

September 12, 2021

## EMS Safety and Innovation- the Future is NOW!



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Director of Research and Innovation, Emergency Health Services



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Much of what you shall hear today is thanks to the work of all of those in the:



and the National Academies of Science, Medicine and Engineering  
Transportation Research Board's ANB10(5) EMS Safety Subcommittee

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## Today's Outline

- Future is now!
- New World Order
- Cross skilling Industry and providers
- Innovation dimensions
- Cheaper Better Safer
- Open source
- Challenges

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## So what is safety?

- condition of being protected against undergoing or causing harm, injury or loss

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## And.. what is innovation?

- Something new, original and more effective

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## The Future is NOW!

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## Space based solar power, million mile battery, eVTOL & XR

### Morning Brief: Secret Air Force space plane to beam solar power to Earth, Tesla's 'million-mile' battery

Also in the brief: DOE kicks off \$230 million advanced reactor demonstration program, and the global coal industry will never recover from the Covid-19 pandemic.

MAY 18, 2020 ERIC WESOFF

The U.S. Air Force launched its secret X-37B space plane on Sunday for a long duration mission in low Earth orbit. Ahead of its fifth launch, the X-37B gave some (see details) about its cargo: a solar panel developed by the Naval Research Lab will be used to conduct the first orbital experiment with space-based solar power. The premise is to convert the sun's energy into microwave and beam it down, or ultra from space. [Read more in the 1940s.](#)

This experiment is closely related to the Air Force Research Lab's Space Solar Power (SSP) which is based on solar energy with high-efficiency solar cells, convert it to microwaves to beam it to earth — providing an energy source to forward operating bases with no traditional power sources. Air Force awarded Northrop Grumman a \$300M contract for development and testing of the program. [Source: U.S. Space Force, 1919.](#)

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Tesla CEO Elon Musk has been teasing investors and rivals with promises to reveal significant advances in battery technology at a "Battery Day" this month — now postponed. The new "million-mile" battery at the center of Tesla's strategy was developed with China's Contemporary Amperex Technology Ltd (CATL) and a team of battery experts recruited by Musk. Tesla's new batteries rely on low-cobalt and cobalt-free battery chemistries, and the use of additives, materials and coatings that will reduce internal stress and enable longer duration. The cost of CATL's cobalt-free lithium iron phosphate battery packs has fallen below \$100/kWh. CATL's low-cobalt NMC battery packs are close to \$100/kWh. [Source: Reuters.](#)

## eVTOL and XR

electric Vertical Take Off & Landing and mixed reality



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## Next is now!

- Fleet mix
  - Vertical take off vehicles
  - Drones- manned and unmanned
- Smart Technologies
  - AI dispatch
  - AI Ultrasound
  - Voice activated commands
  - Advanced Smart phone technology
- XR - Mixed reality
- Covid PPE and innovation
- Connected health
- Wireless patient monitoring
- Health Information Exchange (HIE) Applications

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## Be ready to deploy new and effective tools for both training and operations

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## New Solutions

- Training and education
- Operational tools
- PPE innovation
- New Transport Vehicles
- AI Support tools and adjuncts
- Community Engagement
- Scope of practice

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## Leadership and Innovation

- “Being responsible sometimes means pissing people off... By procrastinating on the difficult choices, by trying not to get anyone mad, and by treating everyone equally "nicely" regardless of their contributions, you'll simply ensure that the only people you'll wind up angering are the most creative and productive people in the organization.”



A Leadership Primer from General (Ret.) Colin Powell, Former Secretary of State, USA

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## Chris Cebollero, 2020

- "Leadership is not about position, it's about professional development."
- Leadership as a verb, it's an action not a position and everyone will influence someone else... for the good or the bad.

## New World Order

### September 10, 2021 – Pandemic Occupational Recommendations

<https://www.cdc.gov/coronavirus/2019-ncov/hcp/infection-control-recommendations.html>

Summary of Recent Changes

Updates as of September 10, 2021

- Updated source control recommendations to address limited situations for healthcare facilities in countries with low to moderate community transmission where select fully vaccinated individuals could choose not to wear source control measures, or general, the other practice is the wearing of a healthcare setting to wear source control.
- Updated quarantine recommendations for fully vaccinated patients who have had close contact with someone with SARS-CoV-2 infection to more closely align with recommendations for the community.
- Clarified the recommended intervals for testing asymptomatic HCP with a SARS-CoV-2 test.

### First Responders

<https://www.cdc.gov/coronavirus/2019-ncov/hcp/guidance-for-ems.html>

Interim Recommendations for Emergency Medical Services (EMS) Systems and 911 Public Safety Answering Points/Emergency Communication Centers (PSAP/EC) in the United States During the Coronavirus Disease (COVID-19) Pandemic

Updated July 15, 2020

This guidance applies to all medical first responders, including fire services, emergency medical services, and emergency management officials, who anticipate close contact with persons with suspected or confirmed Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) infection in the course of their work.

## Sept 11, 20 years on



## TOPTEC, September 11<sup>th</sup> 2001

- Risk Management Strategies
- Biomechanics
- Accident Analysis
- Ergonomics / Human Factors
- Crashworthiness
- Training Programs
- Legal Perspectives

SAE Presents ...

**MILITARY AND EMERGENCY VEHICLES SAFETY**

International Military and Emergency Service Experts will present their research on Accidents, Biomechanics, Vehicle Dynamics, and the United States will share their research!

Register by Priority August 31 for Special Early Bird Fee!

