

**DRONES,
GUERRE & PAIX...
& PAIX !**

Opportunités & défis

Matthieu HEIDET

SAMU 94 & Urgences
HU Henri Mondor (Créteil)

Pas de conflit d'intérêt

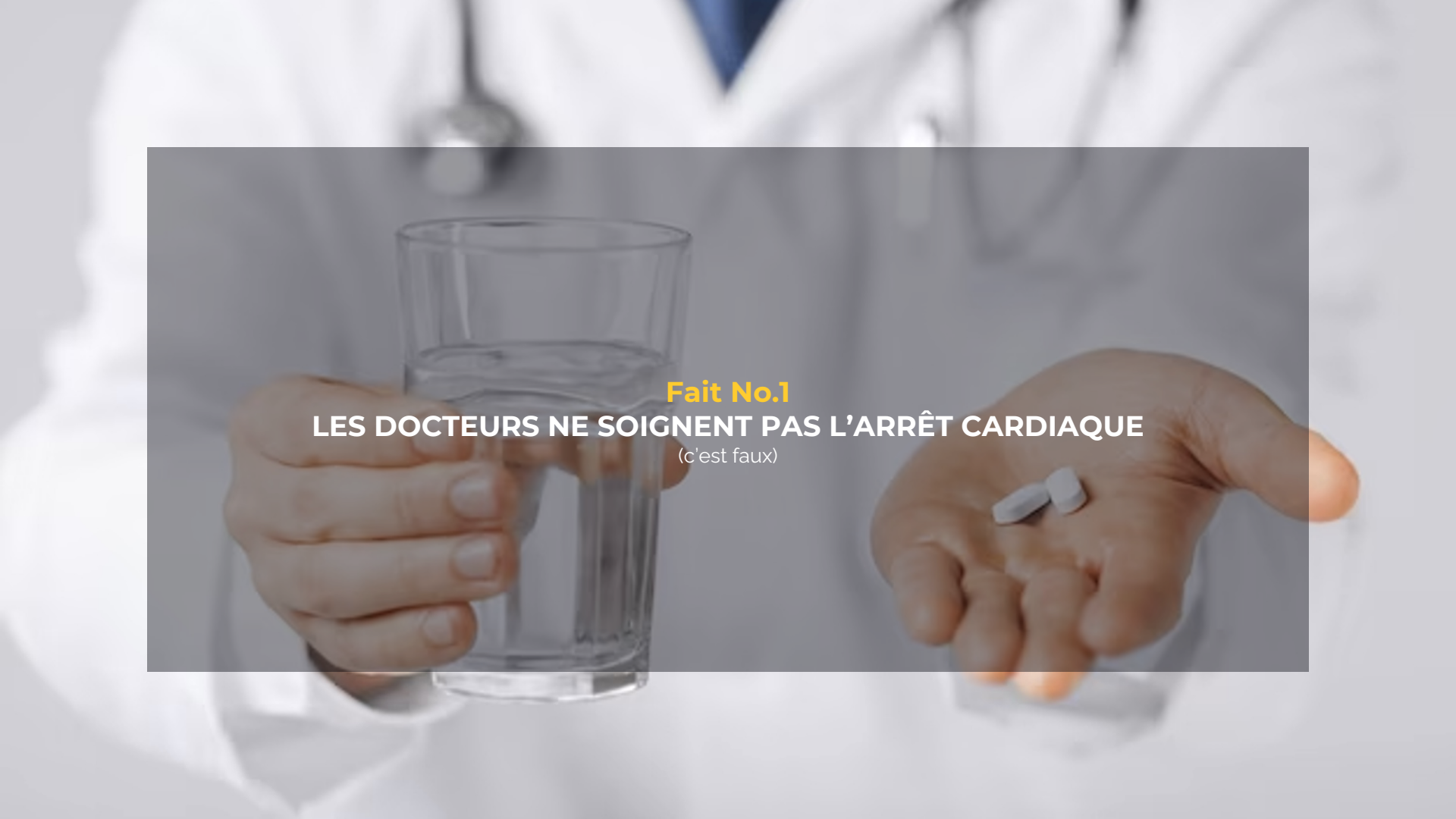
WSJ





A close-up photograph of a person lying down, wearing a blue shirt. A hand is resting on their back, and a white medical patch with a wire is attached to their chest. The background is blurred, showing other people in a clinical setting.

TIME
IS LIFE

A doctor in a white coat with a stethoscope around their neck is shown from the chest up. They are holding a clear glass of water in their right hand and two small, white, oval-shaped pills in their left palm. The background is a soft, out-of-focus grey.

Fait No.1
LES DOCTEURS NE SOIGNENT PAS L'ARRÊT CARDIAQUE
(c'est faux)

Epinephrine in Out-of-Hospital Cardiac Arrest

A Network Meta-analysis and Subgroup Analyses of Shockable and Nonshockable Rhythms

Shannon M. Fernando, MD  • Rebecca Mathew, MD • Behnam Sadeghirad, PharmD, MPH, PhD • ...

Paul Dorian, MDCM • Gavin D. Perkins, MBChB • Jerry P. Nolan, MBChB • [Show all authors](#)

Published: January 30, 2023 • DOI: <https://doi.org/10.1016/j.chest.2023.01.033>



ROSC et vivant à l'arrivée

Survie et CPC



A close-up photograph of a person wearing blue nitrile gloves. They are holding a small glass vial with a red cap and a syringe. The syringe is being used to draw liquid from the vial. The syringe has markings for 1, 2, 3, 4, and 5 ml. The background is a plain, light-colored surface.

Fait No.2
ADRÉNALINE, VITE !
(c'est provoc)

Time to Epinephrine Administration and Survival From Nonshockable Out-of-Hospital Cardiac Arrest Among Children and Adults

Matthew Hansen, MD, MCR, Robert H. Schmicker, MS, Craig D. Newgard, MD, MPH, Brian Grunau, MD, MHSc, Frank Scheuermeyer, MD, MHSc, Sheldon Cheskes, MD, Veer Vithalani, MD, — [SHOW ALL](#) — for the Resuscitation Outcomes Consortium Investigators | [AUTHOR INFO](#)

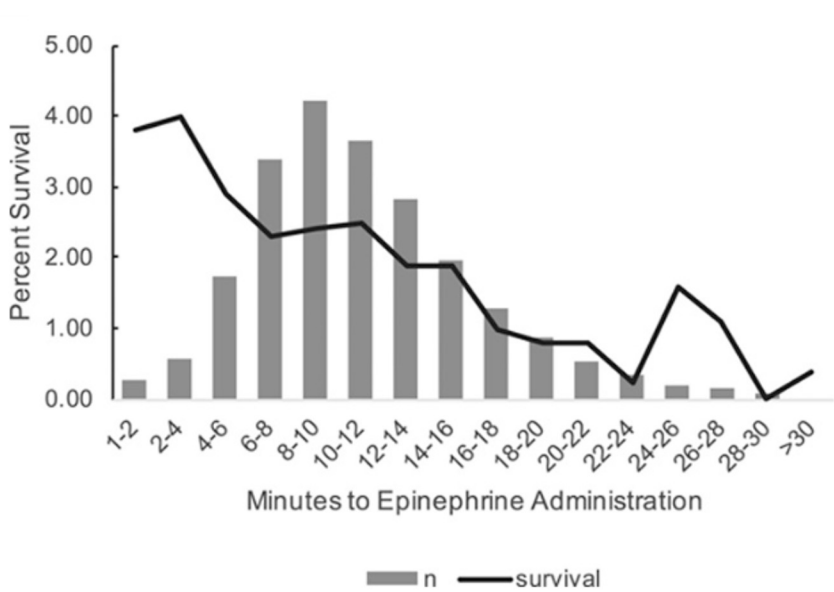


Figure 2. Unadjusted survival and number of patients that received epinephrine by 2-minute intervals. Epi indicates epinephrine.

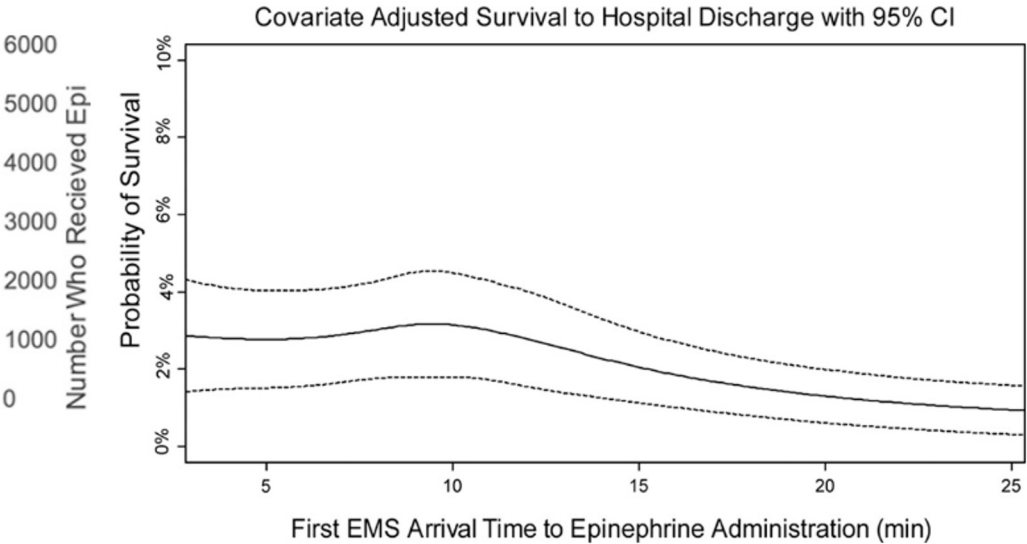


Figure 3. This analysis was conducted using average values for all covariates on the basis of adjusted analyses and was fit by using spline regression. CI indicates confidence interval; and EMS, emergency medical services.

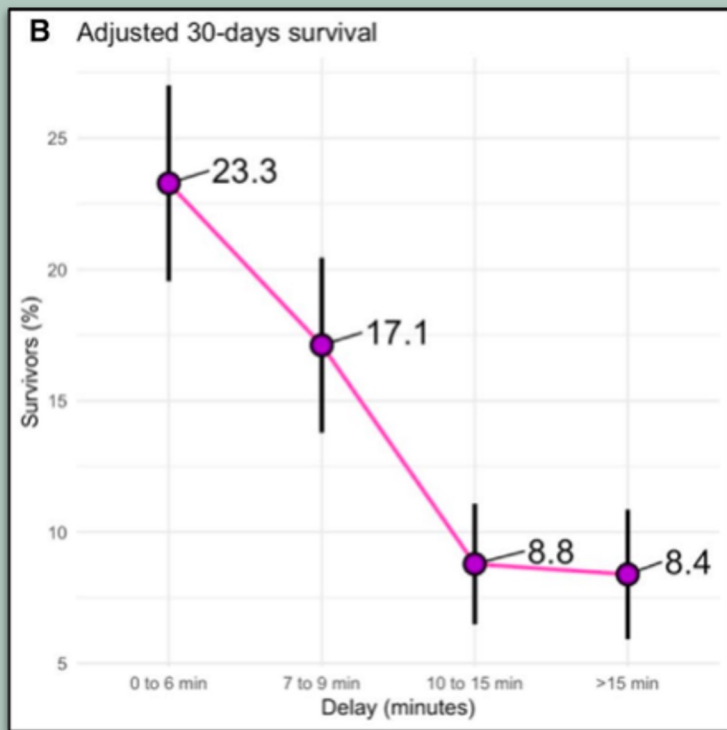
A white ambulance with blue and red stripes is parked on a wet street at night. The ambulance's emergency lights are flashing, casting a blue glow on the wet pavement. The background is dark with some blurred lights from buildings and other vehicles.

Fait No.3

LES SECOURISTES NE DÉFIBRILLENT PAS ASSEZ VITE

(c'est un peu faux)

CPR ONLY BEFORE EMS



CPR only before EMS arrival



A man with a beard and blonde hair, wearing a pink shirt and dark pants, stands in the center of a subway station. He is looking slightly to his right. The background is filled with many people walking, their figures blurred to indicate motion. The station has a high ceiling with fluorescent lights and large stone arches.

Fait No.4

LES TÉMOINS NE DÉFIBRILLENT PAS ASSEZ

(c'est vrai)

Clinical paper
Three-year trends in out-of-hospital cardiac arrest across the world: Second report from the International Liaison Committee on Resuscitation (ILCOR)

	2015	2016	2017
United States	36,733 (69.4)	42,221 (68.5)	53,240 (69.8)
Denmark	2,691 (75.2)	3,732 (73.5)	3,953 (74.2)
Norway	1,402 (61.0)	1,690 (60.6)	1,735 (62.6)
United Kingdom	N/A (77.5)	6,756 (72.3)	8,948 (72.3)
Australia	4,741 (66.6)	5,379 (69.8)	7,818 (71.3)
New Zealand	1,554 (67.4)	1,644 (69.4)	1,802 (70.5)
Singapore	1,649 (71.0)	1,828 (74.0)	2,110 (75.2)
South Korea	16,089 (58.2)	15,457 (57.0)	15,318 (56.6)
Japan	N/A	N/A	N/A
Germany	— (62.6)	3,264 (62.0)	3,759 (62.0)
Ireland	1,483 (69.0)	1,514 (67.1)	1,508 (68.5)
Regional Registries			
Italy	393 (80.2)	360 (81.6)	360 (76.3)
Switzerland	167 (67.6)	158 (71.5)	150 (61.5)
France	1,511 (74.1)	1,674 (69.7)	1,894 (70.4)
Bosnia and Herzegovina	— (73.0)	230 (63.7)	219 (63.7)

IQR denotes interquartile range; EMS: emergency medical
 * We excluded EMS-witnessed OHCA from the denominator

AED use by bystander*, n (%)

AED use
 2015 2016 2017

2015	2016	2017
2,866 (6.2)	3,511 (6.5)	4,589 (6.9)
N/A	N/A	N/A
256 (12.8)	304 (12.7)	324 (13.7)
443 (2.5)	756 (4.0)	876 (4.5)
N/A	N/A	N/A
N/A	N/A	N/A
90 (4.3)	110 (5.0)	178 (7.0)
518 (2.0)	581 (2.3)	525 (2.1)
N/A	NA	NA
—	58 (2.7)	80 (3.0)
334 (15.5)	386 (17.4)	423 (20.9)
9 (2.2)	8 (2.2)	17 (4.3)
41 (18.5)	39 (19.4)	40 (19.0)
35 (2.0)	56 (2.7)	51 (2.2)
—	0	0

