



## Letter to the Editor

### Is there an association between emergency physician gender and decision-making during out-of-hospital cardiac arrest? A retrospective study



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Out-of-hospital cardiac arrest covers a continuum of diverse situations, from sudden/traumatic death, to the discovery of long-dead patients. France has a two-tiered prehospital rescue system, which sends two teams for Basic Life Support, and another one or Emergency Medical Service. Since the Basic Life Support network is much narrower than that of Emergency Medical Services, they are the first to interact with the patient and start cardio-pulmonary resuscitation. At that time, no decision is made by the rescuers: all patients receive cardio-pulmonary resuscitation, regardless of their age or circumstances of the cardiac arrest, excluding patients with rigor mortis. Once the emergency physician takes the lead of the intervention, he/she must quickly decide to continue or terminate resuscitation efforts. This decision is based on patient characteristics, some parameters of the out-of-hospital cardiac arrest and the doctor's intuitive and complex integration. Termination of resuscitation rules is not common practice among French physicians [1]. However, for patients with similar profiles, practitioners may take opposing decisions without explanation [2]. In addition, according to recent systematic analyses, decision-making in out-of-hospital cardiac arrest is probably influenced by the emotions and cognition of the resuscitation providers [3]. A recent quality literature highlights the influence of physician gender in his or her practices [3,4]. The aim of this study was to evaluate the factors associated with the decision to provide medical resuscitation, specifically concerning physician gender.

We studied the greater Paris cardiac arrest register from 01/01/2012 to 31/12/2014, which contains data from Basic Life Support and lists all cardiac arrests supported by its teams.

#/Emergency Medical Services. We included any out-of-hospital cardiac arrest interventions handled by an Emergency Medical Services ambulance. This represents 6 centres spread over an area of 800 km<sup>2</sup> for 9 million inhabitants. We excluded out-of-hospital cardiac arrests in which the doctor gender was not identified. We used a stepwise logistic regression to estimate the

Odds Ratio (OR) and their 95% Confident Interval (95% CI) to determine the association between whether resuscitation was performed and the physician gender, by adjusting on any variables available with  $P < 0.2$  in univariate analysis. Another logistic regression was performed to assess associations between live discharge at the hospital and the emergency physician gender, with adjustment for the other collected variables. A two-tailed  $P$  value of less than 0.05 was considered to be significant. Data management and statistical analyses were performed with STATA software version 13.3 (StataCorp, College Station, Texas, US). This study was approved by the ethical committee of the French Society of Anaesthesia and Intensive Care Medicine (No. IRB 00010254 - 2016–130).

Over the three years of collection, Emergency Medical Services firefighters handled 2024 out-of-hospital cardiac arrest interventions, from which we excluded 70 and analysed 1954 of them. Male practitioners were more numerous (60 vs. 42), older (39.9 years vs. 34.4,  $P < 0.001$ ), and more experienced than female ones (8.5 years vs. 5.3,  $P < 0.001$ ). They handled less out-of-hospital cardiac arrest interventions than female practitioners (19.5 per physician vs. 26.8,  $P = 0.046$ ). Emergency Medical Services team performed resuscitation in 840 patients (43%) and 488 were admitted alive to the hospital (25%). Concerning resuscitation, the multivariable analysis showed an association between its initiation and male physicians (OR: 3.22; 95% CI [1.94–5.37],  $P < 0.001$ ) (Table 1), whereas no association was observed between physician gender and admission alive to hospital (OR: 1.09, 95% CI: [0.69–1.70]).

The finding key of our study was that male emergency physicians were associated with more frequent resuscitation achievements, for a hospital admission rate similar to that of female physicians. In the literature, large recent cohorts find a decrease in morbidity and mortality with female physicians or surgeons [3,4]. Our work suggests that women practitioners better predict patient outcomes than their male counterparts. We could also evocate potentially “inappropriate” resuscitations, not without possible side effects: ethics (false hope of survival for relatives and family), economics (cost induced by Emergency Medical Services), increased downtime of the working teams, and risk of accidental exposure to blood. More specifically for out-of-hospital cardiac arrests, the term “medical futility” includes the following concepts: low survival rate without consequence, manifest disproportion between the patient's previous condition and the aggressiveness of Emergency Medical Services gestures, cost to society, idea that the care given has no chance of success. Because of the retrospective nature of our work, we were unable to compare the performance of termination of resuscitation rules with physician decisions.