September 11-12, 2001  
Tempe, Arizona  
Embassy Suites Hotel

A two-day TOPICAL TECHNICAL WORKSHOP (TOPTEC) presenting the latest developments and ongoing research in Military and Emergency Vehicles Safety, including:

- Accident Analysis
- Risk Management Strategies
- Training Programs
- Legal Perspectives
- Biomechanics
- Ergonomics/Human Factors
- Mine Protected Vehicular/Tactical Vehicles
- Crashworthiness

## From 2001 Toptec - Needs

- Need for morbidity and mortality surveillance system
- National and International collaboration is key
- Current funding base is rate limiting to progress
- A defined pathway for translation of problem identification to resolution and policy implementation
- Need for appropriate overseeing infrastructure with development of safety performance standards

## From 2001 Toptec - Needs

- Focus on safety of ALL aspects of the ambulance environment
- Real dangers exist in some current practices
- Safer patient transport practices exist & should be used
- Importance of dynamic vs static safety testing
- Collaborative, interdisciplinary approach (bridging all involved disciplines) for design initiatives & setting of transport safety standards is essential

## EMS Agenda 2050

[https://www.ems.gov/pdf/EMS\\_Agenda\\_2050\\_Summary.pdf](https://www.ems.gov/pdf/EMS_Agenda_2050_Summary.pdf)

- Adaptable and Innovative
- Inherently Safe and Effective
- Sustainable and Efficient
- Integrated and Seamless
- Socially Equitable
- Reliable and Prepared



## Joe Bourgraf, President, Ferno Group

- “To create an innovative and model EMS system..., we must engage in a collaborative and cross-functional conversation among the many contributing partners in the EMS industry. EMS suppliers should embrace and drive new innovation.. to improve the process and efficiency of delivering service, while advancing the level and outcome of emergency care”

## From low tech to high tech

- System of Safety
- Think of the overall impact
- Small low cost changes in practice
- Policies that augment safety
- Innovation in design from micro to macro
- Preparedness and Training

## Safety of the...

- Provider
- Public
- Patient

## Safety is a tool to save

- Lives
- Time
- Money

must be evidenced based

## Work Smarter NOT Harder

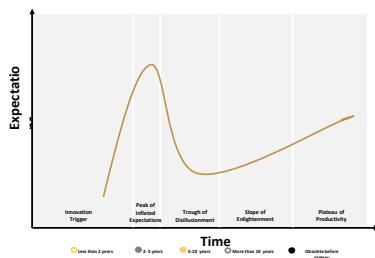
## To Do...

- The right thing:
  - At the right place
  - At the right time
  - For the right person
- How best to achieve that goal now and for the future??

## EMS Safety's frontier -

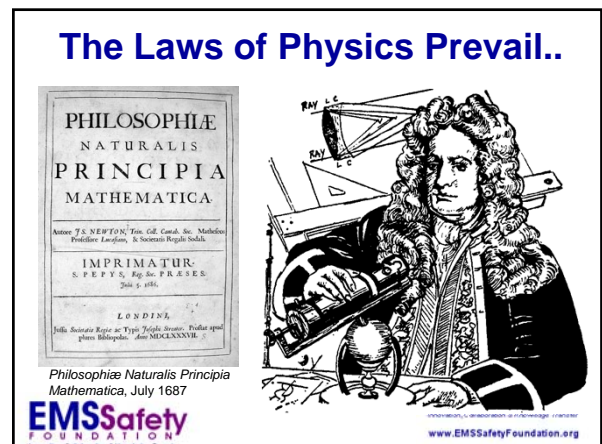
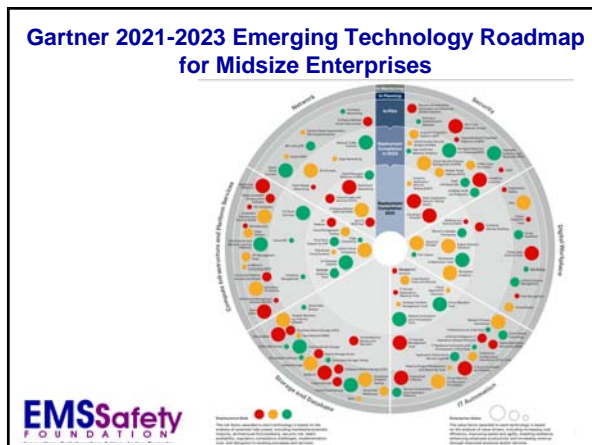
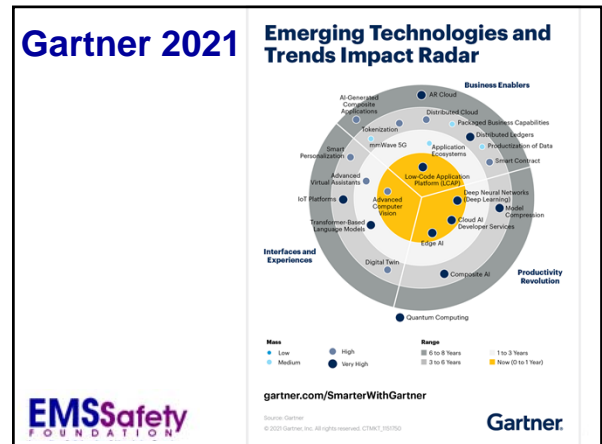
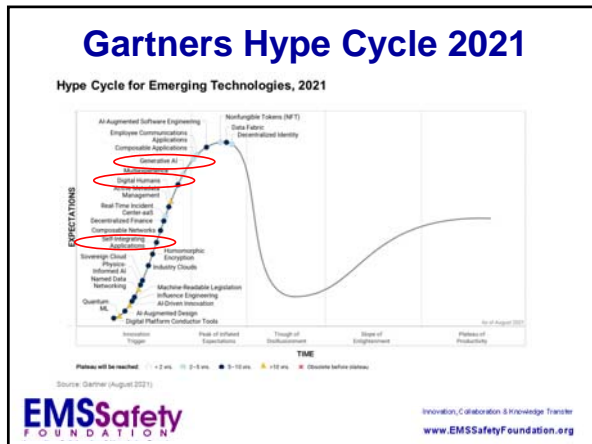
- the interface of disruptive new tech and operational practice at all levels of the EMS system and across disciplines