2 - 20%

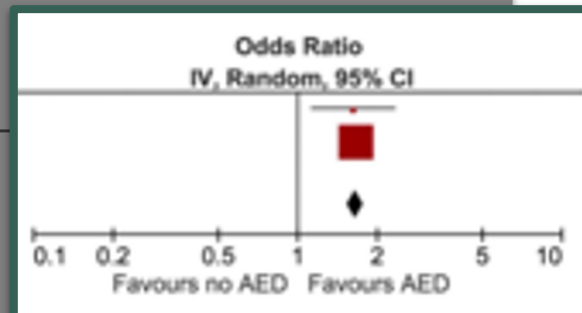
First monitored shockable rhythm, n (%)			Pathogenesis, n (%)		
2015	2016	2017	2015	2016	2017
15	2016	2017	2015	2016	2017
1,049 (1.9)	1,199 (1.8)	10,594 (20.0)	12,217 (19.8)	14,019 (18.4)	45,243 (85.5)
395 (8.8)	367 (7.7)	607 (17.6)	793 (16.3)	837 (16.3)	N/A
79 (3.3)	86 (3.6)	575 (25.0)	656 (23.5)	656 (23.7)	1659 (72.2)
N/A	N/A	5,762 (21.3)	5,521 (20.5)	5,862 (20.9)	21,858 (92.1)
101 (1.7)	232 (2.5)	1,757 (4.3)	1,875 (25.9)	2,839 (36.3)	2,389 (91.3)
133 (0.5)	133 (0.5)	3,591 (13.0)	3,795 (14.0)	3,720 (13.7)	20,329 (75.3)
1,968 (1.7)	2,102 (1.8)	8,039 (6.5)	8,192 (6.6)	8,209 (6.5)	82,547 (66.8)
20 (0.9)	37 (1.4)	—	1,230 (23.6)	1,418 (23.4)	4,139 (79.4)
134 (6.0)	132 (6.5)	450 (20.9)	501 (22.2)	440 (20.0)	1,944 (86.2)
5 (1.4)	6 (1.5)	84 (17.1)	83 (18.8)	91 (19.3)	410 (93.0)
13 (6.5)	13 (6.2)	45 (18.2)	47 (21.3)	63 (25.8)	193 (87.3)
N/A	N/A	552 (27.1)	569 (23.7)	606 (22.5)	1,975 (82.2)
0	0	—	105 (33.3)	114 (33.1)	302 (95.9)
					306 (89.0)

ET POURTANT !

M.J. Holmberg et al. / Resuscitation 120 (2017) 77–87

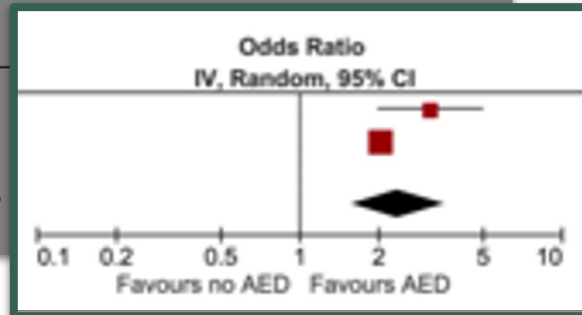
A Survival to hospital discharge/30 days

Study or Subgroup	Weight	Odds Ratio
		IV, Random, 95% CI
Lijovic, 2014	4.0%	1.62 [1.12, 2.34]
Kitamura, 2016	96.0%	1.66 [1.54, 1.79]
Total (95% CI)	100.0%	1.66 [1.54, 1.79]
Heterogeneity: $\tau^2 = 0.00$; $\chi^2 = 0.02$, $df = 1$ ($P = 0.90$); $I^2 = 0\%$		
Test for overall effect: $Z = 13.42$ ($P < 0.00001$)		



B Favorable neurological outcome at hospital discharge/30 days

Study or Subgroup	Weight	Odds Ratio
		IV, Random, 95% CI
Berdowski, 2011	35.8%	3.14 [1.98, 4.99]
Kitamura, 2016	64.2%	2.03 [1.87, 2.20]
Total (95% CI)	100.0%	2.37 [1.58, 3.57]
Heterogeneity: $\tau^2 = 0.07$; $\chi^2 = 3.31$, $df = 1$ ($P = 0.07$); $I^2 = 70\%$		
Test for overall effect: $Z = 4.13$ ($P < 0.0001$)		



A woman wearing an orange hard hat and a high-visibility yellow and orange safety vest over a dark suit. She has a confused or uncertain expression on her face, with her eyebrows furrowed and her mouth slightly open. Her hands are raised in a shrug gesture, palms facing up. The background is a plain, light gray.

2 raisons

Ne sait pas faire / a peur de faire
N'a pas accès à un défibrillateur



Fait No.5

LES DAE NE SONT PAS LÀ OÙ SURVIENNENT LES AC

Matthew J. Levy, DO, MSc;^{1,2,3} Kevin G. Seaman, MD;² Michael G. Millin, MD, MPH;¹ Richard A. Bissell, PhD;³ J. Lee Jenkins, MD, MSc¹

Matthew J. Levy, DO, MSc;^{1,2,3} Kevin G. Seaman, MD;² Michael G. Millin, MD, MPH;¹ Richard A. Bissell, PhD;³ J. Lee Jenkins, MD, MSc¹



Abbreviation: AED, automated external defibrillator



Ecoles

Piscines

Eglises

Administrations



Fait No.6

LES DAE NE SONT PAS ACCESSIBLES

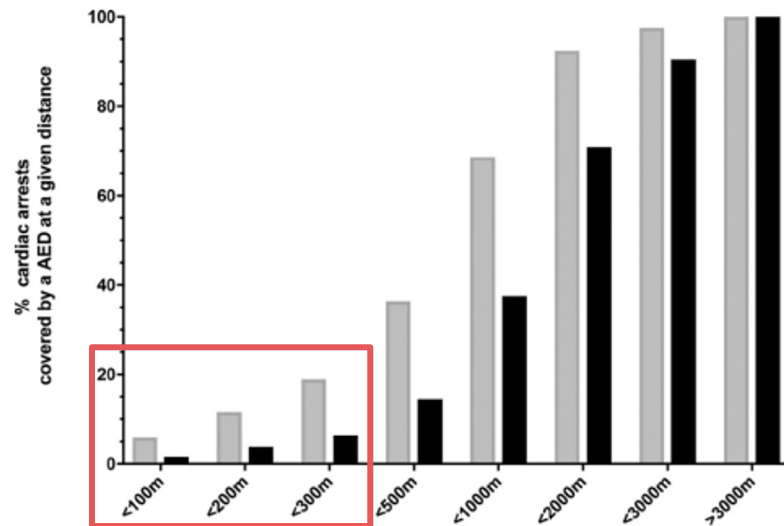
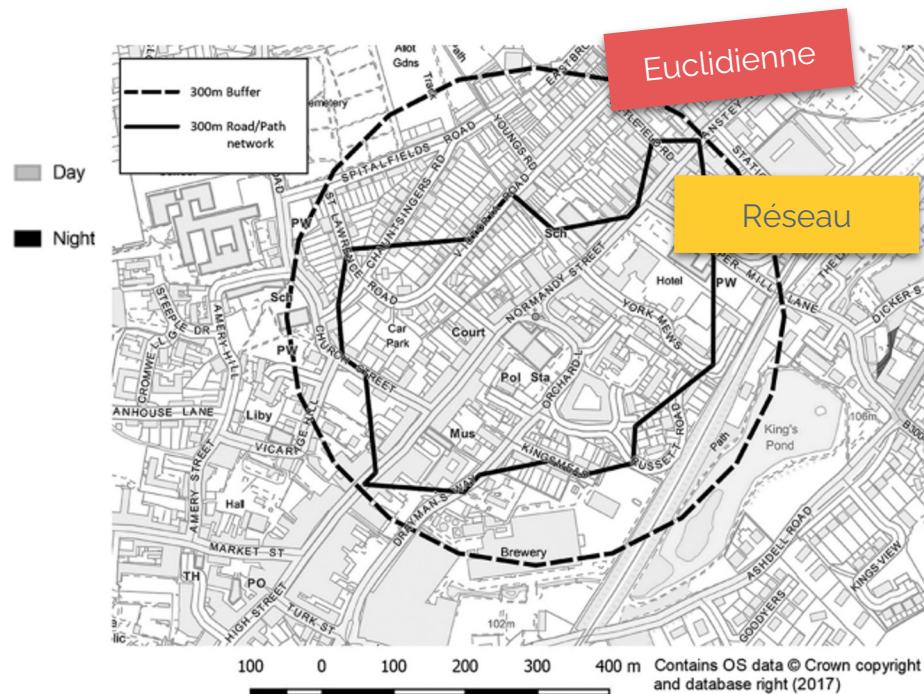


Figure 1 The percentage of cardiac arrests covered by an AED at any given distance, for both daytime (08:00–18:00) and out-of-hours (18:00–08:00) incidents. AEDs, automated external defibrillators.



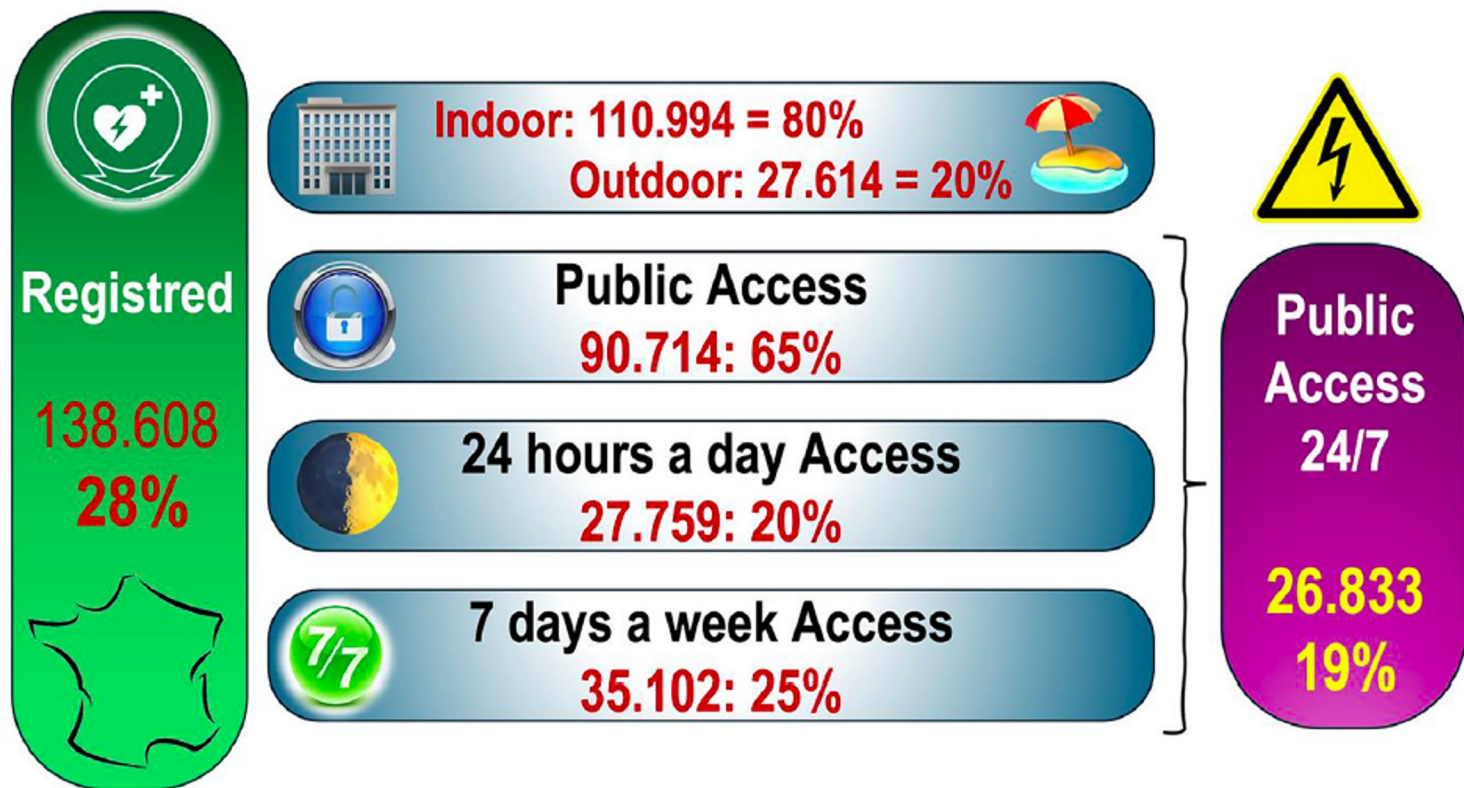


Fig. 1 – Accessibility of the 138.608 AED recorder in the French registry.