Medical decision-making is a cognitive process that combines voluntary decision-making and unconscious influences, both derived from medical evidence, personal medical beliefs and, to

**Table 1**  
Univariate and multivariable logistic regression with initiation of Advanced Life Support by a physician as the dependent variable.

		Univariate			Multivariable logistic regression		
		OR	95% CI	P value	OR	95% CI	P value
<b>Physicians</b>							
Age	< 30 years	1.16	0.99–1.36	0.06	1.27	0.64–2.51	0.801
	[31–35] years	1.10	0.99–1.26		1.16	0.76–1.77	
	[36–45] years	1	–		1	–	
	> 45 years	0.87	0.75–1.00		0.77	0.36–1.60	
Gender	Female	1	–	0.046	1	–	< 0.001
	Male	1.21	1.00–1.43		3.22	1.94–5.37	
Experience	< 1 year	1.44	1.15–1.81	< 0.001	1.03	0.55–1.94	0.92
	1–5 years	1.25	1.01–1.55		0.77	0.45–1.32	
	> 5 years	1	–		–	–	
Number of OHCA by physician median	0–1	–	1.10	0.29–4.24	0.98	–	–
	2–5	–	0.96		0.51–1.71		
	6–15	–	1		1		
	> 15	–	1.12		0.85–1.49		
<b>Patients</b>							
Age	< 2 years	8.17	5.69–11.72	< 0.001	29.00	11.28–76.65	< 0.001
	[2–12] years	6.81	4.90–9.74		22.40	9.31–53.06	
	[13–40] years	3.72	2.97–4.99		8.23	4.55–14.78	
	> 40 years	1	–		1	–	
Gender	Female	1	–	< 0.001	1	–	0.48
	Male	1.61	1.34–1.94		1.03	0.57–1.31	
OHCA in public location No flow	2.6	2.09–3.25	< 0.001	2.57	1.44–4.58	< 0.001	
	< 5 min	1.26		1.18–1.35	1.17		1.11–1.31
	[5–10] min	1		–	1		–
	[11–15] min	0.78		0.73–0.84	0.64		0.54–0.74
	[16–20] min	0.63		0.55–0.72	0.49		0.39–0.62
	> 20 min	0.24		0.16–0.37	0.33		0.23–0.48
First Rhythm (BLS)	Asystole	1	–	< 0.001	1	–	< 0.001
	Shockable rhythm	32	10–101		9.71	2.22–42.36	
	PEA	4.62	3.14–6.77		2.92	1.54–3.04	
Witnessed OHCA		2.38	1.88–3.01	< 0.001	1.73	0.99–3.04	0.056

OR: odd ratio; CI: confident interval; OHCA: out-of-hospital cardiac arrest; PEA: pulseless electrical activity. The category with the most membership was chosen as a reference.

the extent possible, patient choice [5]. Our work illustrates the non-voluntary part of this decision-making. A significant number of cardiac arrest studies cannot be conducted in double-blind, which is the most robust method to limit the influence of physician beliefs. We therefore strongly recommend that these studies collect data on physician gender; it should be integrated to the Utstein style. This is particularly important since Western medical demographics tend to feminise significantly.

This study, however, had some limitations. Some parameters could not be collected, notably medical history, presumed origin of out-of-hospital cardiac arrest, and low flow duration. Some other non-collected information may have influenced our results, such as the presence of a junior doctor in training among the medical team. The multivariable analysis, including the number of out-of-hospital cardiac arrests per practitioner and years of experience, allows to avoid a bias where female practitioners expect a lot more out-of-hospital cardiac arrests, so should potentially be more experienced and confident at making decisions.

This is the first publication, to the best of our knowledge, of an association between determinants related to physicians and resuscitation of out-of-hospital cardiac arrest by Emergency Medical Services. A better understanding of human factors, especially those related to physicians, is a key factor in decreasing out-of-hospital cardiac arrest mortality. This work cannot answer to such a fundamental question. It highlights a possible misunderstood influence on decision-making and encourages further studies on this topic.

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C.D., R.K., and D.J. conceived the study; O.B. provided data analysis/interpretation. C.D., D.J and A.L. drafted the manuscript. All authors contributed substantially to the manuscript revision and approved the article.

### Disclosure of interest

The authors declare that they have no competing interest.

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