## Change, Adoption and Sustainability

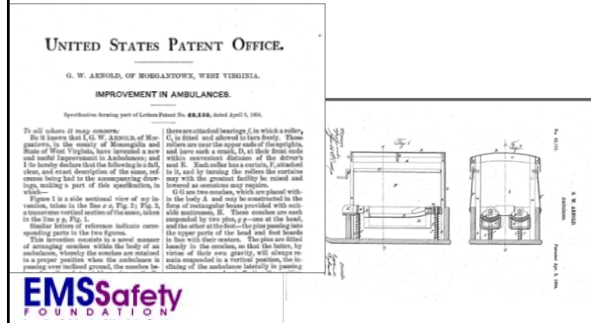


## Gartners Hype Cycle 2017





## 1864 Ambulance Design Patent re: safety of ambulance design > 150 years ago



## If you were to survey for what would enhance safety and efficiency then....

- Likely “more rest stations”
- Not likely – “the combustion engine”
- Let alone the Hydrogen powered eVTOL



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## Very Important Principle

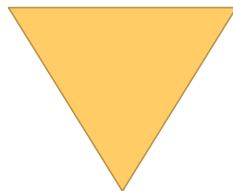
Ambulance transport safety is part of a SYSTEM, the overall balance of risk involves the safety of all occupants and the public



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## How does design happen in EMS

- Tradition
- Experience
- Vision
- Interdisciplinary



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## EMS Safety timeline

- Didn't know it was an issue – 60's-70's
- Knew it was an issue – but didn't really know what to do – 80's-90's
- Safety technical data rolls out – past 10 years
- **Change and adoption challenges – we are here now**



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## An All Hazard Safety Approach

- Multidisciplinary Hazard Analysis
  - Biological
  - Physical
  - Chemical
  - Psychological
  - Operational
- Applied use of state of the art technology to address and neutralize or minimize hazards



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## An Iron Dome for EMS....



Rockets (R) are seen in the night sky fired towards Israel from Beit Lahia in the northern Gaza Strip on May 14, 2021, while Iron Dome interceptors rise to meet them. (Photo by ANAS BABA / AFP)

## Effective technology to 24/7 minimize casualties and EMS burden September 12, 2021

Home | Israel News

### Gaza Rocket Intercepted Over Southern Israel for Third Consecutive Night

No casualties or damage reported

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Almog Ben Zikri

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Thu, 12, 2021 9:08 PM

A rocket fired from the Gaza Strip was intercepted Sunday over southern Israel, the Israeli military said in the third consecutive night of cross-border fire. No casualties or damage were reported.

Tension between Israel and the Palestinians has risen over the past week, after six Palestinian militants escaped from a maximum security Israeli jail on Monday. Israeli forces have since



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## Covid19, the 2020-? Pandemic



Ibrara-Lebanon Hospital Center medical staff stand outside of the emergency room bay, April 8, 2020 in New York City. (David Dine Delgado/Getty Images)



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## June 2020 New patterns of morbidity and mortality - a 10 fold increase in Out of Hospital Cardiac Arrest Deaths

Research

JAMA Cardiology | Original Investigation

### Characteristics Associated With Out-of-Hospital Cardiac Arrests and Resuscitations During the Novel Coronavirus Disease 2019 Pandemic in New York City

Parthiv H. Lal, MD, PhD, MSc; Elizabeth A. Lanasz, DPH, MPH; Michael D. Wadden, MS, MD; Mayra F. Wadler, DPH, MPH; Rachel Zeng-Owen, DPH, MPH; Charles B. Hall, PhD; David J. Preiser, MD

**IMPORTANCE** Risk factors for out-of-hospital death due to novel coronavirus disease 2019 (COVID-19) are poorly defined. From March 1 to April 26, 2020, New York City, New York (NYC), reported 17 188 COVID-19-related deaths. On April 6, 2020, out-of-hospital cardiac arrests peaked at 305 cases, nearly a 10-fold increase from the prior year.

Editor's Note



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## EMS Personnel at High Risk and above all prior occupational fatality risks

EMSS | NEWS PRODUCTS TOPICS SPECIAL CAREERS TRAINING GRANTS COVID-19

EMERGENCY MEDICAL SERVICES TRAINING FACILITIES & VEHICLE PLAYS

### EMS providers lost to COVID-19

Remembering our brother and sister EMTs and paramedics who died from COVID-19

Apr 29, 2021

EMSS | ELEXPOL

### CORONAVIRUS (COVID-19) SPECIAL COVERAGE

COMPLETE COVERAGE

First responders on the front lines, EMS providers in particular, are increasingly vulnerable to contracting the COVID-19, and the death toll includes a significant number of EMS personnel.

Here we have compiled the names of those EMS providers (EMTs, etc.) who have died from COVID-19, and the names of those EMS providers who have been hospitalized with the disease. Names and obituaries of our fallen heroes.



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## New Tragic Hazards for EMS by April 22, 2020 8 Covid-19 FDNY active duty deaths

NYC EMT Idris Bey dies of coronavirus, becoming 8th active FDNY member killed by pandemic

**Coronavirus News: FDNY mourns death of EMT from COVID-19**

NEW YORK CITY (EMS1) — The Fire Department of New York is mourning the loss of Emergency Medical Technician Idris Bey, 43, from COVID-19.

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## April 28, 2020 > 24 Covid19 USA EMS Provider deaths

**COVID-19: EMS deaths**  
Tracking the coronavirus-related deaths of EMTs and paramedics

Apr 28, 2020

**EMSS1** **ELEXPOL**  
**CORONAVIRUS (COVID-19)**  
**SPECIAL COVERAGE**

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## USA: 36 Covid19 EMS Provider Deaths AND 3 + suicide... in NYC alone March 2020 to September 2020

**Chart 2. EMS providers COVID-19 fatalities by month of death in 2020 (N = 36)**

| Month | Fatalities |
|-------|------------|
| Mar   | 1          |
| Apr   | 24         |
| May   | 4          |
| Jun   | 1          |
| Jul   | 1          |
| Aug   | 1          |
| Sep   | 1          |

The 26 victims came from 11 states. Figure 1 shows the distribution of states. Thirty six percent of the EMS providers were from New Jersey and 22% from New York. It should be noted that although we suspect that most of these victims died in their home states, at least one Colorado EMS provider died while on this EMS1 national publication content (EMS1 Equipment) in New York City under the National Incident Framework Emergency Support Function #3 Public Health and Medical Services (23).

