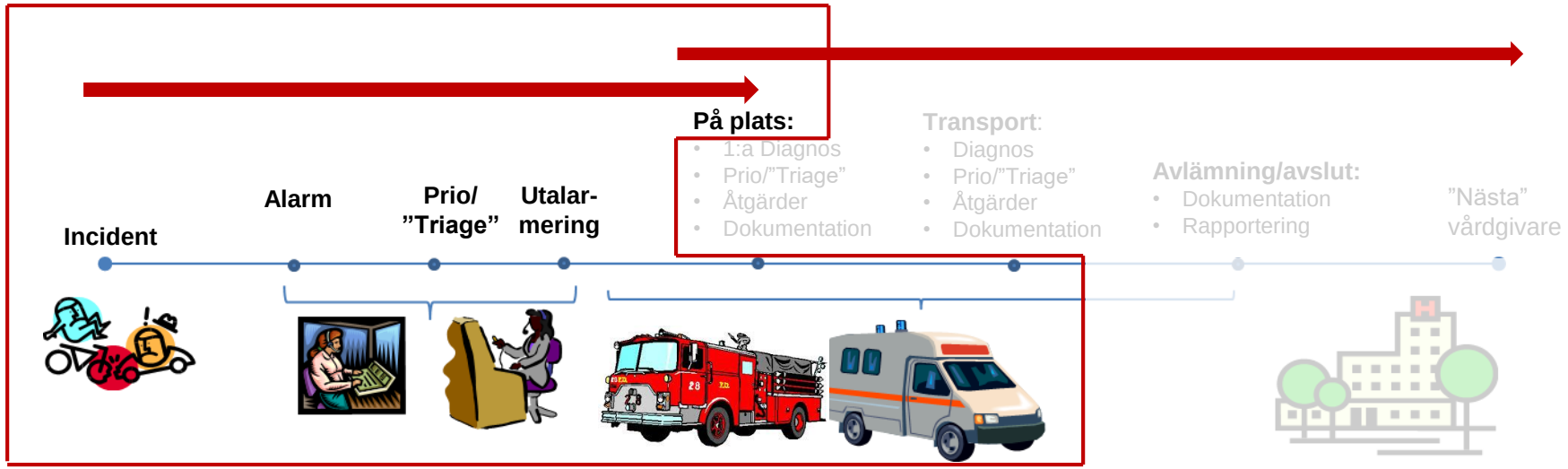
RESULTS

- OSISP has the potential to improve triage of traffic injuries in Sweden and the US
- Performance has improved from the previous algorithm
- <10 variables are sufficient, providing more easy-to-use tools
- Clinical evaluation next step

VIA APPIA –

AN IMPORTANT AND FOCUSED PROJECT IN SAFER STAGE 4

Rescue operation and prehospital care chain



How can we improve the situation for the injuried already in this phase of traffic accidents?