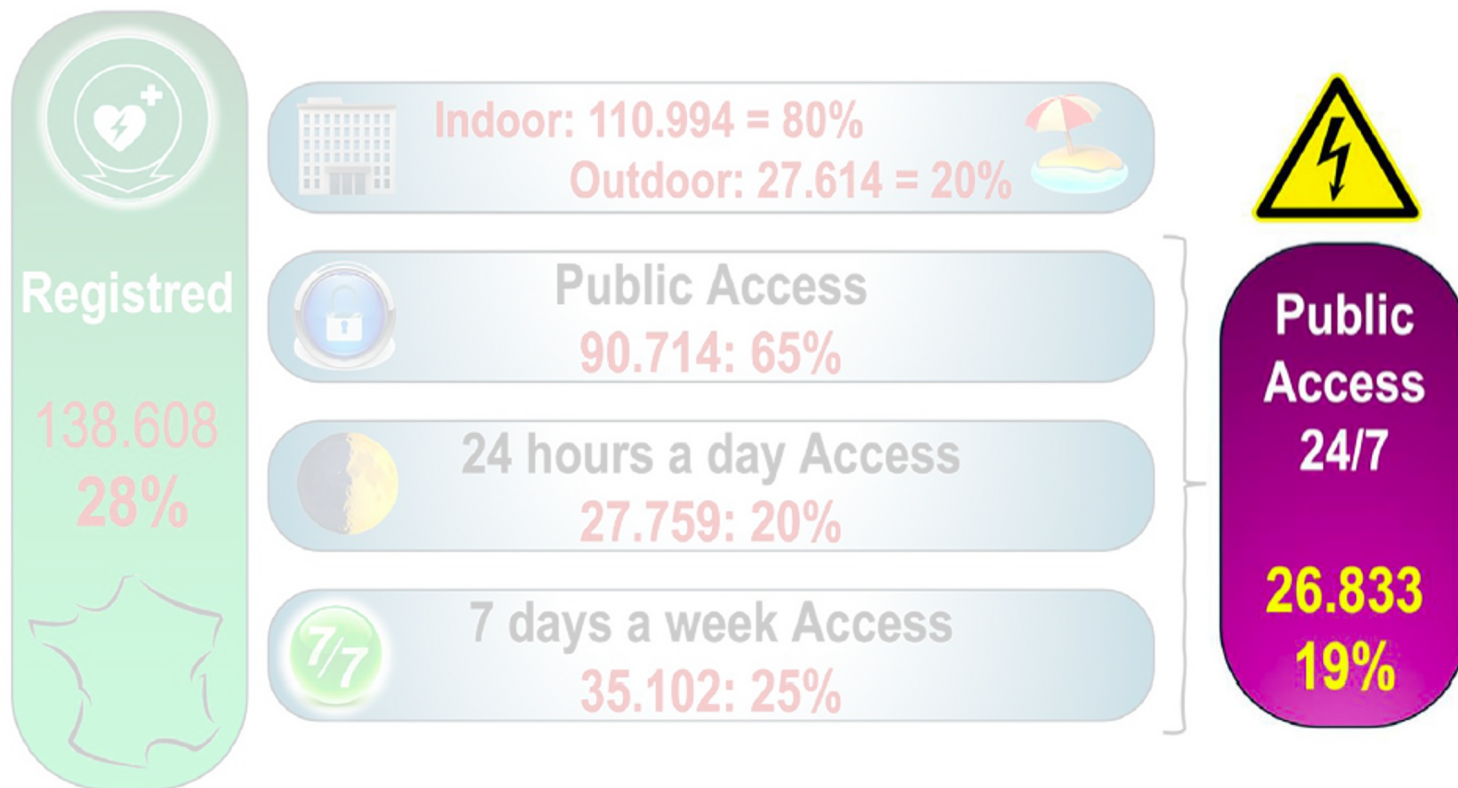


Fig. 1 – Accessibility of the 138.608 AED recorder in the French registry.





Vols de défibrillateurs : des effractions qui peuvent coûter des vies



lire plus tard



commenter



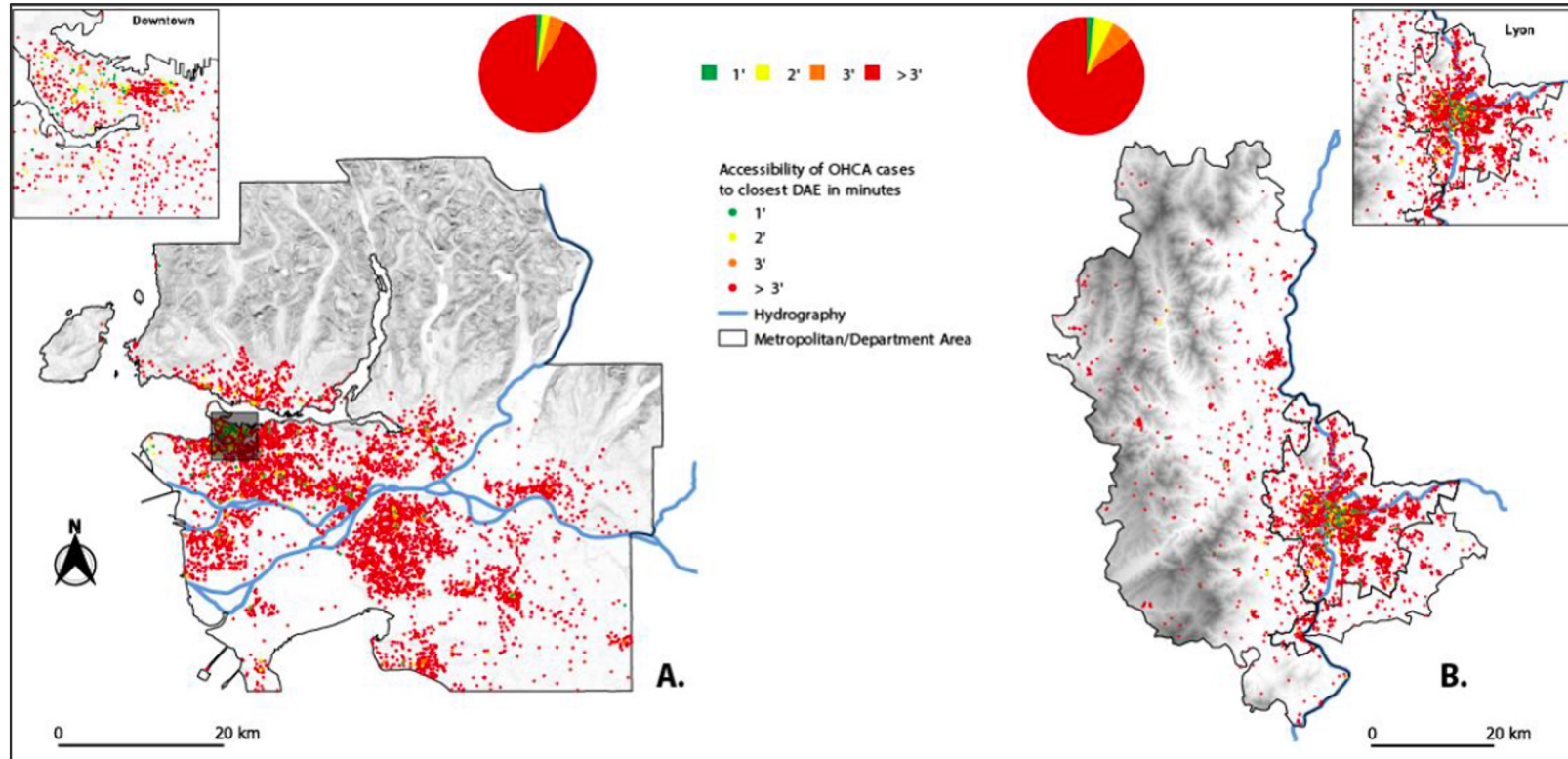
partager

Publié le 01/06/2025 20:45 | Mis à jour le 01/06/2025 23:31

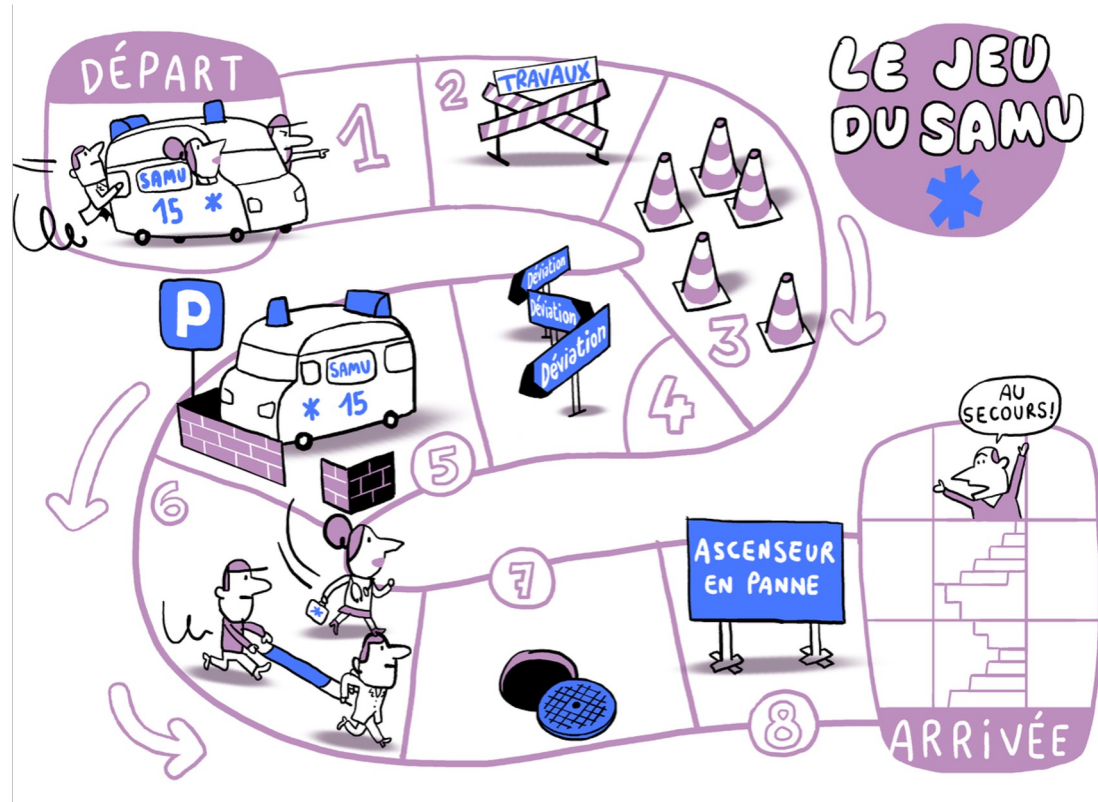
⌚ Temps de lecture : 2min - vidéo : 3min

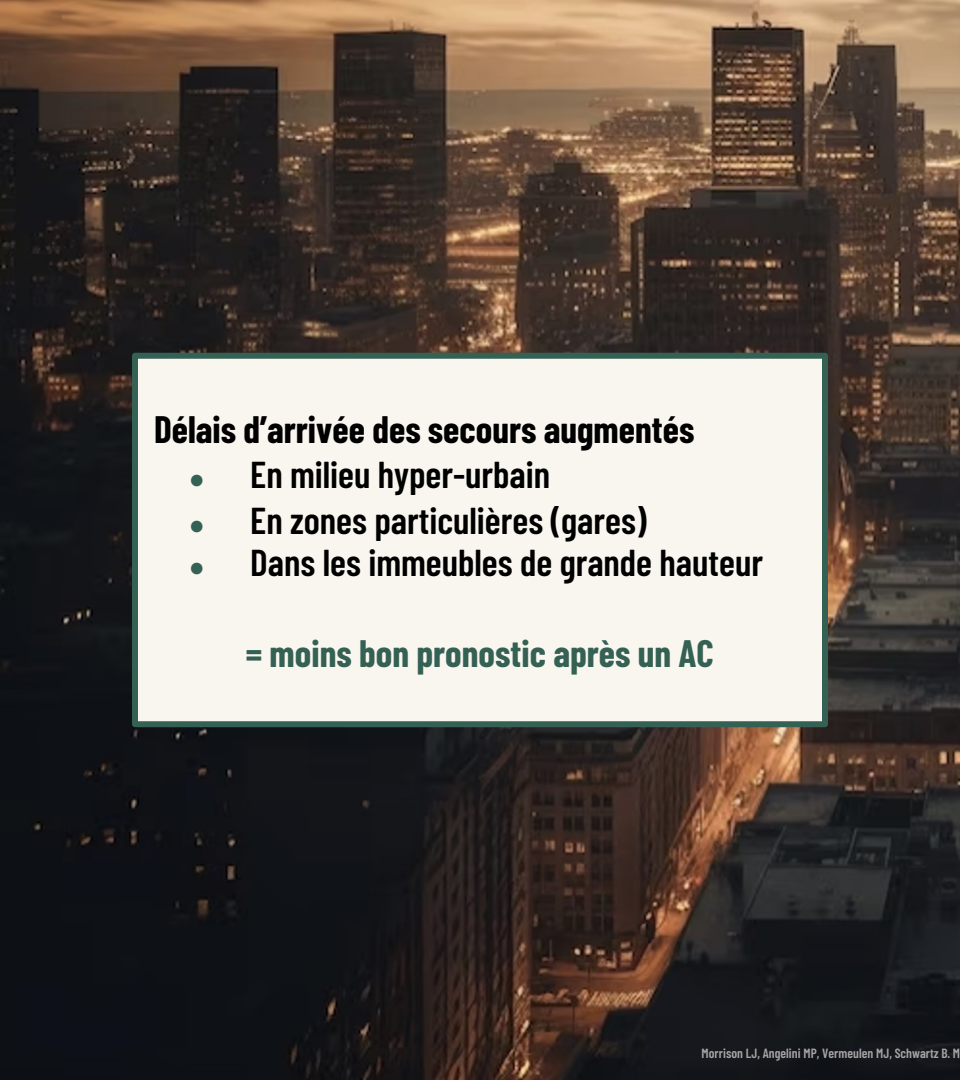


Fig.1 Spatial distribution of OHCA represented by walking access time



Quel rôle de l'accessibilité fine ?



A nighttime photograph of a city skyline with numerous illuminated skyscrapers and buildings, representing an urban environment.