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## 2020, Quarantined EMS Services

### FDNY monitoring new COVID-19 outbreak at Queens EMS station

Five EMS providers at the Astoria station have tested positive; union officials warned that the department may not be prepared for a second wave

Oct 14, 2020

NEW YORK — Five FDNY EMS providers at a station in Queens have tested positive for COVID-19, renewing warnings from union leaders regarding a potential second wave of the pandemic.

The department is closely monitoring the outbreak at the Astoria EMS station with contact tracing and additional

### Entire Mo. FD quarantined after FF tests positive for COVID-19

All 27 firefighters of the Lemay Fire Protection District, including the fire chief and deputy chiefs, are quarantined pending further test results

Yesterday at 5:38 PM

St. Louis Post-Dispatch

LEMAY, Mo. — Every firefighter in the Lemay Fire Protection District was under quarantine at home Thursday after a colleague tested positive for the coronavirus, a district official said.

The 311 calls that Lemay normally would handle were being rerouted to fire houses in Valley Park, Brenton, Affton and elsewhere. Crews are rotating the responsibility of filling in for Lemay, according to Jerry Schibus, chairman of

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## January 2021, First Responder Covid-19 Registry

**NEWSROOM**  
North Carolina Now First State in the Country to Launch Voluntary COVID-19 Registry for First Responders

January 28, 2021

The new tool will help state leaders understand how first responders are impacted by the virus and provide real time data on cases, quarantines, and vaccinations

**RESEARCH TRIANGLE PARK, N.C.** — Earlier this month, RTI International, a nonprofit research institute, and the Office of State Fire Marshal (OSFM), under the North Carolina Department of Insurance, released a statewide voluntary registry for fire fighters, emergency service workers, and other first responders to report COVID-19 cases, quarantines, and vaccinations. The new registry aims to expedite collection of this information from over 1,500 state departments and make it available to fire service and public health authorities in real time.

First responders have a higher risk of COVID-19 infections and tracking data in real time will help inform state leaders what resources are needed to increase safety.

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## Solutions out there

- PPE
- Handwashing
- Patient Barriers
  - Spectrum – high and low tech
- Air filtration systems - ?

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## April 2020 - PPE Shortages

**EMSWORLD**  
PPE ONLINE EXPO

### Calif. EMS Agencies Manufacture PPE Amid Shortage During COVID-19

04/29/2020

**PRESS RELEASE**

April 28th marks National Superhero Day and some California Ambulance services are leveraging their individual super powers to manufacture their own capes and masks. With continuing shortages of personal protective equipment (PPE) and lengthy delivery schedules, California Ambulance Association members have taken matters into their own hands and are locally manufacturing PPE. Members of the CAA's Inter Facility Transfer (IFT) Committee identified the ways they were individually creating PPE and

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## EMS Patient Isolation Design requirement/constraints

- Easy to get the patient in and out
- Contain aerosol pathogens
- Tolerable for the patient
- Cleanable or disposable
- Cost effective
- Time effective
- Does the WHOLE patient need to be contained

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**Dynamics of isolation chamber transports**

Medics  
4 May 2020  
Sean Bryan  
Share



**ion**  
ant Director of Medical  
ulance, shares the

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## Whole Vehicle Air Filtration Systems

- Is this a realistic tool in the time and physical constraints of an EMS system
- ? Practical
- ? Effective
- ? Cost effective
- ? System of solutions

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## Challenging design related Human Factors

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## Equipment hard to reach



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## Interior design exposes EMS to unnecessary biological, automotive and ergonomic hazards



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## New Tools, New Vehicles new industry relationships

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## Safety Dimensions we know

- Safe systems – CRM / transport system safety
- Risk perception
- Fleet and operations management
- Vehicle design safety
- Scene safety
- Patient Handling: physical & biological hazards
- Health and wellness
- Hours of service



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## TRB EMS Safety Summit

<http://www.EMSSafetyFoundation.org/2012TRBSummitMultimedialinks.pdf>



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## TRB TRANSPORTATION RESEARCH BOARD OF THE NATIONAL ACADEMIES

### The 2012 TRB EMS Safety Summit

print this page & your smart phone will play the 8 sessions from the QR codes



- 1: Intro & Data and Recent Initiatives
- 2: Transport, Human Factors - Bridging Diverse Disciplines
- 3: Testing and Standards
- 4: New systems safety technology solutions & telematics
- 5: Fleet management strategies
- 6: Innovative Vehicle Design
- 7: Operationalizing Safety
- 8: Panel: How to optimize the safety of your existing fleet  
Wrap up – from Prof. Art Cooper



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## Now we have many new technologies

- Fleet management tools
- Diverse vehicle types and design & Drones
- Robotic tools
- AI augmented Dispatch
- AI Ultrasound
- XR – AR, VR
- Connected Digital Health
- The Cloud
- The Crowd

..... that we need to harness



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## Fleet telematics tools

The article discusses the benefits of telematics for fleet safety and operational performance, mentioning the use of electronic on-board recorders (EOBRs) and the importance of data in improving driver behavior and vehicle maintenance.



## Telematics

- How much technology and data and of what type do you need to improve fleet safety performance



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## Integrated crowd sourcing

SAVING TIME. SAVING LIVES.

