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Importance of delay for management of STEMI: does the helicopter HEMS is better than ground transport with MICU ambulance? Analyze of the French region Centre Registry of Acute Coronary (CRAC)

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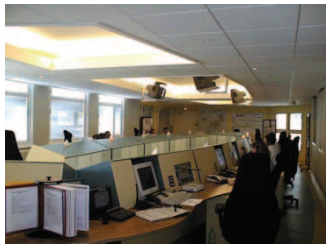
Conflicts of interest

Organization of prehospital EMS (SAMU) in Paris (France)



15

112

10,7 M Emergency Phone Call (15)

6,6 M false distress

20 % GP

4,1 M Medical Problem

(30%) Medical Advice

(36 %) Ambulance, Fire Brigade

S.A.M.U. 15

14 % MICU

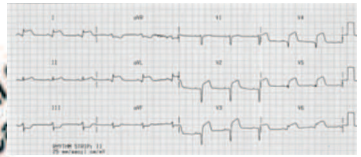
2,8 % stay on scene (deceased,, l)

11,2 % Transport to Hospital

14 % Discharge

86 % Admission

STEMI patients and initial reperfusion treatment



Onset of symptoms of STEMI

9-1-1 EMS Dispatch

EMS on-scene
- Encourage 12-lead ECGs
- Consider prehospital fibrinolytic if capable and EMS-to-needle within 30 min

EMS Triage Plan

Hospital fibrinolysis: Door-to-Needle within 30 min

Not PCI capable

Inter-hospital Transfer

PCI capable

Goals

Patient	*Dispatch*	*EMS on scene*	*EMS transport*	
5 min after symptom onset	1 min	Within 8 min	Prehospital fibrinolysis: EMS-to-Needle within 30 min	*EMS transport:* EMS-to-Balloon within 90 min *Patient self-transport:* Hospital Door-to-Balloon within 90 min

Total ischemic time: Within 120 min*

*Golden Hour = First 60 minutes

George A. Mensah et al. Circulation. 2007;116:e33-e38

American Heart Association.

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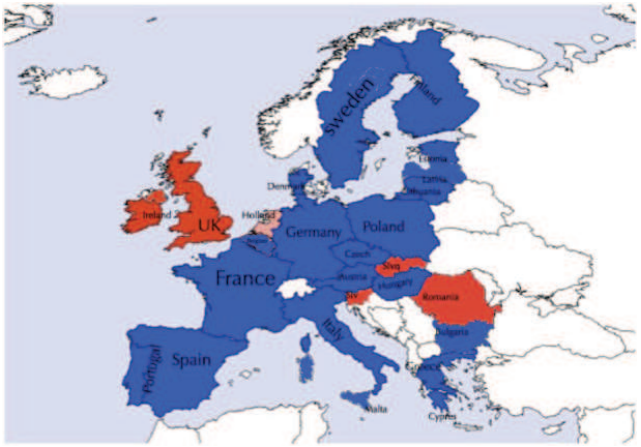
The 2 General Types of EMS Systems

"Anglo-American" system	"Franco-German" system
"Scoop and Run"	*"Stay and Play"*
Prehospital care by paramedics	Prehospital care by Emergency physicians
Patients delivered to hospital-based AED staffed by EP	Patients delivered directly to inpatient services (ACS, Stroke, MultiTrauma..)
"*Bring the patient to the doctor*"	"*Bring the doctor to the patient*"
May just transfer problems to the nearest hospital ?	May take more time on–the-scene ? Cost +++

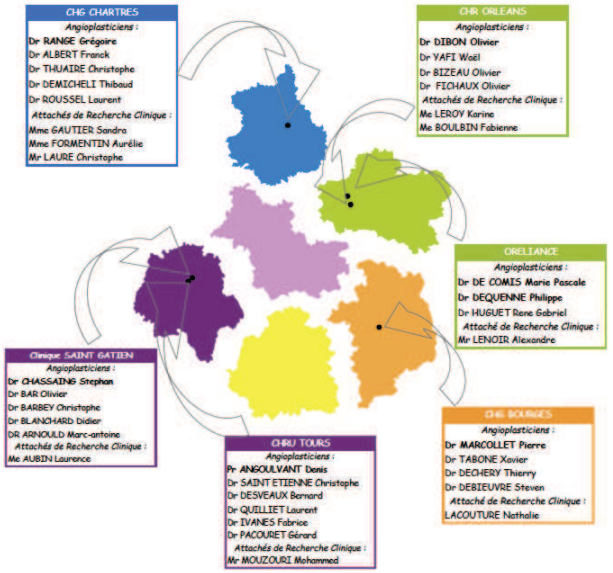
Mix the 2 systems !
"Stay Treat ...and run !"