Délais d'arrivée des secours augmentés

- En milieu hyper-urbain
- En zones particulières (gares)
- Dans les immeubles de grande hauteur

= moins bon pronostic après un AC

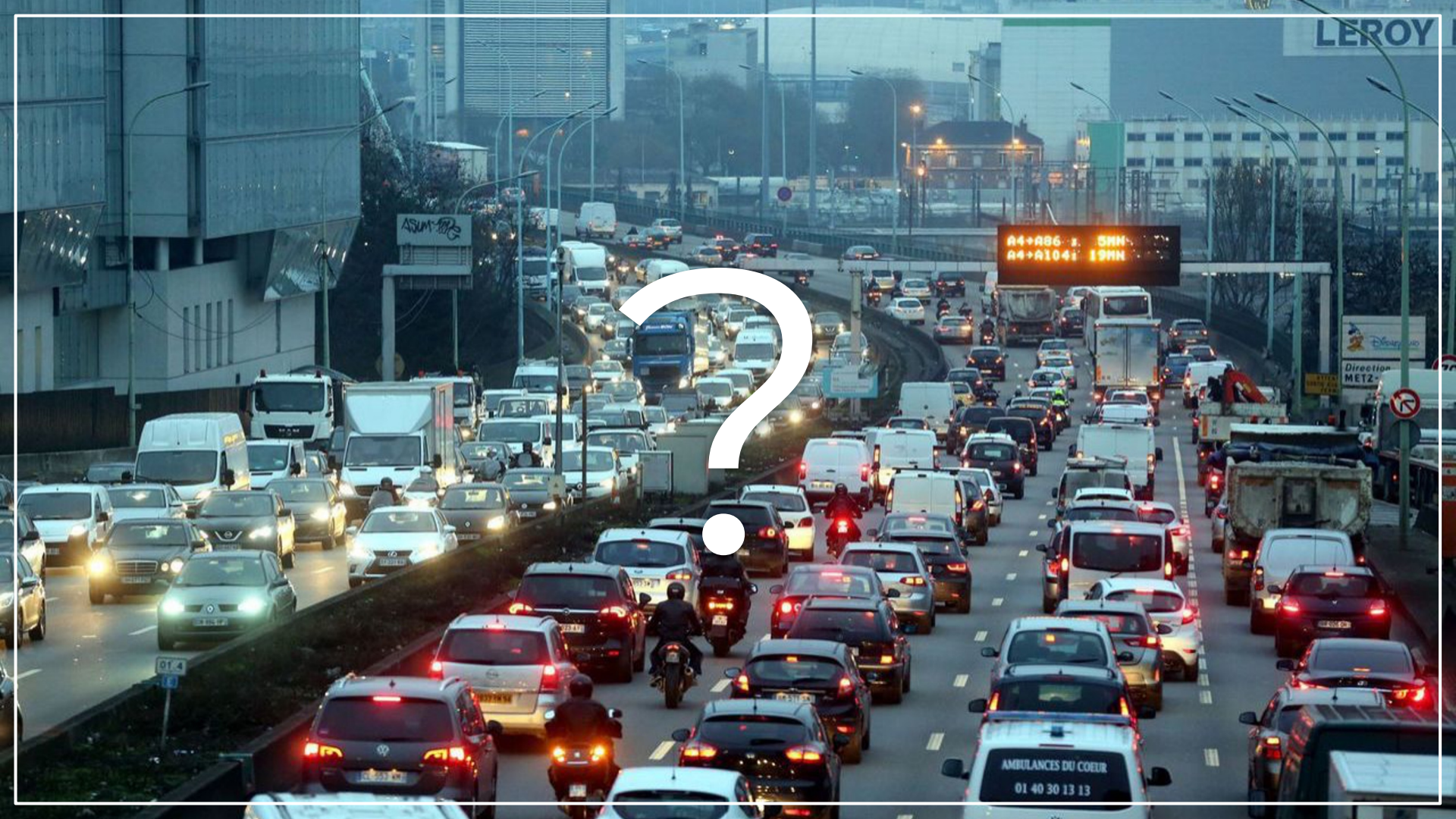
A daytime photograph of a rural landscape featuring a dense forest of tall evergreen trees in the background and a field of green crops in the foreground, with a light fog or mist hanging over the scene.

Délais plus longs qu'en milieu urbain

Accès aux défibrillateurs plus rapide

Témoins pas plus rares

= pas moins bon pronostic qu'urbains



A4+A86 : 59MN
A4+A104 : 19MN

Direction
METZ

AMBULANCES DU COEUR
01 40 30 13 13





3 stratégies

Faciliter l'accès aux DAE

Livrer des DAE

Défibriller autrement





**LIVRER LES
DÉFIBRILLATEURS**

Time to Delivery of an Automated External Defibrillator Using a Drone for Simulated Out-of-Hospital Cardiac Arrests vs Emergency Medical Services

Figure. Automated External Defibrillator (AED)-Equipped Drone (Unmanned Aerial System)

A Drone during flight



B Bystander unloading automated external defibrillator (AED)



A, Drone has an AED symbol and text in Swedish and English. The fluorescent-yellow coloring and light-emitting diodes attract attention. B, AED is placed at the rear of the drone to improve aerodynamics. The bystander unloads the AED after landing by releasing the straps.



Available online at www.sciencedirect.com

Resuscitation

Journal homepage: www.elsevier.com/locate/resuscitation



Simulation and education

Automatic external defibrillator provided by unmanned aerial vehicle (drone) in Greater Paris: A real world-based simulation

Clément Derkenne^{a,*}, Daniel Jost^{a,b,1}, Albane Miron De L'Espinay^a, Pascal Corpet^c, Benoît Frattini^a, Vivien Hong^a, Frédéric Lemoine^a, Romain Jouffroy^a, Florian Roquet^{a,e}, Elai Marjion^{f,g,h}, Frankie Beganton^{i,j}, Olivier Stibbe^a, Sabine Lemoine^a, Marina Salome^a, Romain Kedziewicz^a, Bertrand Prunet^{a,j}, Paris Fire Brigade Cardiac Arrest Task Force^a

Dispatcher of the emergency dispatch center receives call and detects unconsciousness

BLS team leaves the fire station



OHCA detection
sent if OHCA detected:
71% in public place
87% at home

No-abnormal ventilation evaluation:

Unsuccessful detection

Out-Of-Hospital Cardiac Arrest (OHCA) in the Greater Paris in 2017, n=3515

OHCA excluded

Traumatic OHCA, n= 226

OHCA in presence of BLS/EMS team, n= 279

OHCA with public defibrillator before BLS team arrival, n= 111

OHCA included n=3014

No drone flight n=2175 +/-21 (72%)

BLS first n=62 +/-6 (2%)

Drone first, n= 777 +/- 20 (26%)

72 %

26 %

After a run, no drone available at the same fire station for 5 hours

Drone takes off



Cruise speed : 100km/h
Landing delay: 15 seconds

Wind : 10km/h influence

rs.

meter should be me modified on the simulation website.
art team.



Et dans la VRAIE VIE ?

Review

The Role of Drones in Out-of-Hospital Cardiac Arrest: A Scoping Review

Joseph Chun Liang Lim ^{1,†}, Nicole Loh ^{1,†}, Hsin Hui Lam ¹, Jin Wee Lee ², Nan Liu ^{2,3,4}, Jun Wei Yeo ¹ and Andrew Fu Wah Ho ^{5,6,*}



N=26



(Practical)
Simulations
N=23 (88%)



Qualitative



Prospective





Drone delivery of automated external defibrillators compared with ambulance arrival in real-life suspected out-of-hospital cardiac arrests: a prospective observational study in Sweden

Sofia Schierbeck, Anette Nord, Leif Svensson, Mattias Ringh, Per Nordberg, Jacob Hollenberg, Peter Lundgren, Fredrik Folke, Martin Jonsson, Sune Forsberg, Andreas Claesson

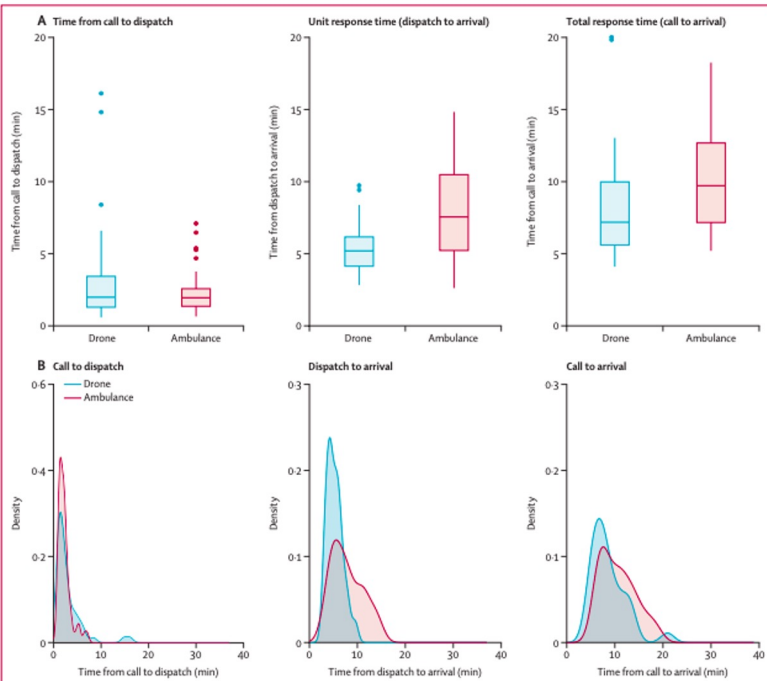


Figure 2: Response times for AED-drones and ambulances

(A) Boxplots of response times for AED-drones and ambulances. From the left, call to dispatch, dispatch to arrival, and call to arrival. (B) Density plots of response times for AED-drones and ambulances. From the left, call to dispatch, dispatch to arrival, and call to arrival. AED=automated external defibrillator.

	Ambulance-treated out-of-hospital cardiac arrests (n=68)	Ambulance-treated out-of-hospital cardiac arrests (when drone did not deliver an AED; n=44)	Ambulance-treated out-of-hospital cardiac arrests (in cases with a drone-delivered AED; n=24)	Ambulance-treated out-of-hospital cardiac arrests (when drone arrived first; n=18)
Age, years	74 (64–82)	71 (60–81)	77 (69–82)	77 (69–82)
Females	19 (28%)	8 (18%)	11 (46%)	7 (39%)
Males	49 (72%)	36 (82%)	13 (54%)	11 (61%)
Residential location	59 (87%)	39 (89%)	20 (83%)	15 (83%)
Witnessed	37 (54%)	23 (52%)	14 (58%)	9 (50%)
CPR before ambulance arrival	50 (74%)	30 (68%)	20 (83%)	15 (83%)
AEDs attached before ambulance arrival*				
On-site AEDs	4/58 (7%)	4/43 (9%)	0/15	0/11
First responders' and lay responders' AEDs	5/58 (9%)	4/43 (9%)	1/15 (7%)	1/11 (9%)
Drone AEDs	2/58 (3%)†	0/43	2/15 (13%)†	2/11 (18%)†
Shockable first rhythm	9 (13%)	5 (11%)	4 (17%)	2 (11%)
Defibrillated before ambulance arrival*				
On-site AEDs	1/58 (2%)	1/43 (2%)	0/15	0/11
First responders' and lay responders' AEDs	3/58 (5%)	3/43 (7%)	0/15	0/11
Drone AEDs	1/58 (2%)†	0/43	1/15 (7%)†	1/11 (9%)†
Return of spontaneous circulation at hospital arrival	20/58 (34%)	14/43 (33%)	6/15 (40%)	4/11 (36%)
Survival past 30 days	6/58 (10%)	4/43 (9%)	2/15 (13%)	1/11 (9%)

Data are median (IQR), n (%), or n/N (%). Data collected from ambulance charts and The Swedish Registry of Cardiopulmonary Resuscitation. Ambulance-treated out-of-hospital cardiac arrest means true cardiac arrest where ambulance personnel performed CPR. AED=automated external defibrillator. CPR=cardiopulmonary resuscitation. *Data from The Swedish Registry of Cardiopulmonary Resuscitation. 15% of all out-of-hospital cardiac arrests identified in ambulance charts are missing in the registry. †Four cases of drone-delivered AED attachment missing. ‡One case of defibrillation by drone-delivered AED missing.

Table 2: Patient characteristics of ambulance-treated out-of-hospital cardiac arrest cases, by drone delivery of AED

Drone delivery of automated external defibrillators compared with ambulance arrival in real-life suspected out-of-hospital cardiac arrests: a prospective observational study in Sweden

Sofia Schierbeck, Anette Nord, Leif Svensson, Mattias Ringh, Per Nordberg, Jacob Hollenberg, Peter Lundgren, Fredrik Folke, Martin Jonsson, Sune Forsberg, Andreas Claesson

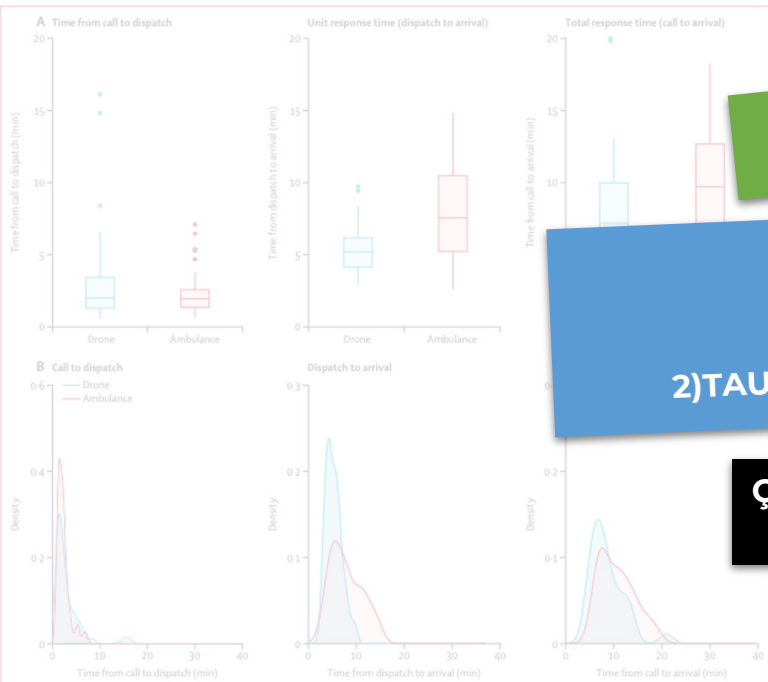


Figure 2: Response times for AED-drones and ambulances
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ÇA VA VITE !

ÇA AUGMENTE :
1) APPLICATION DAE
2) TAUX DE RYTHME CHOQUABLE

ÇA N'AUGMENTE PAS
LA SURVIE

	Ambulance-treated out-of-hospital cardiac arrests (n=68)	Ambulance-treated out-of-hospital cardiac arrests (when drone did not deliver an AED; n=44)	Ambulance-treated out-of-hospital cardiac arrests (in cases with a drone-delivered AED; n=24)	Ambulance-treated out-of-hospital cardiac arrests (when drone arrived first; n=18)
Median (IQR)	14 (6-28)	71 (60-81)	77 (69-82)	77 (69-82)
n (%)	28 (41%)	8 (18%)	11 (46%)	7 (39%)
Residential location				
Urban	49 (72%)	36 (82%)	13 (54%)	11 (61%)
Suburban	19 (28%)	8 (18%)	20 (83%)	15 (83%)
On-site AEDs				
Present	43 (63%)	14 (32%)	20 (83%)	15 (83%)
Absent	25 (37%)	30 (68%)	4 (17%)	2 (11%)
Survival past 30 days	6/58 (10%)	4/43 (9%)	2/15 (13%)	1/11 (9%)

Data are median (IQR), n (%), or n/N (%). Data collected from ambulance charts and The Swedish Registry of Cardiopulmonary Resuscitation. Ambulance-treated out-of-hospital cardiac arrest means true cardiac arrest where ambulance personnel performed CPR. AED=automated external defibrillator. CPR=cardiopulmonary resuscitation. *Data from The Swedish Registry of Cardiopulmonary Resuscitation. 15% of all out-of-hospital cardiac arrests identified in ambulance charts are missing in the registry. †Four cases of drone-delivered AED attachment missing. ‡One case of defibrillation by drone-delivered AED.