- Integrates with Waze to help call centers pinpoint traffic events and avoid emergency units along their routes
- Alerts users upon detection of service that does not meet established standards
- Displays real time with past incident data on target areas, including weather in PULSE Live and PULSE mobile
- Replays system-wide events to review and optimize and assignments and route changes
- Delivers dashboard analytics, real time status feedback, and on demand reports

It partners with

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## Community Outreach –2020 Crowdsourcing intervention

Layperson reversal of opioid overdose supported by smartphone alert: A prospective observational cohort study

David C. Schwartz<sup>1,2</sup>, James Robinson<sup>3</sup>, Alexis Roth<sup>4</sup>, Catherine Martin<sup>5</sup>, Michael Valasek<sup>6</sup>, Benjamin Chouhan<sup>7</sup>, Michael Chouhan<sup>8</sup>, Stephen Galloway<sup>9</sup>

<sup>1</sup>Department of Emergency Medicine, University of Michigan, Ann Arbor, Michigan, USA; <sup>2</sup>Department of Emergency Medicine, University of Michigan, Ann Arbor, Michigan, USA; <sup>3</sup>Department of Emergency Medicine, University of Michigan, Ann Arbor, Michigan, USA; <sup>4</sup>Department of Emergency Medicine, University of Michigan, Ann Arbor, Michigan, USA; <sup>5</sup>Department of Emergency Medicine, University of Michigan, Ann Arbor, Michigan, USA; <sup>6</sup>Department of Emergency Medicine, University of Michigan, Ann Arbor, Michigan, USA; <sup>7</sup>Department of Emergency Medicine, University of Michigan, Ann Arbor, Michigan, USA; <sup>8</sup>Department of Emergency Medicine, University of Michigan, Ann Arbor, Michigan, USA; <sup>9</sup>Department of Emergency Medicine, University of Michigan, Ann Arbor, Michigan, USA

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## Cardiac Arrest.... Engage bystanders!

| Intervention Status        | 1-Yr Risk of Death from Any Cause (%) | 1-Yr Risk of Brain Damage or Nursing Home Admission (%) |
|----------------------------|---------------------------------------|---|
| EMS-witnessed              | ~9                                    | ~10   |
| Bystander CPR              | ~8                                    | ~10   |
| Bystander defibrillation   | ~4                                    | ~10   |
| No bystander resuscitation | ~16                                   | ~20   |

Figure 4. Absolute Risk of Anoxic Brain Damage or Nursing Home Admission and Death from Any Cause at 1 Year of Follow-up According to EMS-Witnessed and Bystander-Intervention Status.

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## Wearable tech..

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<http://www.visimobile.com/visi-product-info/>

Product Information

- Visi Mobile Home
- Overview
- Benefits
- Explore
- Product Information
- Clinical
- Technical
- Business
- FAQ
- Training
- System Wireless Home

CONTACT US FOR A LIVE DEMO

PRODUCT INFORMATION

Visi Mobile introduces the Visi Mobile System, a comprehensive vital sign monitoring platform designed to keep clinicians connected to their patients, whether the patient is in or out of bed or in transport. The Visi Mobile System is the only monitor that allows clinicians to continuously monitor all vital signs with 99.9% accuracy, in a wearable and non-invasive package. Now, when a patient's blood pressure and heart rate dip, you'll know immediately. The Visi Mobile System also monitors respiratory rate, SpO2, temperature, and more. The Visi Mobile System will also include future updates: "Mobile" and "Home" versions.

Visi Mobile is a "best of the best" system, designed to enhance patient safety through early detection of signs of patient deterioration and prevent discussions with their patients, providers, and family.

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Learning from our international colleagues  
[www.Rettmobil.com](http://www.Rettmobil.com)



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The old  
 expensive and  
 not versatile

and the new...

Rapidly and  
 game changing  
 technology and  
 cheaper, better,  
 very versatile



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**Fleet Mix ?**



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**The Motorcycle Medics**



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EM FOUN

Page Transfer  
#Eon.org



## SimRec - Ben Gurion University's State of the Art Healthcare Simulation & Training Center – opening 2021

Brainchild of Dr. Oren Wacht PhD Paramedic  
<https://in.bgu.ac.il/en/simrec>



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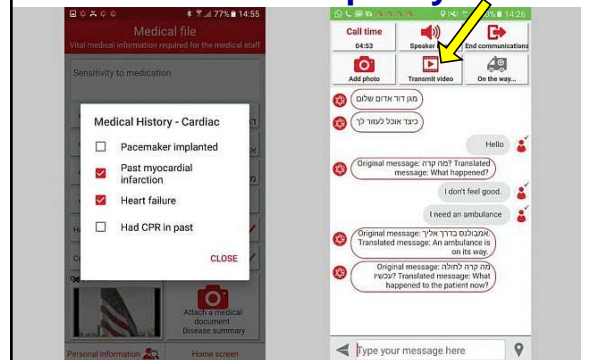
## Israel Magen David Adom - MDA

- The MDA fleet
  - Mobile Advanced Life Support Units (MALSUs [Hebrew: "NATAN"])
  - Advanced Life Support Ambulances (ALSAs [Hebrew: "ATAN"])
  - Standard Ambulances
  - Mobile Mass Casualty Incident Units (MMCIUs [Hebrew: "TARAN"])
  - Command and Control Vehicle
  - Ambulances equipped with 4 X 4 wheel drive
  - All Terrain Vehicle – Ambulance (ATV - Ambulance)
  - MDA - Helicopter, Segway
  - Advanced Life Support Motorcycles
  - Supervisor Vehicle.

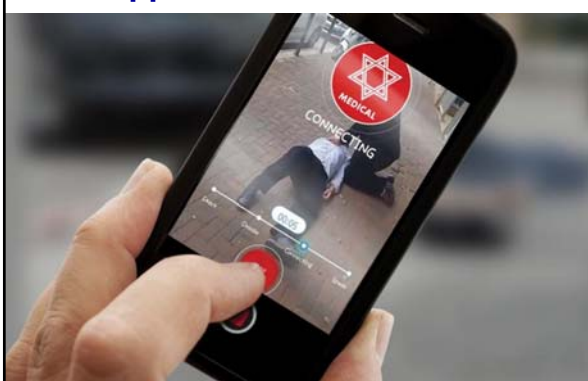
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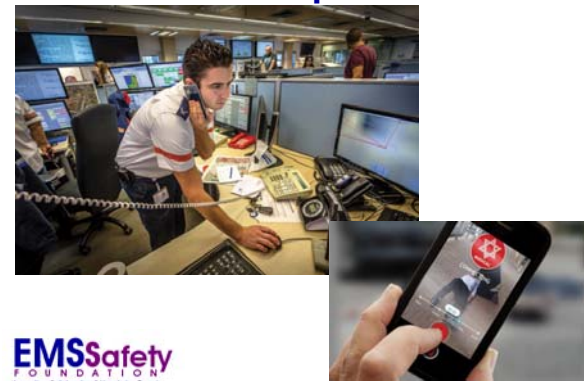
## MDA App – Medical Hx & Video transmit capacity