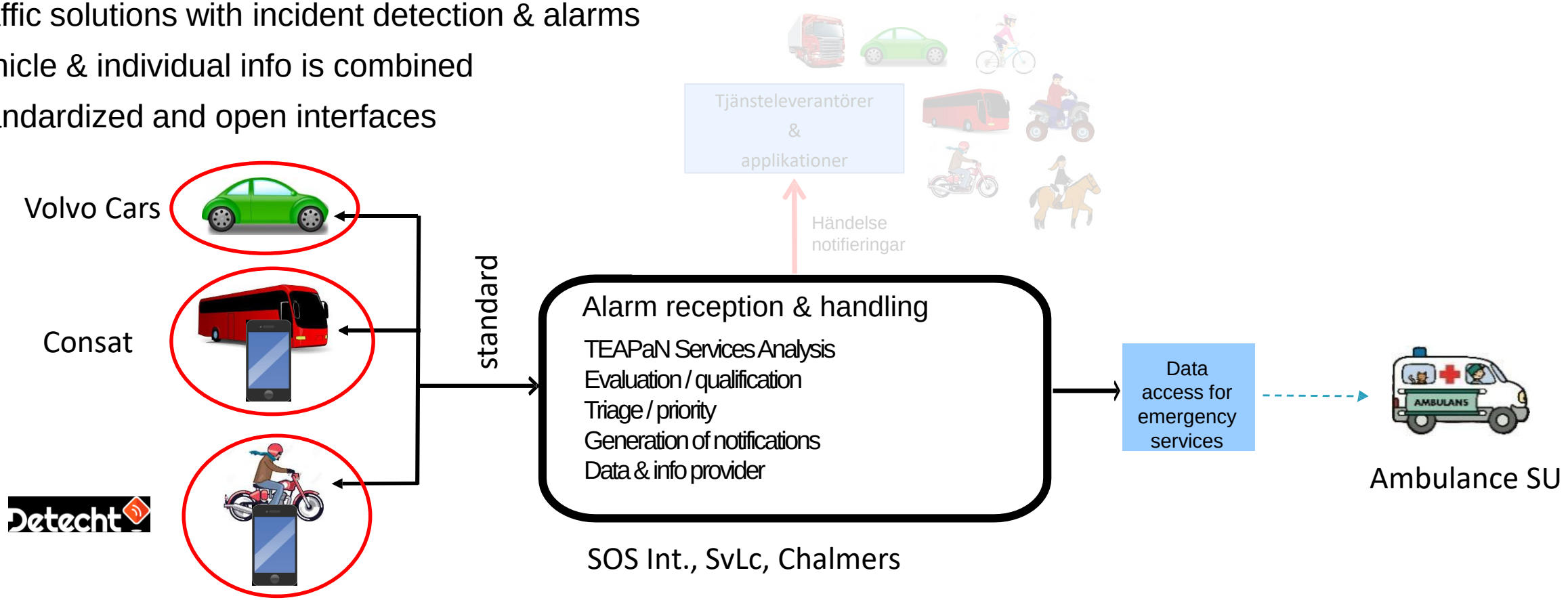
The right effort with the right priorities!

We cannot immediately send the very best at every incident - other things can have a higher priority

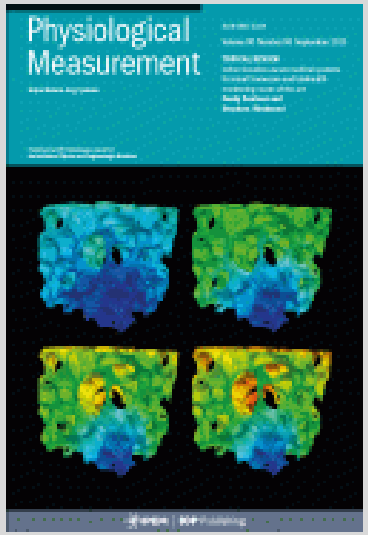
NEXT STEP OF VIA APPIA:

TEAPaN – **T**raffic **E**vent **A**ssessment, **P**rioritizing **a**nd **N**otification

- Different suppliers
- Traffic solutions with incident detection & alarms
- Vehicle & individual info is combined
- Standardized and open interfaces



VALUABLE PUBLICITY IN PRESTIGIOUS JOURNAL



Publications from the SAFER environment have attracted great international attention and received awards, e.g. SAFER researchers Rubén Buendia, Stefan Candefjord and Bengt Arne Sjöqvist was published in the very prestigious scientific journal **Physiological Measurement**. The title of the paper is Bioimpedance technology for detection of thoracic injury and gives in depth scientific information on how prehospital care can save lives, e.g. after a traffic accident. The article was selected into PMEA´s Highlights of 2017 Edition as **one of the very best research articles** which featured some of the most cutting-edge areas of biomedical engineering.

SAFER researchers Stefan Candefjord, Rubén Buendia and Bengt Arne Sjöqvist