Table 2: Patient characteristics of ambulance-treated out-of-hospital cardiac arrest cases, by

ÇA NE TOMBE PAS

**ET LES AUTRES
CAS D'USAGE ?**



Surman and Lockey
Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine
(2024) 32:9
<https://doi.org/10.1186/s13049-024-01180-7>

Scandinavian Journal of
Trauma, Resuscitation
and Emergency Medicine

REVIEW

Open Access

Unmanned aerial vehicles and pre-hospital emergency medicine



Katy Surman¹ and David Lockey^{1,2,3*} 

ORIGINAL RESEARCH ARTICLE

Time to Epinephrine Administration and Survival From Nonshockable Out-of-Hospital Cardiac Arrest Among Children and Adults

Matthew Hansen, MD, MCR, Robert H. Schmicker, MS, Craig D. Newgard, MD, MPH, Brian Grunau, MD, MHSc, Frank Scheuermeyer, MD, MHSc, Sheldon Cheskes, MD, Veer Vithalani, MD, Fuad Alnaji, MD, Thomas Rea, MD, MPH, Ahmed H. Idris, MD, Heather Herren, RN, MPH, Jamie Hutchison, MD, Mike Austin, MD, Debra Egan, MPH, and Mohamud Daya, MD, MS for the Resuscitation Outcomes Consortium Investigators

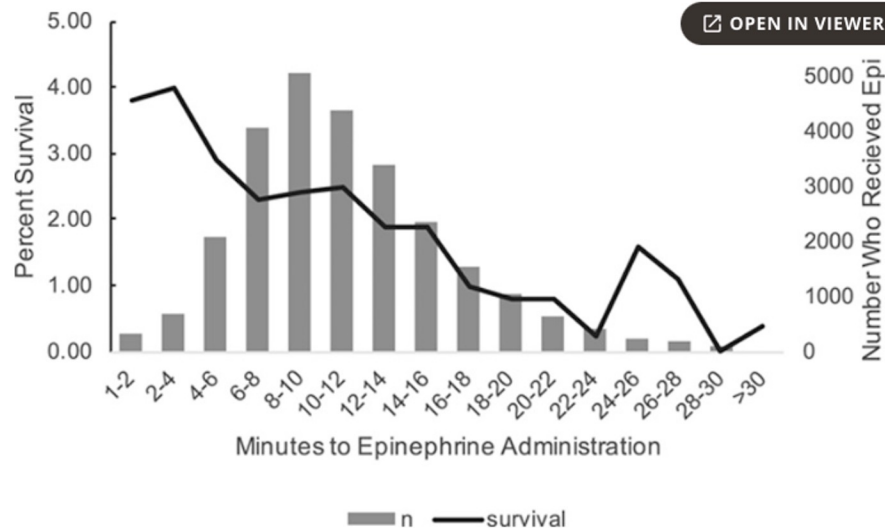


Figure 2. Unadjusted survival and number of patients that received epinephrine by 2-minute intervals. Epi indicates epinephrine.

ADRÉNALINE

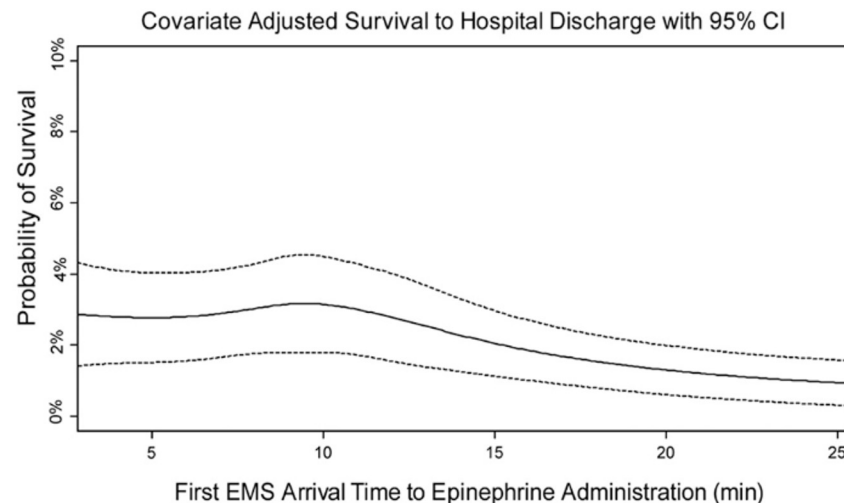
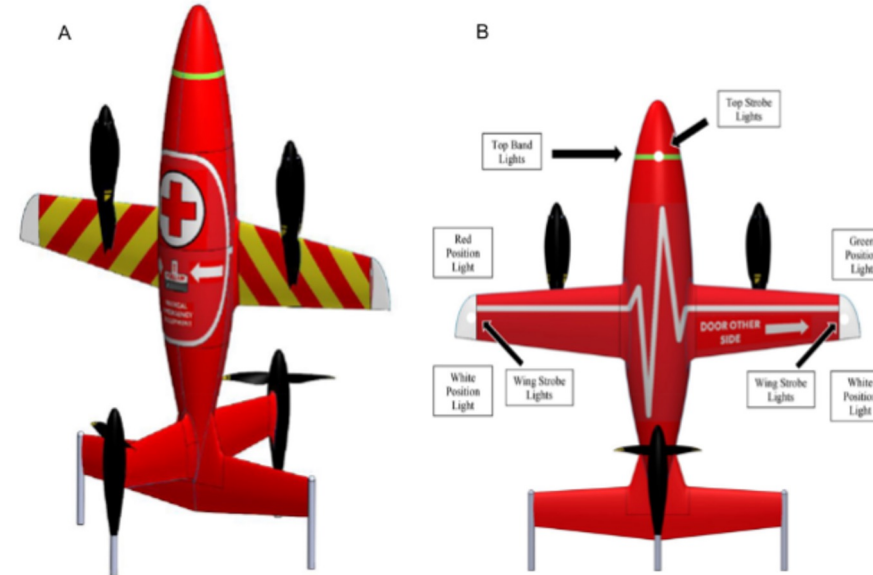


Figure 3. This analysis was conducted using average values for all covariates on the basis of adjusted analyses and was fit by using spline regression. CI indicates confidence interval; and EMS, emergency medical services.

Bystander interaction with a novel multipurpose medical drone: A simulation trial

Thomas Leith^{a,b}, Jason A. Correll^a, Emma E. Davidson^{c,g}, Adam L. Gottula^{b,f},
Noor K. Majhall^{c,g}, Emily J. Mathias^b, James Pribble^b, Nathan B. Roberts^h,
Isabella G. Scott^d, James A. Cranford^b, Laura R. Hopson^b, Nathaniel Hunt^b,
Christine M. Brent^{b,i}

TOUT LE RESTE

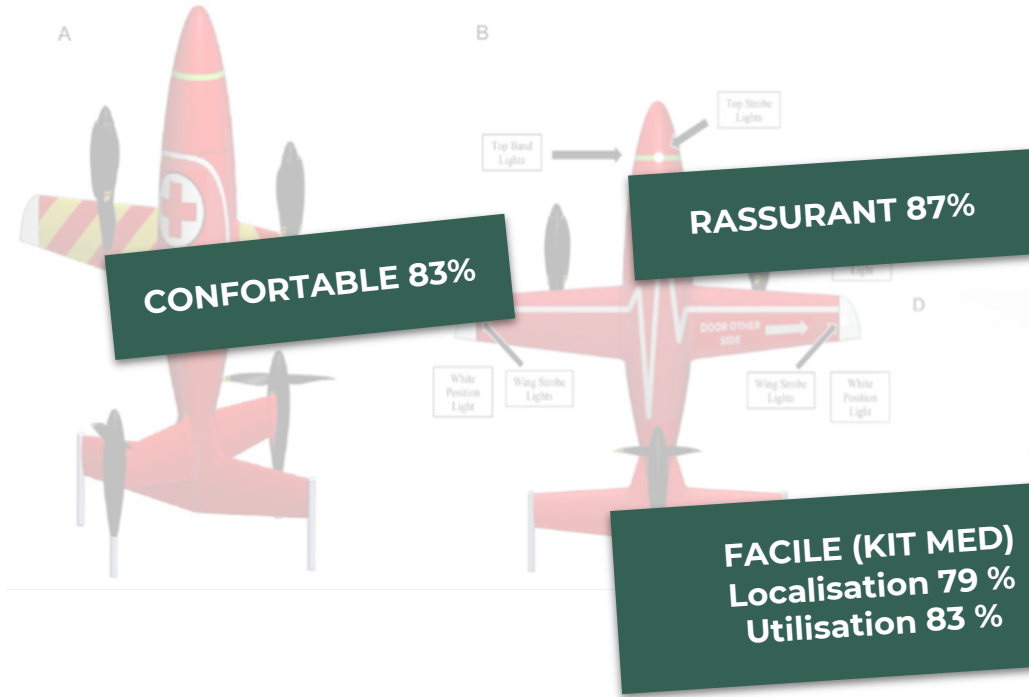


D



Bystander interaction with a novel multipurpose medical drone: A simulation trial

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Noor K. Majhalli^{a,g}, Emily J. Mathias^b, James Pribble^b, Nathan B. Roberts^b,
Isabella G. Scott^d, James A. Cranford^b, Laura R. Hopson^b, Nathaniel Hunt^b,
Christine M. Brent^{b,*}



C



The Use of Unmanned Aerial Vehicles to Assist Lifeguards Identifying, Preventing, and Rescuing: A Systematic Review

Filipe Maia, MS¹, Henrique Sousa, MS¹,
and Paulo Santiago, PhD²

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The Use of Unmanned Aerial Vehicles to Assist Lifeguards Identifying, Preventing, and Rescuing: A Systematic Review

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Table 1
Characteristics of a search-party versus UAV search for the early recognition of a submerged manikin in a beach environment.

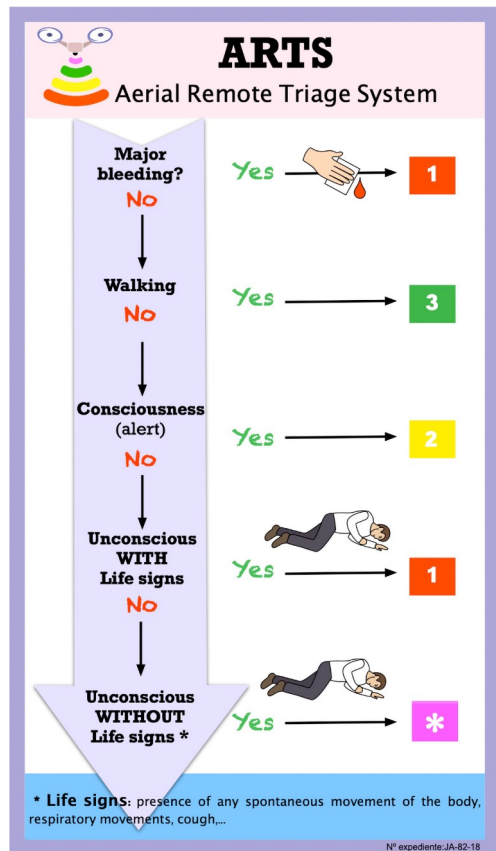
Search operation	Search party covered area (m ²)	Search party covered area (m ² /min)	UAV covered area (m ² /min) ^a	Search party vs UAV difference covered area (m ² /min)	Search party start to contact (min) ^b	UAV start to recognition (min)	UAV start to contact (min)	Search party vs UAV difference start to contact (min)
1	2442	623	10,000	9377	3:55	0:28	1:05	2:50
2	3668	386	5000	4614	9:30	0:20	0:38	8:52
3	1196	1176	5000	3824	1:01	0:19	0:47	0:14
4	3651	468	10,000	9532	7:48	0:39	1:10	6:38
5	2415	823	10,000	9177	2:56	0:27	0:37	2:19
6	2850	475	5000	4525	5:30	0:29	0:50	4:40
7	2247	749	10,000	9251	3:00	0:25	0:58	2:02
8	1265	1432	5000	3568	0:53	0:18	0:37	0:16
9	3484	433	5000	4567	8:02	0:26	0:48	7:14
10	2695	516	5000	4484	5:13	0:19	0:46	4:27
	Median: 2568.5	Median: 569.5	Median: 5000	Median: 4590	Median: 4:34	Median 0:25 (IQR	Median 0:47 (IQR	Median: 3:38

Median: 2568.5 (IQR: 2001–3526)
Median: 569.5 (IQR: 459–911)
Median: 5000 (IQR: 5000–10,000)
Median: 4590 (IQR: 4319–9282)
p < 0.001^c
Median: 4:34 (IQR 2:56–7:48)
Median 0:25 (IQR 0:19–0:38)
Median 0:47 (IQR 0:38–0:58)
Median: 3:38 (IQR 2:02–6:38)
p < 0.001^c

^b Time from start to recognition and contact with the manikin is presented as one timestamp in the search-party group as the lifesaver immediately makes contact upon recognition of the manikin.
^c P for difference search party versus UAV: <0.001.

Development of the Aerial Remote Triage System using drones in mass casualty scenarios: A survey of international experts

Cristina Álvarez-García¹, Sixto Cámara-Anguila², José María López-Hens², Nani Granero-Moya^{1*}, María Dolores López-Franco^{1*}, Inés María-Comino-Sanz¹, Sebastián Sanz-Martos¹, Pedro Luis Pancorbo-Hidalgo¹



Development of the Aerial Remote Triage System using drones in mass casualty scenarios: A survey of international experts

Cristina Álvarez-García¹, Sixto Cámara-Anguita², José María López-Hens², Nani Granero-Moya^{3*}, María Dolores López-Franco^{3*}, Inés María-Comino-Sanz³, Sebastián Sanz-Martos³, Pedro Luis Pancorbo-Hidalgo¹

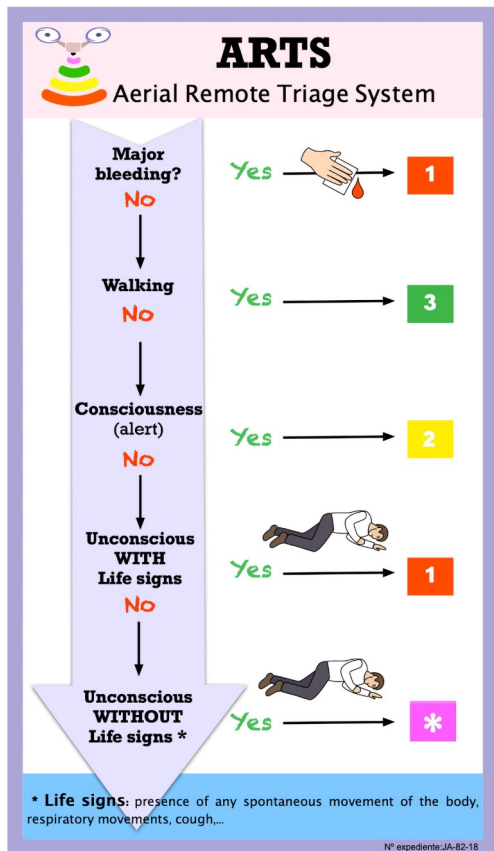


Table 3. Content evaluation of statements about triage with ARTS algorithm.