## MDA App with scene video connect



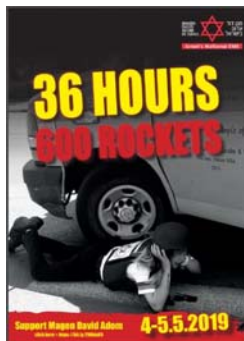
## MDA Dispatch



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## Constant preparedness a reality



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## MDA Innovation

Eli Jaffe EMT-P, PhD – MDA Deputy Director  
General-Community & International Relations

### Israeli EMTs train Americans to deal with mass casualties

Magen David Adom paramedics provide Jewish, Muslim and Christian Americans with tools for dealing with emergencies.



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Members of the First P Flatoon course given by Magen David Adom paramedics in Philadelphia. Photo courtesy of MDA

## Mass casualty drills & Eli Jaffe EMT-P, PhD's moulage T-Shirts



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## New Models in the Corona Era

- 25- 30% EMS runs are non transport
- 30% of EMS transports to the ED are discharged home within 4 hours
- 24/7 national physician video interactive telemedicine support for these cohorts

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## EMS Triage... no.. Voting booth



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## Multicultural service



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## Innovation!!

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## A Simple Practical Solution compact patient barrier – Ferno Covid Shield



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## 2020 – Industry Cross-skilling soda to O2 delivery systems



Israeli Company SodaStream Creates New Breathing Machine to Fight COVID-19

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## Ultrasound and EMS

Journal of Trauma Research, Emergency Medicine, 2021, 29, 124  
Published online 2021 Aug 26, doi: 10.2196/13669-22102533

PMID: 34639081  
PMID: 3448523

**Point-of-care ultrasound (POCUS) practices in the helicopter emergency medical services in Europe: results of an online survey**

Patel, Jibran, Caruso, M, Mariani, F, Strack, F, Berczak, Rudolph, J, Jansen, Koenen, F, Leif, Stenlund, J, Jinn, Adam, F, Cao, Sheng, F, Lata, Johannes, M, Rappold, Eric, T, Matuszewski, D, Christensen, T, Costello, David, S, Frenkel, M, Abu, Karem, P, and POCUS in HEMS collaborators

Author information · Article metrics · Copyright and License information · Disclaimer

### Associated Data

Supplementary Materials

### Abstract

Go to 10

### Background

The extent to which Point-of-care of ultrasound (POCUS) is used in different European helicopter EMS (HEMS) is unknown. We aimed to study the availability, perception, and future aspects of POCUS in the European HEMS using an online survey.

### Method

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## Ambulance Safety Innovation

### Design Module 1.0

[www.INDEMO.info](http://www.INDEMO.info)

the future concepts you can  
have right now!!!

*Better, safer and cheaper*

**INDEMO** 1.0  
POWERED BY EMS SAFETY FOUNDATION



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### LED lights on the stretcher

Simple equation

- Strip of LED lights + small battery + switch = \$20
- Can see where the stretcher is going at night
- Fewer tripping injuries, fewer dropped patients

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### Voice Activated

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## The Virtual World XR (VR, AR, MR) – and EMS

| VIRTUAL REALITY (VR)  | AUGMENTED REALITY (AR)  | MIXED REALITY (MR)  |
|---|---|---|
| Fully artificial environment  | Virtual objects overlaid on real-world environment                                | Virtual environment combined with real world                                      |
|  |  |  |
| Full immersion in virtual environment   | The real world enhanced with digital objects                                      | Interact with both the real world and the virtual environment                     |
|  |  |  |

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## Virtual Reality First Aid/EMS

- VR Patients - Virtual Reality Scenarios that you can build, April 2020 – and with gratis Covid19  
<https://www.VRpatients.com>
- Real First Aid, First Aid and MCI VR both physical simulation scenarios Jan 2018
- Haseeb Iqbal, Published on Jan 27, 2018  
– Virtual Reality CPR created for the Oculus Rift using Unreal Engine 4. Integrated with Leap Motion technology  
<https://www.youtube.com/watch?v=Vq7sKq7J4p>
- IRC ircouncil, Published on Oct 10, 2017  
– Project by Italian Resuscitation Council  
– Scientific Supervision: Federico Semeraro, Andrea Scapigliati & Giuseppe Ristagno  
– VR development: Studio Evil s.r.l.  
<https://www.youtube.com/watch?v=Spd1hrVXQ>
- ResusCouncilUK, Published on Sep 8, 2017  
– A virtual reality game-in-a-film that teaches you to save a life. Step inside, save a life.  
– Play now - <http://lifesavervr.org.uk/> <https://www.trustedtraining4u.co.uk/vr-training> <http://dualboothhealth.com/info/>  
– <https://www.youtube.com/watch?v=QzUJwS3W5A>
- Virtual Education Systems, Published on May 16, 2017  
– This video is showcasing the abilities of VRPatients.  
– [https://www.youtube.com/watch?v=K\\_hfSR0o0tg](https://www.youtube.com/watch?v=K_hfSR0o0tg)  
– <https://virtualeducation.com/>
- Marco Vettorello, Published on Sep 3, 2017  
– First test of teaching defibrillation (AED) with the HTC Vive in a homemade Unity scenario  
<https://www.youtube.com/watch?v=MPtzzd9kw>

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## VR Training for ACLS



<https://healthscholars.com> IMMERSIVE, REPEATABLE ACLS SIMULATION TRAINING DESIGNED FOR FIRST RESPONDERS.

## The NEXT LEVEL VR Scenario Training AUTHORABLE – by YOU!!

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## Virtual Reality Patients – EMS



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## DIY VR Training and evaluation tools just like making a Power Point



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[www.EMSSafetyFoundation.org](http://www.EMSSafetyFoundation.org)

[www.VRpatients.com](http://www.VRpatients.com)

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**VR Training that you can create**

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www.EMSSafetyFoundation.org

VRpatients.com  
REQUEST A DEMO

ASSESS  
MONITOR  
TREAT

REAL LIFE TRAINING *without* REAL LIFE CONSEQUENCES

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VRpatients.com

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www.EMSSafetyFoundation.org

**VR – CPR training**  
<http://dualgoodhealth.com/info/>

Virtual Reality in First Aid training  
Engaging and informative scenario simulation

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**VR EMS violence training**

- AmbulanceVic,
  - Feb 2017, Virtual Reality training for all Ambulance Victoria paramedics to better protect them from violence as they respond to medical emergencies.
  - Ambulance Victoria is using Virtual Reality to help paramedics manage violence and aggression in the workplace.

[www.globalfrontline.com.au](http://www.globalfrontline.com.au)  
<https://www.youtube.com/watch?v=lQhxrF5tvFA>

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**Virtual Reality**  
**A new design tool too**

**Exploring the inside of a virtual ambulance**

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## eVTOL, October, 2020



The Vertical Flight Society's 76th Annual Forum & Technology Display is the world's leading international technical event on vertical flight technology. The virtual conference will span 4 days and include 230+ technical papers on every discipline from Acoustics to Unmanned Systems, as well as invited presentations and discussions by leaders in the military, government agencies and industry.

The Technology Display, running concurrent with the Forum, is the most extensive exposition of cutting edge vertical flight technologies in the world, and also includes other technologies more broadly applicable to aerospace in general. Leading manufacturers, service providers, defense agencies, universities, and research and development organizations will showcase the very latest in vertical flight technology in our virtual exhibit hall.

Take a look at our Forum 76 Program Overview to see what we have planned!



## Unmanned Ambulance drones



**FlyPulse**  
@FlyPulseAid  
Develops drone systems for rescue missions

© 2018 Twitter  
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## Manned Drones



argodesign's drone ambulance quickens emergency responses

Small passenger drones to link airports in the emergency zone

## eHang passenger drone



## ? The ambulance of the future

First passenger drone makes its debut at CES

Chinese entrepreneurs bring their one-person craft, which is controlled by tablet and capable of flying 60mph, to the annual technology convention



Passenger drone powered by batteries unveiled at CES

A Chinese company claimed a world first on Wednesday by unveiling a drone capable of carrying a human passenger.



## Thought leaders – Urban Aeronautics Ambulance Transport Safety 2002

*X-Hawk:  
The Revolutionary, Modular, Aerial Vehicle*



Whereas most designs for new, aerial vehicles offer incremental improvements in the state of the art, the X-Hawk flying platform presents a revolutionary advance in both the mobility and utility of aerial vehicles. Simply put, nothing like it has ever hit the market before.



## Urban Aeronautics, 2020

**Urban Aeronautics To Develop Emergency Response Flying Vehicle With Hatzolah Air**

Urban Aeronautics CEO has designed a made-in-Israel flying car

The car is able to take off the ground with two compressors located at its base.

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## Unmanned operational Prototype

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### Urban Aeronautics CityHawk for Rescue & EMS

**Unprecedented Safety** "fly anywhere, land anywhere"

- No exposed rotors
- Emergency parachute
- Flight in long corridors
- Automatic safety
- One-way
- Unpowered safety

Copyright © 2020 Urban Aeronautics, Ltd.

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## EVTOL, Hydrogen powered, 2021

FutureFlight PROGRAMS LATEST NEWS SPECIAL REPORTS ON THE RADAR LOGIN REGISTER

Urban Aeronautics has unveiled a redesigned version of its CityHawk eVTOL aircraft, which will now feature a hydrogen-electric propulsion system to drive its ducted fans. (Image: Urban Aeronautics)

**URBAN AERONAUTICS SWITCHES TO REDESIGNED HYDROGEN-POWERED CITYHAWK EVTOL AIRCRAFT**

CHARLES NICHOL / JULY 14, 2021

Urban Aeronautics is aiming to retain the CityHawk's current projected range, speed, and payload when it replaces the aircraft's current Safran Arriel turboshaft engine with a propulsion system based on myPoint's new hydrogen fuel cells. The company recently completed the latest round of initial flight trials using the current technology demonstrator and aims to build the first of the new version in 2022.

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## September 29, 2020

### Jet suit paramedic takes Lake District test flight

Inventor Richard Browning puts potentially life-saving suit through its paces in 'groundbreaking exercise'

Defying gravity as they braver over water before slipping across mountainous landscapes and landing with pinpoint accuracy, the jet suit paramedic could soon form part of what could become an extraordinary new service being trialled in the Lake District.

If given the green light by ambulance service chiefs, the paramedic powered by lightweight jet-packs would fit across treacherous terrain within minutes to reach stranded casualties.

In an awe-inspiring test flight, the inventor Richard Browning, looking distinctly like Marvel's Iron Man, put the suit through its paces on the Langdale Piles.

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# AI

## the good the bad and the ugly

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## AI and EMS

AI ambulances and robot doctors: China seeks digital salve to ease hospital strain

WANGZHONG, CHINA (HONGKONG) (Reuters) - In the eastern Chinese city of Wuzhong, an ambulance speeds through traffic on a wave of green lights, helmed along by an artificial intelligence (AI) system and big data.

**Revealed: how AI will transform Dubai ambulance services**

Emergency Response project aims to transform every Dubai resident into a potential lifesaver




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## AI and EMS Dispatch

### Becoming The Best In The World At Detecting Cardiac Arrest

AI detects cardiac arrest

Emergency services in Denmark are embracing the help of artificial intelligence to analyse emergency calls along with a human operator



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## AI is good, and so are dispatchers

Effect of Machine Learning on Dispatcher Recognition of Out-of-Hospital Cardiac Arrest During Calls to Emergency Medical Services: A Randomized Clinical Trial

**Abstract**

**IMPORTANCE** Emergency medical dispatchers fail to identify approximately 20% of cases of out-of-hospital cardiac arrest (OHCA), resulting in opportunities to save lives by initiating cardiopulmonary resuscitation.