Statements	CVR	Mean	SD
1 The first step before starting the triage will be to broadcast an audio message through the drone speakers instructing people who can walk to remain standing and those who cannot walk to make some movement.	0.83	3.75	0.62
2 The assessment of healthcare priority will start with those injured people who do not respond to messages from the drone speakers.	0		
3 In the assessment of healthcare priority supported by drones, the aspects to be evaluated would be, in this order: 1°, major bleeding, 2°; walking, 3°; consciousness (alertness); 4°, signs of life.	0.1		
4 In the assessment of healthcare priority supported by drones, if the injured person presents wounds with important bleeding (exsanguinating according to criteria of Hartford Consensus), priority 1 (RED) will be assigned.	0.5	3.25	1.06
5 In the assessment of healthcare priority supported by drones, if the injured person presents wounds with important bleeding (exsanguinating according to criteria of Hartford Consensus), the employment of some hemostatic techniques will be instructed to the injured person or some bystander through the drone speakers, if possible.	1		
6 In the assessment of healthcare priority supported by drones, if the injured person can walk, priority 3 (GREEN) will be assigned.	0.67	3.58	1
7 In the assessment of healthcare priority supported by drones, if the injured person does not walk, but he or she is conscious (responds to audio messages), priority 2 (YELLOW) will be assigned.			
8 In the assessment of healthcare priority supported by drones, if the injured person is apparently unconscious but shows signs of life (spontaneous movements of the body, respiratory movements, coughing...), priority 1 (RED) will be assigned.			
9 In the assessment of healthcare priority supported by drones, if the injured person is apparently unconscious and with signs of life, bystanders will be instructed through drone speakers to place the injured person in the recovery position, if possible.	1		
10 In the assessment of healthcare priority supported by drones, if the injured person is apparently unconscious and without signs of life (spontaneous movements of the body, respiratory movements, coughing...), priority * (VIOLET) will be assigned.	0.33*		
11 In the assessment of healthcare priority supported by drones, the PRIORITY * (VIOLET) indicates that the injured person is waiting for in situ re-assessment by the first responders.	0.83	3.58	0.67
12 In the assessment of healthcare priority supported by drones, if no signs of life can be observed in the injured person (spontaneous movements of the body, respiratory movements, coughing...), bystanders will be instructed through drone speakers to place the injured person in the recovery position, if possible.	0.67		
13 Providing the first responders with the results of the Aerial Remote Triage System before they have access to the site, can be useful and helpful.	0.83	3.58	0.67

* Value under the optimal CVR value. CVR: Content validity ratio.

CARTOGRAPHIE

TRI

GESTION
RESSOURCES

SAIGNEMENT

GESTES

Utilidad de los vehículos aéreos no tripulados en la búsqueda y triaje de personas en situaciones de catástrofe

Manuel Pardo Ríos^{1,2}, Nuria Pérez Alonso^{1,2}, Joaquín Lasheras Velasco^{1,4}, Laura Juguera Rodríguez^{1,2}, Belén López Ayuso¹, Rubén Muñoz Solera¹, Carolina Martínez Riquelme¹, Antonio Nieto Fernández-Pacheco^{1,2}



Utilidad de los vehículos aéreos no tripulados en la búsqueda y triaje de personas en situaciones de catástrofe

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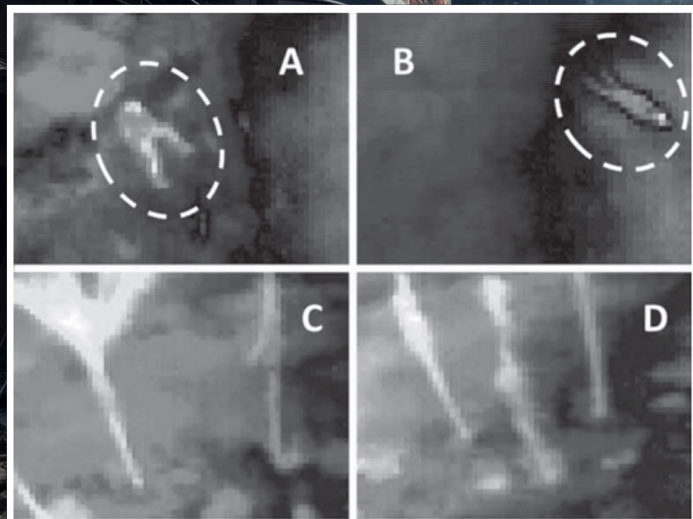


Figura 1. Fotogramas de la cámara térmica transmitidos desde el dron: A y B imágenes de víctimas localizadas, y C y D imágenes de la vegetación (palmeras).

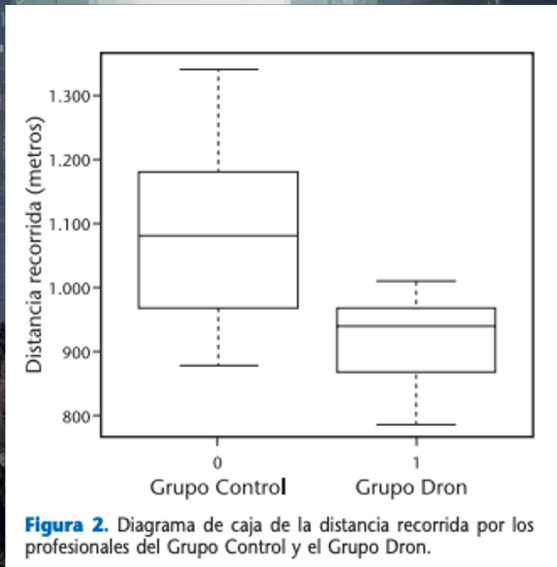


Figura 2. Diagrama de caja de la distancia recorrida por los profesionales del Grupo Control y el Grupo Dron.

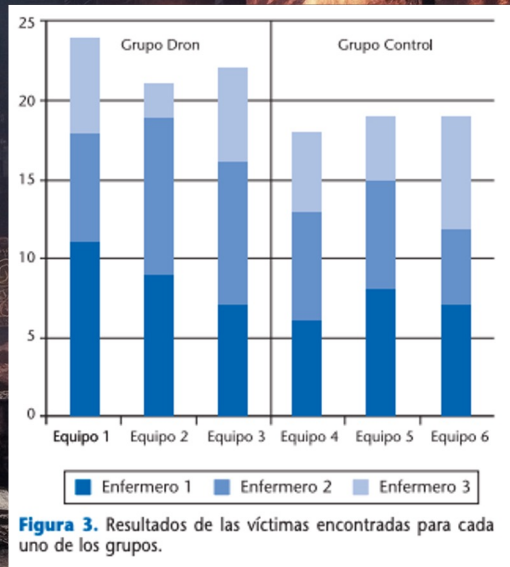


Figura 3. Resultados de las víctimas encontradas para cada uno de los grupos.

Drone versus ground delivery of simulated blood products to an urban trauma center: The Montreal Medi-Drone pilot study

Valerie Homier, MD, Danny Brouard, PhD, Michael Nolan, APC, Marie-Andrée Roy, MD, Patricia Pelletier, MD, Melissa McDonald, MD, François de Champlain, MD, Elene Khalil, MD, Frederic Grou-Boileau, and Richard Fleet, MD, PhD, *Canada*



Drone versus ground delivery of simulated blood products to an urban trauma center: The Montreal Medi-Drone pilot study

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TABLE 3. Comparison of Drone and Ground Transport Times

Variable	Transport Number								
	1	2	3	4	5	6	7	8	9
Start time									
Date	Sep 23	Sep 23	Sep 23	Sep 23	Sep 24	Sep 24	Sep 24	Sep 24	Sep 24
Time	13:58:31	14:40:47	16:04:26	16:49:42	8:28:15	9:07:31	10:03:40	11:26:29	13:04:41
Radiocommunications data									
Type of blood product	pRBCs	Platelets	FFP	Platelets	FFP	pRBCs	FFP	pRBCs	Platelets
UAV landed	16:54.5	17:04.5	17:06.8	17:16.2	17:16.3	17:21.4	17:04.4	16:47.3	17:10.6
UAV bag at blood bank	22:02.2	21:37.5	20:59.2	21:51.1	20:40.9	22:09.9	21:11.1	19:39.3	20:33.1
UAV hospital delay	05:07.7	04:33.1	03:52.3	04:34.9	03:24.5	04:48.4	04:06.7	02:52.0	03:22.6
Driver arrived	22:07.7	30:34.4	34:21.5	33:09.0	29:13.1	27:21.1	28:21.7	28:23.9	26:33.9
Car box at blood bank	25:45.0	36:53.4	38:00.0	36:52.4	34:38.4	31:04.8	32:46.2	33:12.7	30:20.0
Car hospital delay	03:36.0	06:42.0	03:47.0	03:48.0	05:24.0	03:49.0	04:35.0	03:53.0	03:45.0
Delta (car time – UAV time)	03:42.8	15:19.9	17:10.9	15:06.3	13:57.4	08:54.9	11:45.2	12:38.4	09:46.9
UAV landed	16:58.0	16:57.0	17:05.0	17:14.0	17:15.0	17:24.0	17:02.0	16:46.0	17:12.0
UAV bag at blood bank	22:05.0	21:29.0	21:04.0	21:51.0	20:38.0	22:08.0	21:08.0	19:37.0	20:33.0
UAV hospital delay	05:07.0	04:32.0	03:59.0	04:37.0	03:23.0	04:44.0	04:06.0	02:51.0	03:21.0
Driver arrived	22:11.0	30:31.0	34:18.0	33:09.0	29:10.0	27:18.0	28:14.0	28:18.0	26:32.0
Car box at blood bank	25:47.0	37:13.0	38:05.0	36:57.0	34:34.0	31:07.0	32:49.0	32:11.0	30:17.0
Car hospital delay	03:36.0	06:42.0	03:47.0	03:48.0	05:24.0	03:49.0	04:35.0	03:53.0	03:45.0
Delta (car time – UAV time)	03:36.0	15:44.0	17:01.0	15:06.0	13:56.0	08:59.0	11:41.0	12:34.0	09:44.0

Effect of unmanned aerial vehicle (drone) delivery on blood product delivery time and wastage in Rwanda: a retrospective, cross-sectional study and time series analysis

Marie Paul Nsanzirwe, Pacifique Ndimyaye, Katere Swabwa, Ladidas Ndimiyimana, Prosper Karama, Valentine Dushimiyimana, Jean Pierre Musabyimana, Clarisse Musanabagawa, Sabin Nanzimana*, Michael R Law*

2017

	Estimated driving time to CBT, min	Google Maps driving time to CBT, min	Drone mean delivery time post-intervention, min	Time difference (estimated driving time - drone time), min	Time difference (Google Maps driving time - drone time), min
CBT Kigali					
Kabgayi District Hospital	60	83	24	36	59
Ruhango Provincial Hospital	120	94	31	89	63
Muhororo Hospital	120	130	29	91	101
Byumba District hospital	60	84	54	6	30
Ruli District Hospital	90	84	41	49	43
CBT Ruhengeri					
Butaro District Hospital	90	89	52	38	37
Nemba District Hospital	60	42	41	19	19
Kinshira Provincial Hospital	75	78	58	17	17
Kabaya District Hospital	60	61	43	17	17
Shyira Hospital	60	42	46	14	18
CBT Butare					
Gitwe District Hospital	90	86	33	57	53
Nyanza District Hospital	45	49	33	12	16
Gikonko Health Center	60	43	40	20	3
Gakoma District Hospital	60	53	44	16	9
Kibilizi District Hospital	30	23	57	-27	-34
Kigeme Hospital	45	44	40	5	4
Kaduha District Hospital	90	98	37	53	61
CBT Karongi					
Mugonero Hospital	30	33	50	-20	-17
Murunda District Hospital	75	58	48	27	10
Kirinda District Hospital	60	110	31	29	79
Median difference	60	69.5	41	19 (p=0.0018)	28.5 (p=0.0025)

Muhanga was the Zipline site for all hospitals. CBT=Centre for Blood Transfusion.