**OBJECTIVE** To examine how a machine learning model trained to identify OHCA and alert dispatchers during emergency calls affected OHCA recognition and response.

**DESIGN, SETTING, AND PARTICIPANTS** This double-blind, 2-group, randomized clinical trial analyzed all calls to emergency number 112 (equivalent to 911 in Denmark). Calls were processed by a machine learning model using speech recognition software. The machine learning model assigned incoming calls, and calls in which the model identified OHCA were randomized. The trial was performed at Copenhagen Emergency Medical Services, Denmark, between September 1, 2018, and December 31, 2019.

**INTERVENTION** Dispatchers in the intervention group were alerted when the machine learning model identified out-of-hospital cardiac arrest, and those in the control group followed normal protocols without alert.

**MAIN RESULTS AND MEASURES** The primary and key result was the rate of dispatcher recognition of out-of-hospital cardiac arrest.

**RESULTS** A total of 103 000 emergency calls were analyzed, of which the machine learning model identified 242 as suspected OHCA. Calls were randomized to control (50 000) or intervention (52 999) groups. Of these, 106 (0.21%) and 100 (0.19%), respectively, had confirmed OHCA. The mean OHCA age among these 206 patients was 70.0 (SD, 9 years), and 49% of 627 patients (67%) had higher mortality than expected.

**CONCLUSIONS** This study supports that while a machine learning model assigned dispatchers a greater number of out-of-hospital cardiac arrests than dispatchers alone, this did not translate into improved overall patient recognition by dispatchers.

**KEY POINTS**

**Question** Can a machine learning model help reduce the number of missed out-of-hospital cardiac arrests?

**Findings** In this randomized clinical trial of 103 000 emergency calls, a machine learning model trained to call alert dispatchers during emergency calls did not affect the number of dispatchers' cases of suspected cardiac arrest. There was no significant improvement in recognition of out-of-hospital cardiac arrest among calls in which the model alerted dispatchers on those in which it did not. However, the machine learning model had higher mortality than expected.

**Meaning** These findings support that while a machine learning model assigned dispatchers a greater number of out-of-hospital cardiac arrests than dispatchers alone, this did not translate into improved overall patient recognition by dispatchers.

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## AI, Ultrasound and EMS

With industry-leading AI to help you diagnose with confidence, Kosmos isn't just another POCUS tool. It's a whole new paradigm for patient care.

- Full Torso Imaging**  
Clinical clarity without compromise. Precision-grade imaging of the heart, lungs, and abdomen in a handheld, portable ultrasound tool.
- AI Powered POCUS Workflow**  
Kosmos AI guides the probe for the best possible view. Machine learning, built-probes, images in real time. Our AI-powered workflow helps improve detection and reduce workflow time in seconds.
- More than just Ultrasound**  
ECG, ultrasound, auscultation, CW and PW integrate seamlessly for a more holistic view of the patient and bring valuable information to medical decision-making, triage and patient care.
- Easy to Carry, Handle, and Clean**  
Kosmos fits in your pocket, and with built-in light on the handle, you can keep your hands clean & dry while you use the patient. A carry bag ensures you don't need to store and disinfect between calls.
- An Intuitive Education Platform**  
Traditional ultrasound education is time-intensive, but learning about Kosmos is streamlined. Our Model AI software accelerates the learning process, ensuring you're a new generation of doctors to be built in minutes.

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## .... AI, a work in progress

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## Tesla AI and Emergency Vehicles

### September, 2021

September 2, 2021  
10:30 AM EDT  
Last updated 11 days ago

**Autos & Transportation**

### U.S. identifies 12th Tesla Autopilot car crash involving emergency vehicle

WASHINGTON, Sept 1 (Reuters) - U.S. auto safety regulators on Wednesday said they had identified a 12th crash involving Tesla Inc (TSLA) vehicles using advanced driver assistance systems in incidents involving emergency vehicles and demanded the automaker answer detailed questions about its Autopilot system.

**Tesla crashes, causes chain accident with police car, ambulance**

Police say the "Tesla was positioned on 'Autopilot'" at the time of the crash and was investigating whether the driver was drunk.



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## Very Important Principle

Ambulance transport safety is part of a SYSTEM, the overall balance of risk involves the safety of all occupants and the public

## Today's Challenges

- Adopting new technologies and practices that augment EMS performance and safety
- Embracing decentralization of health care
- Doing more with less – money and workforce
- Cross skilling EMS, industry and the community
- Systems thinking and practice

**Things can go wrong – but when there are sound safety policies and technologies in place, and the system is well prepared, you can minimize harm**



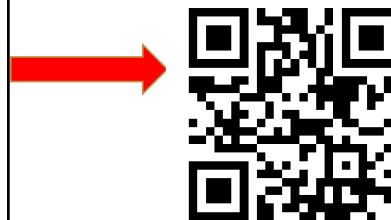
## EMS Systems Safety

- All Hazards Approach
- Technical Collaboration is key
- We cannot afford to play the silo game here, it is costing lives, time and money
- We MUST have a meaningful evidenced based approach to design, operations and policy
- We must be true outcomes driven

## Conclusion

- Future is now!
- All Hazards Approach is Key
- Safety must be inherent to operational process, design and practice
- Adoption challenges of new disruptive technologies and applied innovation exist
- Cross skilling industry, providers and community
- Interplay between patient, provider and public safety from a systems perspective is key to effective and safe operational EMS performance

**Your electronic handout/resource link with all text slides**



Or if you are > 45 years

[www.objectivesafety.net/PDFHO.htm](http://www.objectivesafety.net/PDFHO.htm)

<http://www.objectivesafety.net>  
Your Handout and Additional Resources