Table 2: Delivery time by hospital and median difference (considering one-way trip), stratified by blood transfusion centre

Réduction 80 - 100 min

Économie 7 CGR/mois

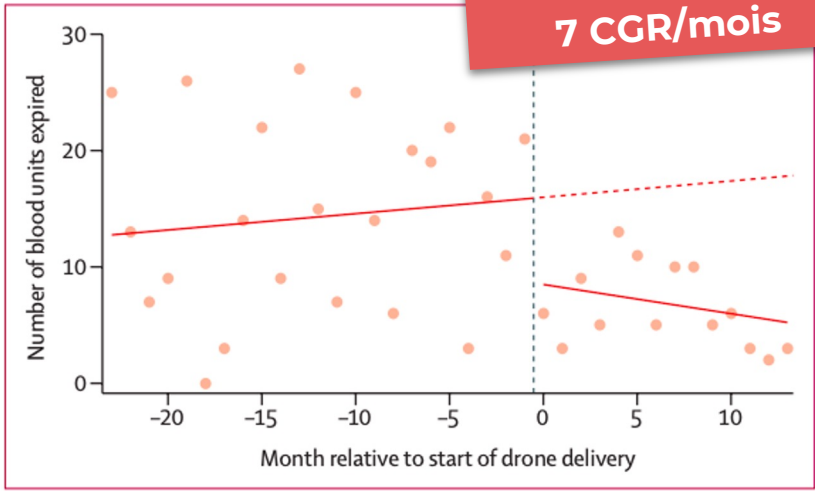
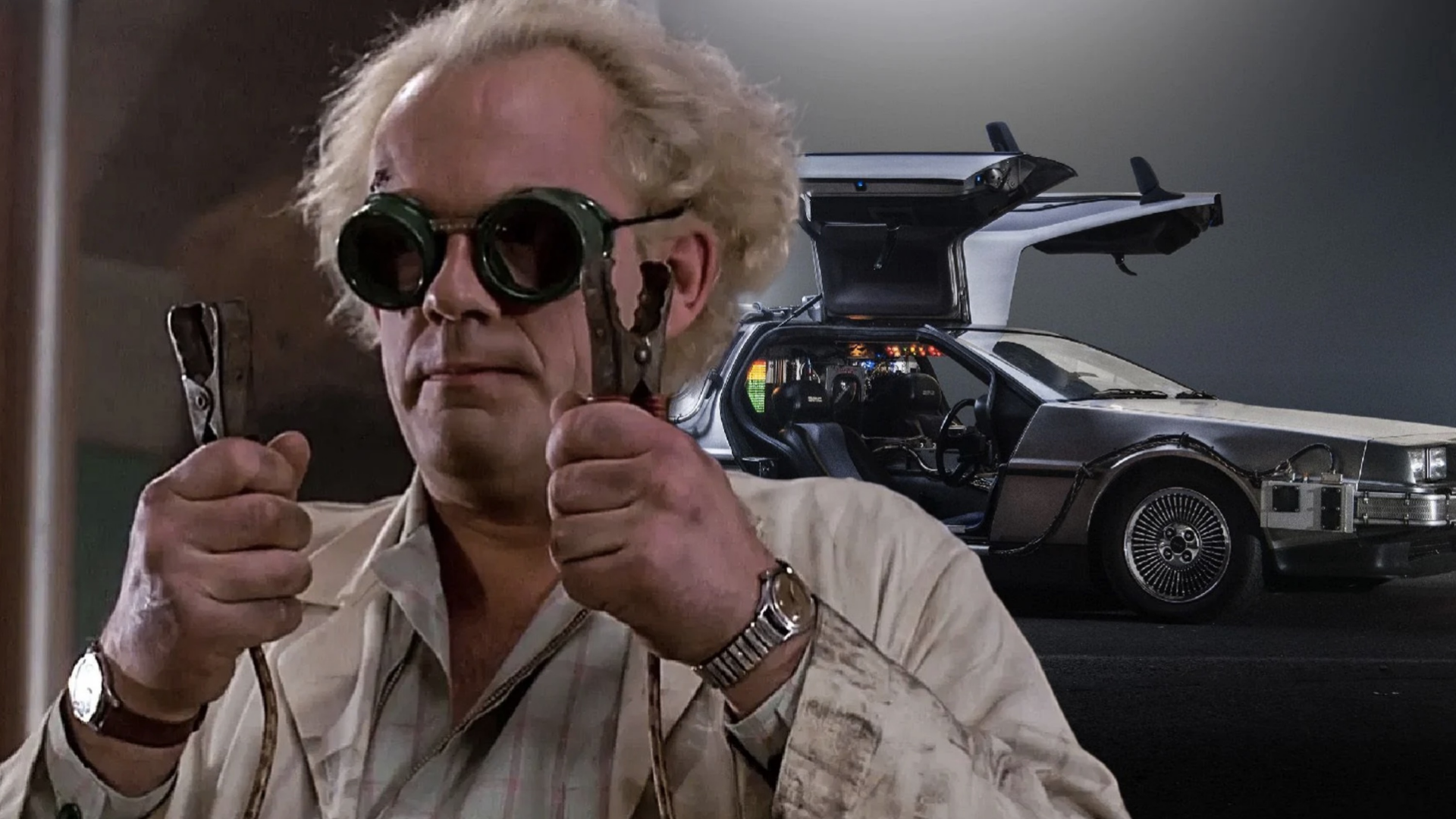


Figure: Interrupted time series analysis of the number of blood units expired before and after the start of drone delivery in 20 health facilities in Rwanda



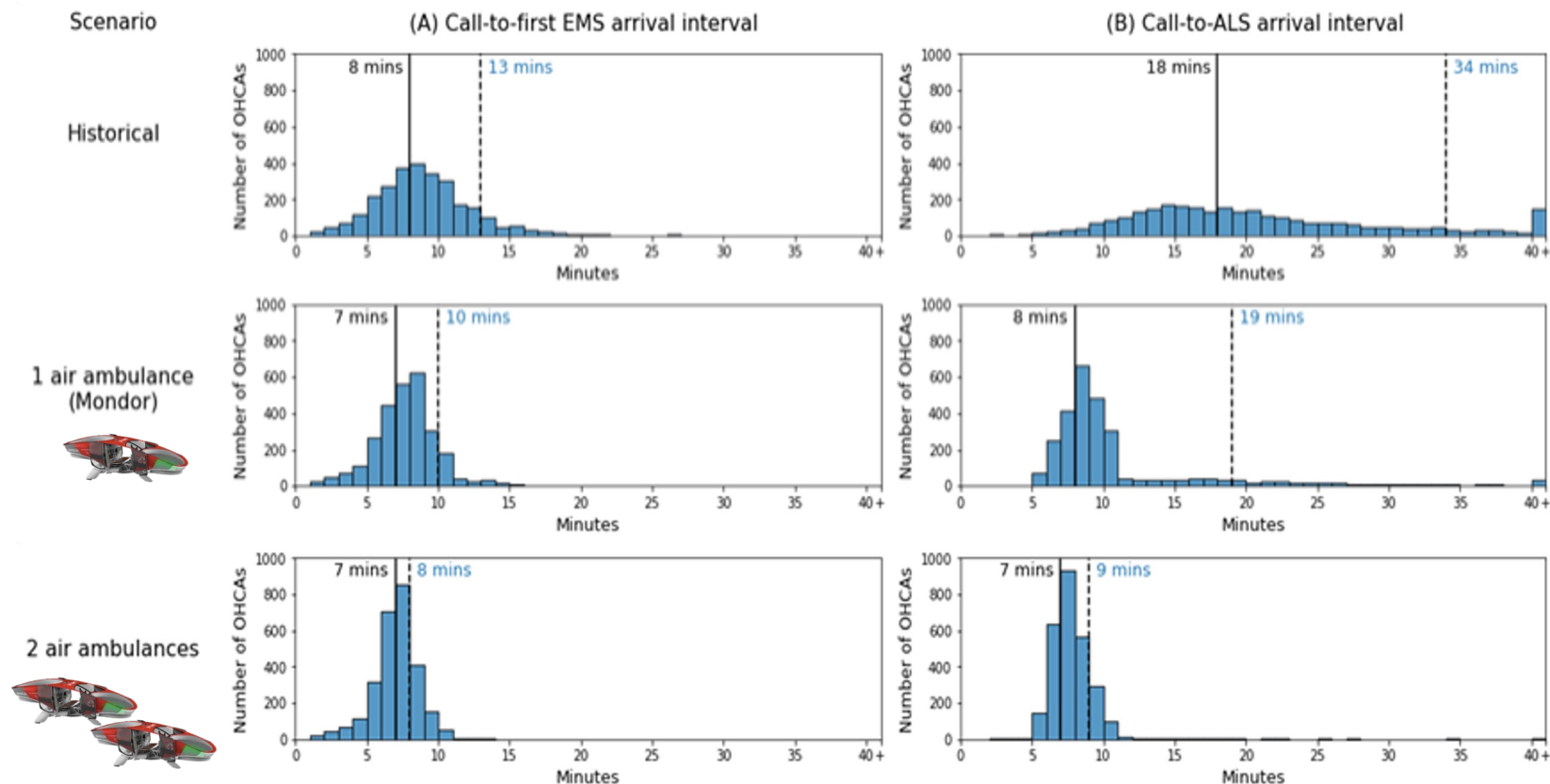
Ambulances 3.0

eVTOL (ambulances volantes)



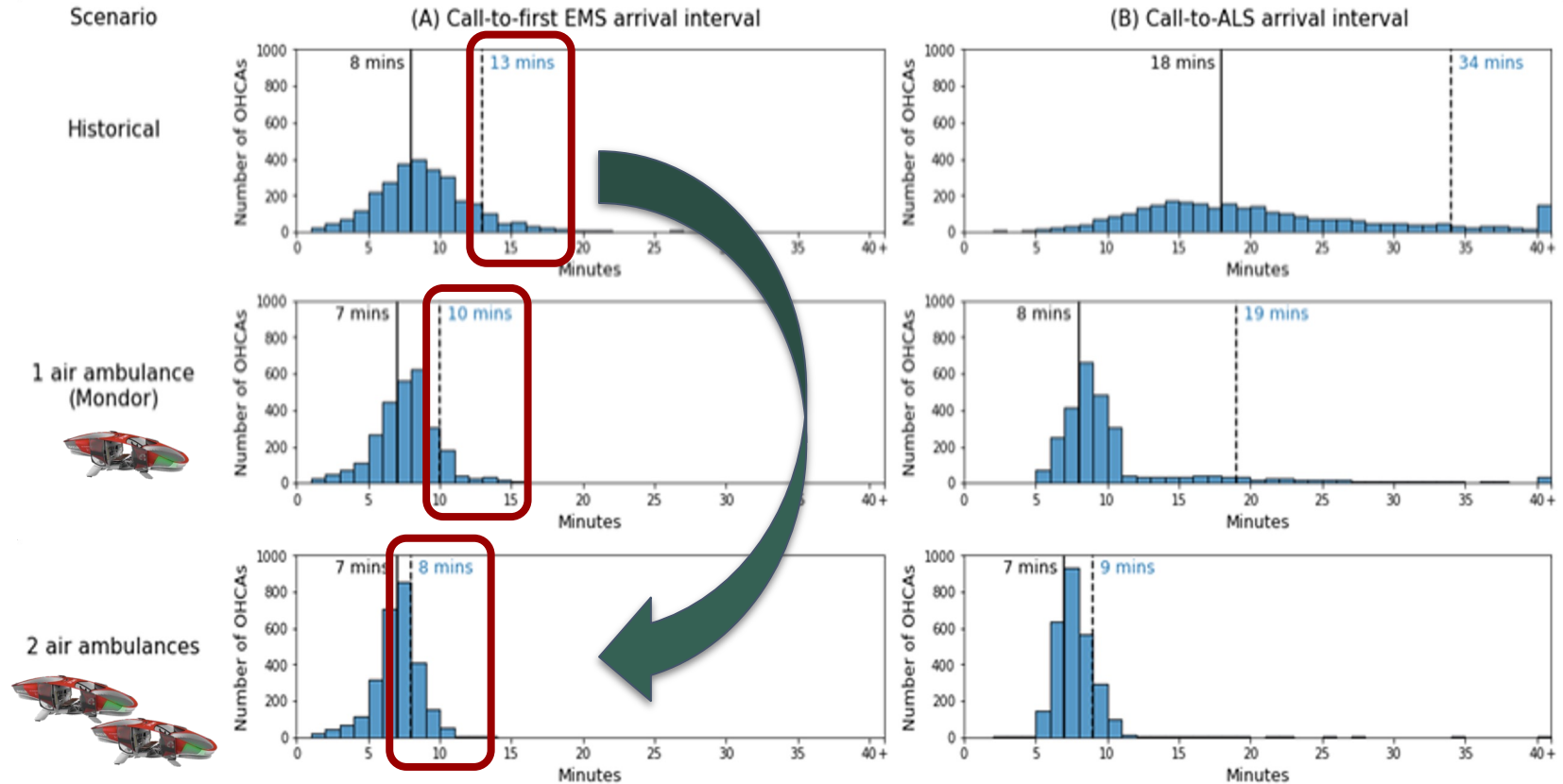
Accessibilité améliorée





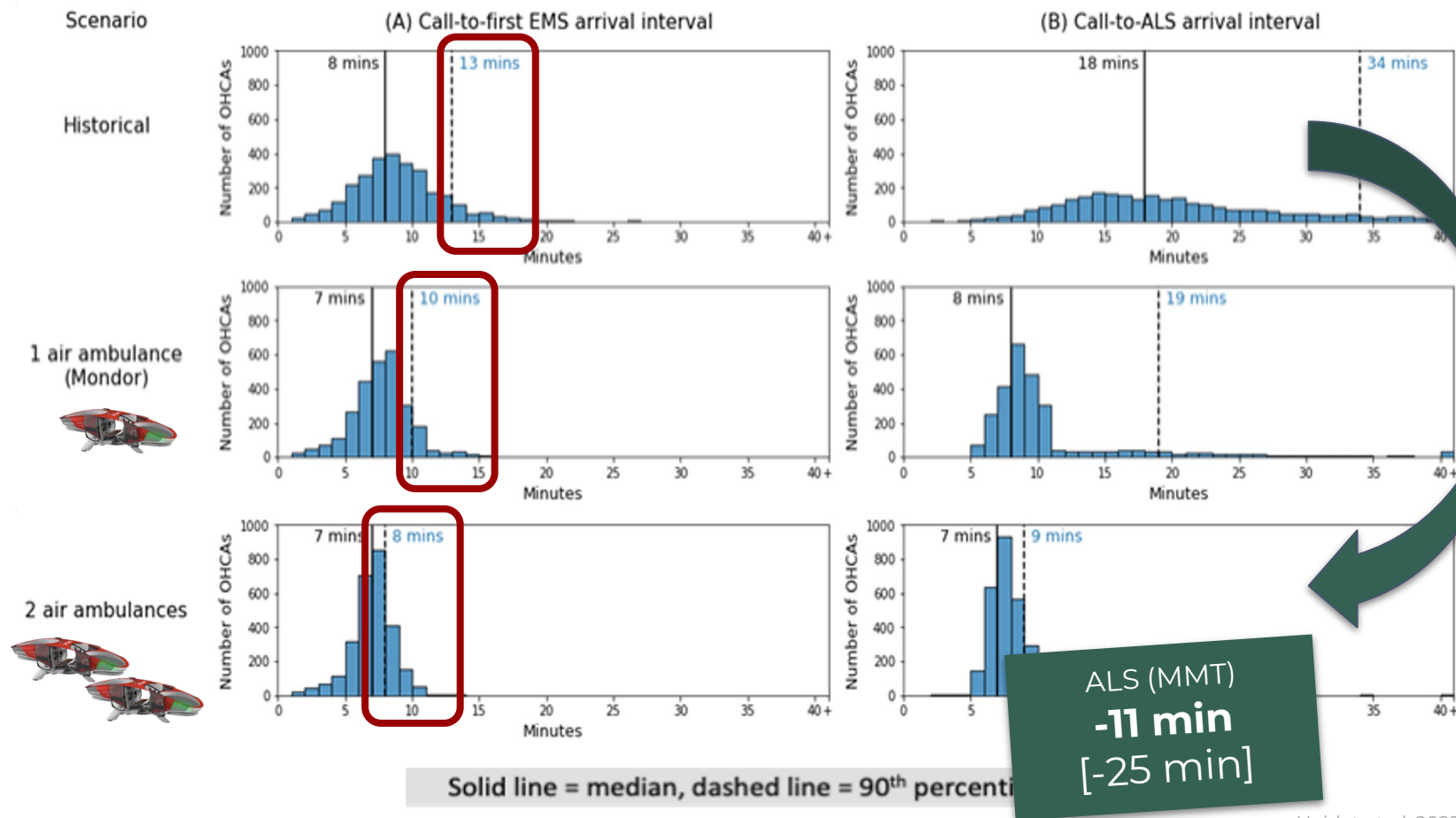
Solid line = median, dashed line = 90th percentile

Paris



Solid line = median, dashed line = 90th percentile

Paris



Scenario	Air ambulance arrives prior to any ground-based resource, %	Air ambulance arrives prior to ALS ground-based resource, %
Actual response	-	-
1 air ambulance (Mondor)	35.4	77.4
1 air ambulance (Avicenne)	41.6	75.3
2 air ambulances	55.4	93.0

Flying ambulance 1st
35-55%

**Flying ambulance
before ALS
77-93%**



Assistance
géolocalisée
24h/24
7j/7



PROCHAIN ARRÊT
DANS 1 MINUTE

Sortie





**OUI
MAIS**

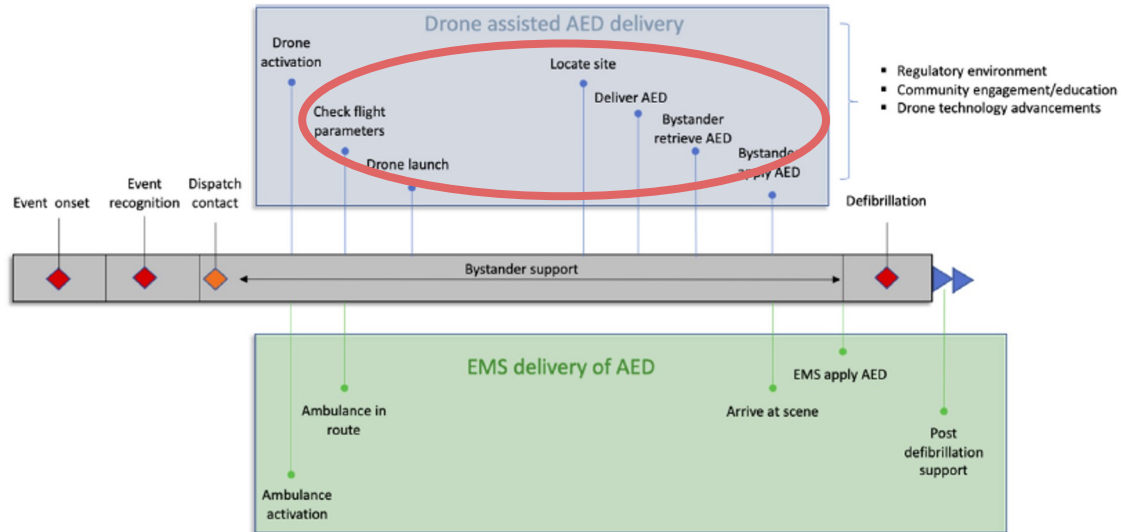


Fig. 1 – Integration of systems for drone-assisted delivery of AED in cardiac arrest.

PAS SI SIMPLE...

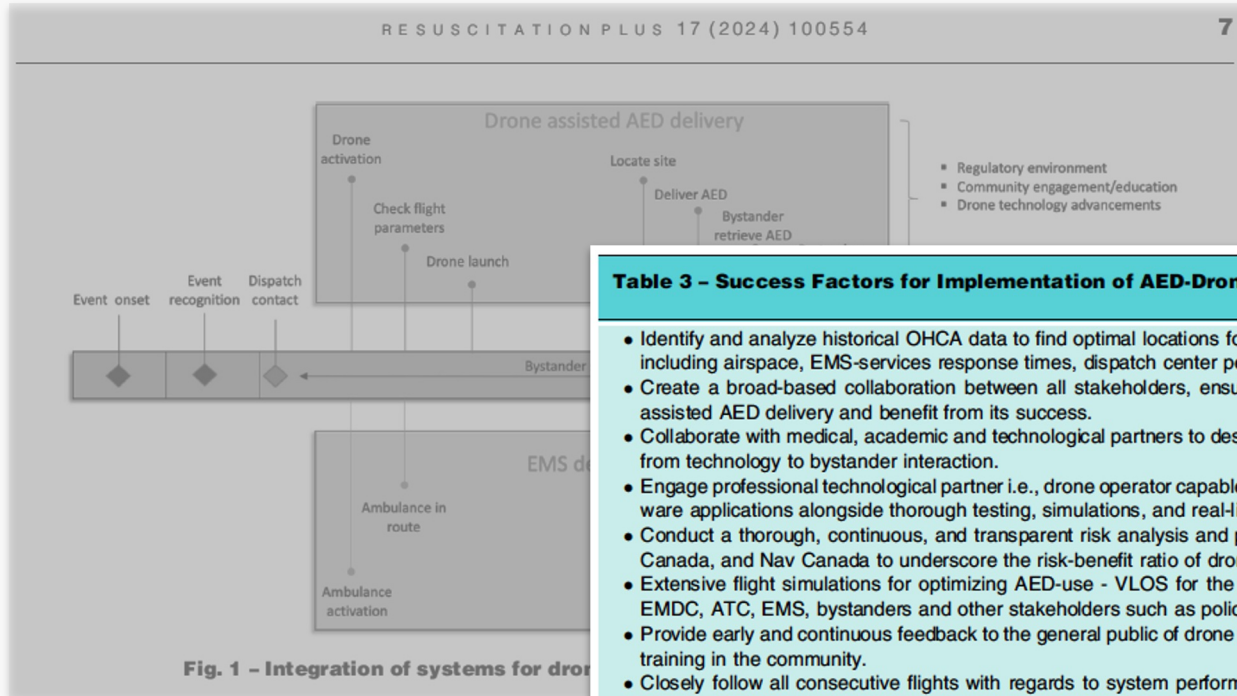


Fig. 1 - Integration of systems for drone

DES ENJEUX

Table 3 – Success Factors for Implementation of AED-Drones into Emergency Care.

- Identify and analyze historical OHCA data to find optimal locations for AD-drone service. Analyze local conditions for implementation including airspace, EMS-services response times, dispatch center performance etc.
- Create a broad-based collaboration between all stakeholders, ensuring each party can contribute to the implementation of drone assisted AED delivery and benefit from its success.
- Collaborate with medical, academic and technological partners to design the very specific application of delivering AEDs using drones from technology to bystander interaction.
- Engage professional technological partner i.e., drone operator capable of developing a technological platform, including hardware, software applications alongside thorough testing, simulations, and real-life flight operations.
- Conduct a thorough, continuous, and transparent risk analysis and provide data to aviation authorities FAA, STA, EASA, Transport Canada, and Nav Canada to underscore the risk-benefit ratio of drone assisted AED delivery.
- Extensive flight simulations for optimizing AED-use - VLOS for the specific use-case of delivering AEDs including drone operator, EMDC, ATC, EMS, bystanders and other stakeholders such as police, fire department, city council and more.
- Provide early and continuous feedback to the general public of drone service/project alongside working to facilitate an increase of BLS training in the community.
- Closely follow all consecutive flights with regards to system performance, adverse events and clinical endpoints and communicate these to stakeholders continuously.
- Post-resuscitation provider and patient interactions and experiences with AED-delivery systems.
- Legislators/Authorities/Transportation boards (e.g., FAA, EASA, Transport Canada, etc.) should develop a predefined risk assessment protocol with clear criteria specifically for drone delivered AEDs. This will inform future steps and be an initial template for authorities to further develop for other applications.

AEDs. This will inform future steps and be an initial template for authorities to further develop for other applications.

La fin des « taxis volants » à Paris, une opportunité gâchée pour la France par rapport aux Etats-Unis et à la Chine ?

POINT MORT - Un arrêté ministériel autorisant la création d'une plateforme de décollage de ces engins a été annulé par le Conseil d'Etat. La Ville, qui dénonçait le projet, salue la décision, tandis que la région regrette une opportunité manquée



Les + lus Les + lus Paris

1

RADICALITÉ

En guerre contre « le vice », les talibans coupent les télécommunications

2

ALPINISME

Un alpiniste se décroche pour prendre une photo, glisse et disparaît

3

PROCHE-ORIENT

Ce que l'on sait du plan de Trump accepté par Israël pour Gaza

[Voir les articles les + lus](#)

Dispatcher nurses' experiences of handling drones equipped with automated external defibrillators in suspected out-of-hospital cardiac arrest - a qualitative study

Dalby-Pedersen Hanna¹, Bergström Erika², Berglund Ellinor³, Schierbeck Sofia³, Svensson Leif⁴, Nord Anette³, Hollenberg Jacob³ and Claesson Andreas^{3*}

Conclusions

Although telephone-assisted cardiopulmonary resuscitation routines for drone dispatch were available, the use of these was a rare occurrence. Registered nurses expressed heterogeneous understanding of how to comply with the telephone-assisted cardiopulmonary resuscitation protocol when drones were dispatched. Collegial and technical support was considered important alongside routines and training, which needs to be improved to further support bystander use of drone-delivered AEDs.

ÉVÉNEMENT RARE

INTÉGRATION
RÉANIMATION ?





Experimental paper

“Drones are a great idea! What is an AED?” novel insights from a qualitative study on public perception of using drones to deliver automatic external defibrillators

K. Sedig^a, M.B. Seaton^a, I.R. Drennan^{b,c,d,f}, S. Cheskes^{b,c,d,e}, K.N. Dainty^{a,g,*}

CULTURE DU DRONE

DSA ?

Semi-autonomous drone delivering automated external defibrillators for real out-of-hospital cardiac arrest: A Danish feasibility study



Louise Kollander Jakobsen^{a,b,c}, Jannie Kristine Bang Gram^c, Anne Juul Grabmayr^{a,b}, Anders Højen^c, Carolina Malta Hansen^{a,d,e}, Martin Rostgaard-Knudsen^c, Andreas Claesson^f, Fredrik Folke^{a,b,d}

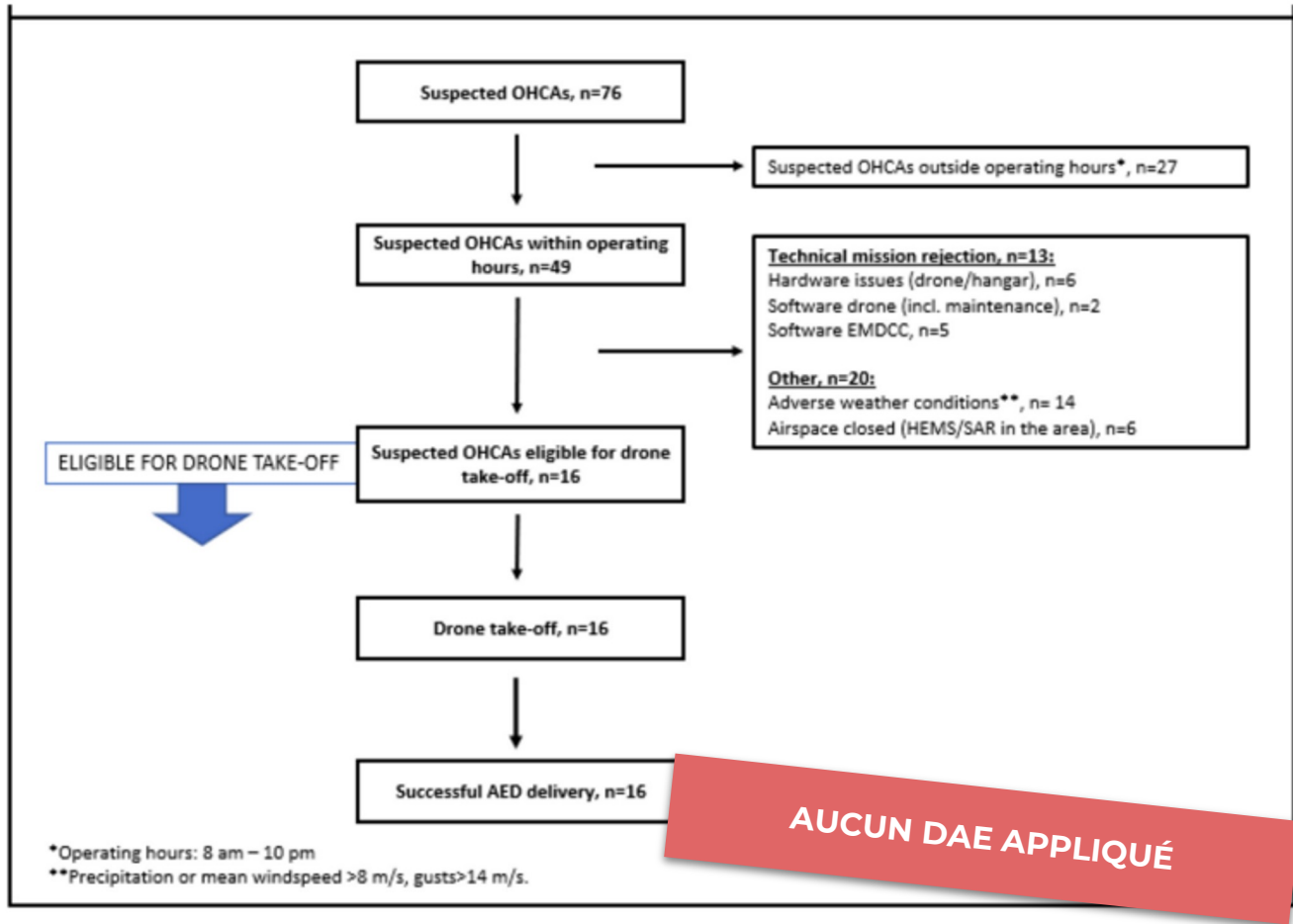
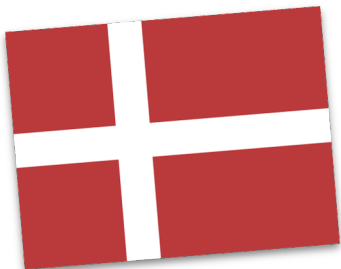


Fig. 3 – Flowchart.



2022

2023

2024

2025 ?

Ce drone unique en France peut transporter un défibrillateur en un temps record et sauver des vies

Correspondance, Marc BRAUN.



DSAÉ
DIRECTION DE LA SÉCURITÉ
AÉRONAUTIQUE D'ÉTAT





MERCI

pour votre attention

matthieu.heidet@aphp.fr