models in Europe : Franco-German (60 %) vs Anglo American (30 %)

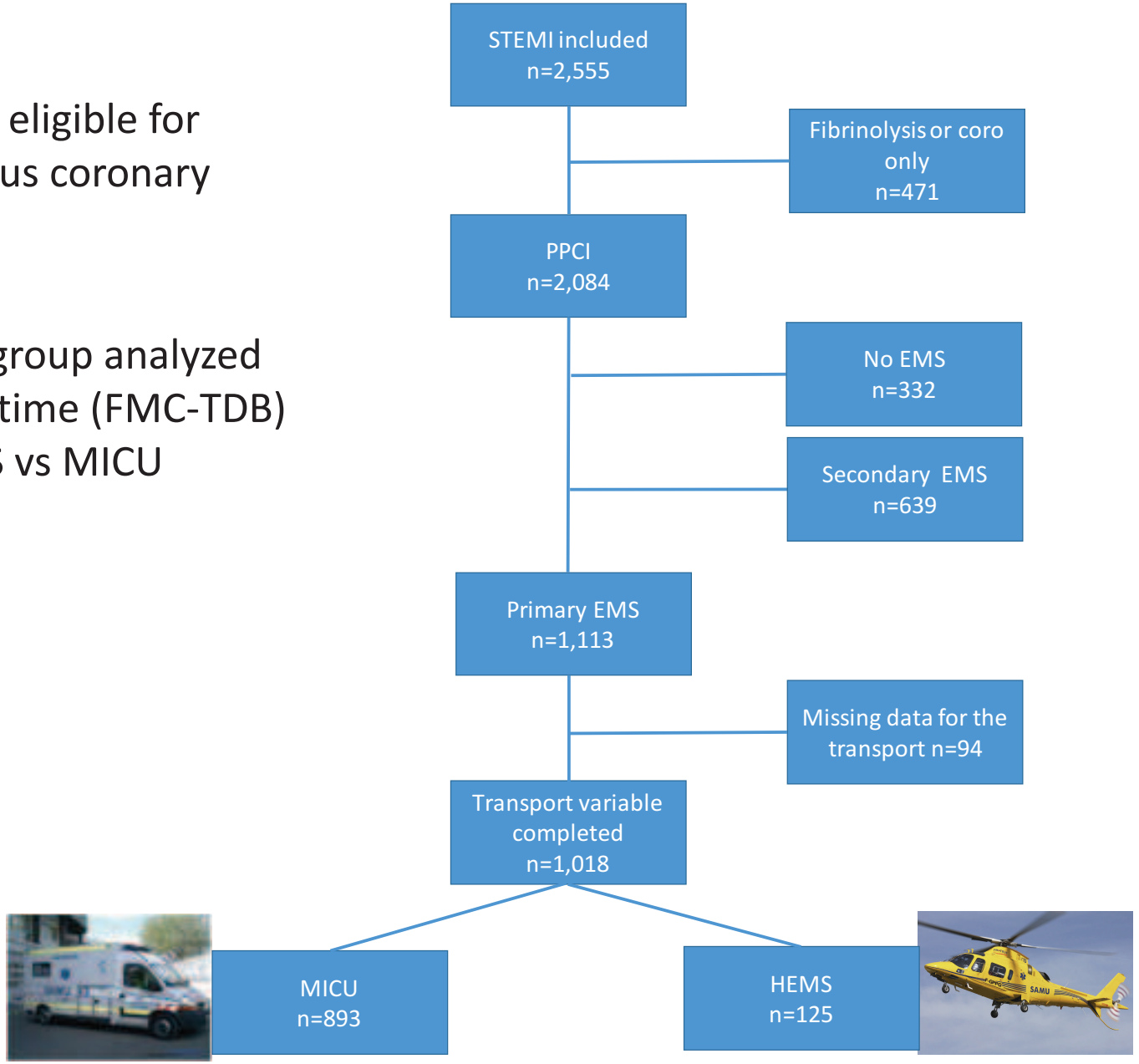
Materials and Methods:

- 3 years (01/14 to 12/16) Prospective multicentric study
- Patients with STEMI eligible for percutaneous coronary intervention (PCI)
- Simulated ground-based access times computed using a digital cartographic program
- Estimation of dispatch French System (SAMU) delay from call to admission to 5 of the cath lab of our region.
- Standard data collection from the *French region Centre Registry of Acute Coronary (CRAC) :*
  - (1) risk factor, history of prior MI or PCI
  - (2) elements of the acute clinical presentation
  - (3) key process times for reperfusion
  - (4) mortality and morbidities 30 days and 1 year follow-up



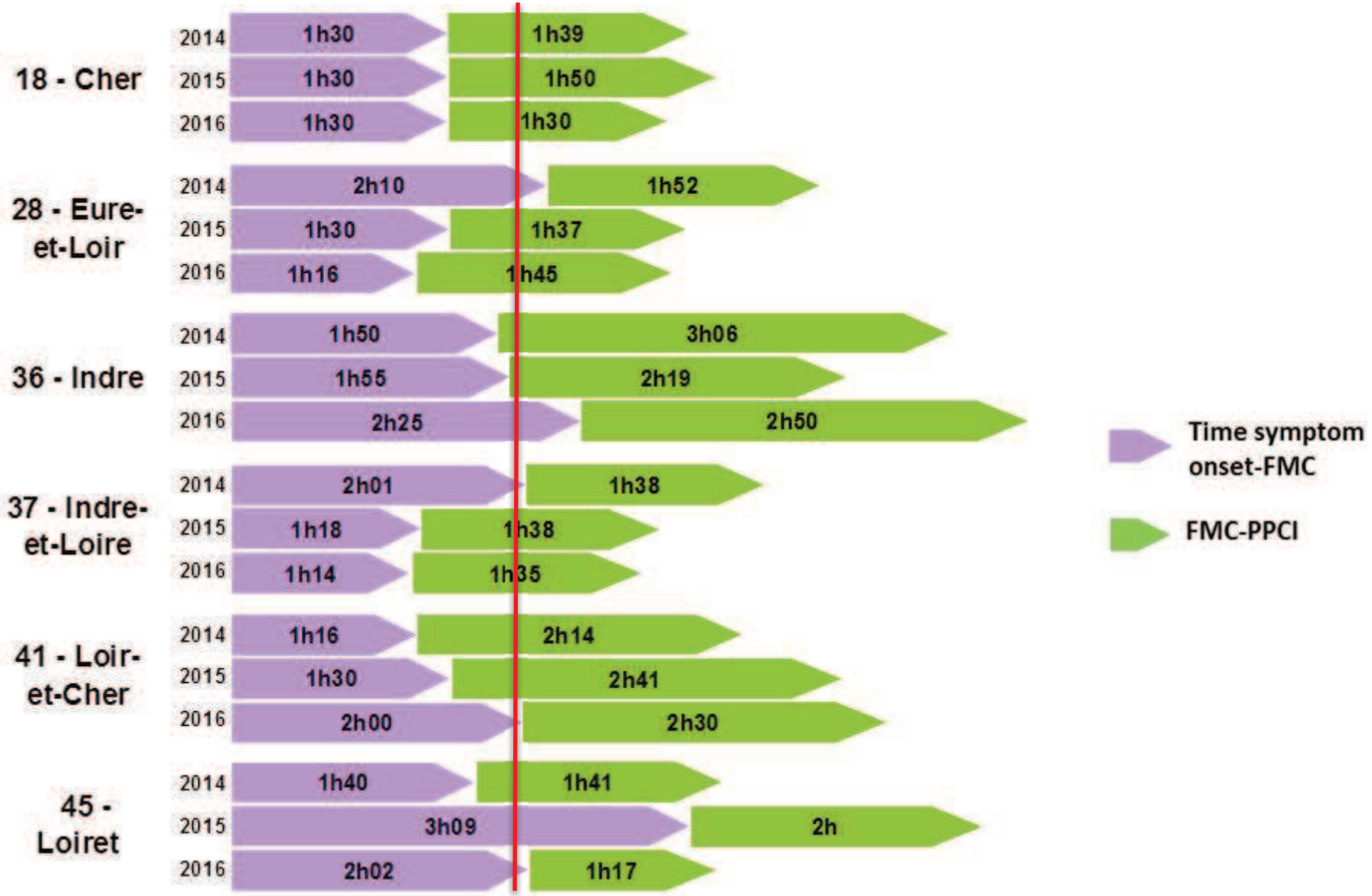
Materials and Methods:

- Patients with STEMI eligible for primary percutaneous coronary intervention (PPCI)
- A comparative sub-group analyzed the mean response time (FMC-TDB) for EMS using HEMS vs MICU



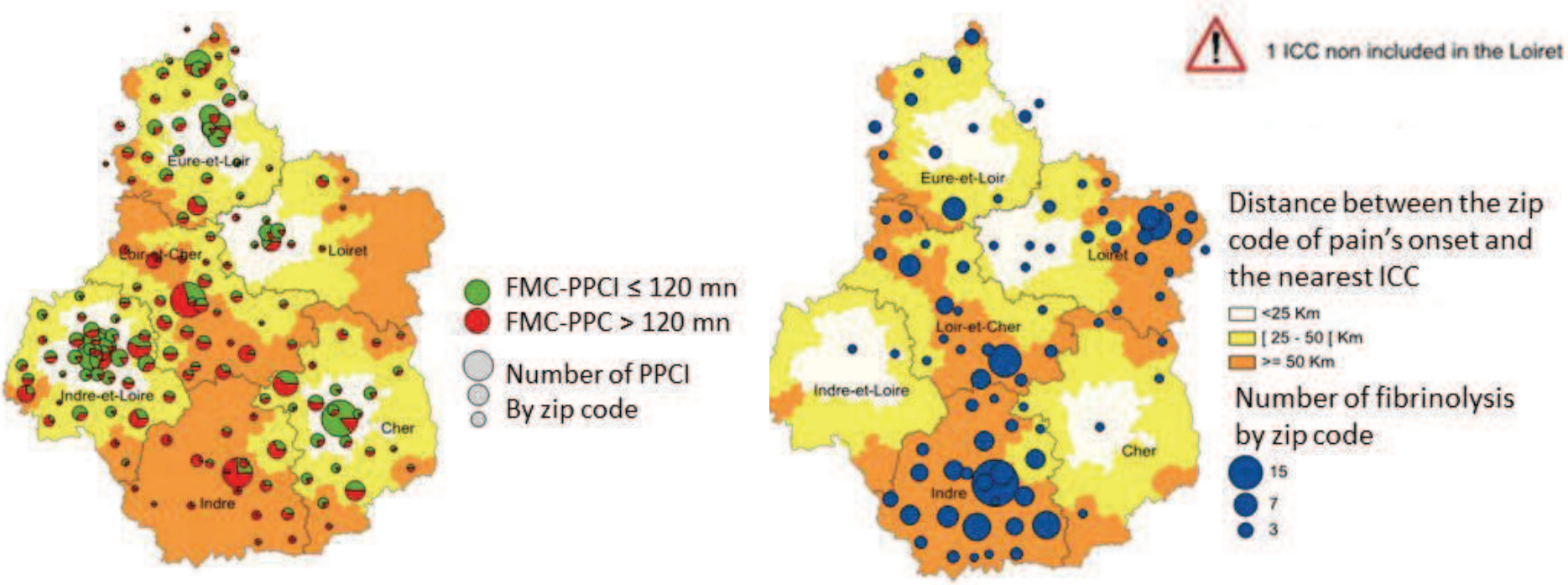
Results STEMI patients

Median time symptom onset-FMC : 1h32 mn
Median time FMC-PPCI : 1h52 mn



Results STEMI patients

82 % were transferred for primary percutaneous coronary intervention (PCI), 2% fibrinolytic therapy, 8% secondary angioplasty and 8% coronarography only.



FMC-PPCI time and fibrinolysis according to the distance between the place of pain and the nearest ICC

Results STEMI patients with PPCI and primary EMS

1,018 STEMI patients with PPCI and primary EMS were included.

Patient characteristics		HEMS n=125 (12.3%)	MICU n=893 (87.7%)	p value
Age median [range]		64 [37-89]	62 [30-95]	
Men		102 (81.6)	692 (77.5)	0.30
BMI ≥25		75 (60.0)	581 (65.2)	0.25
Diabetes		16 (13.2)	112 (12.7)	0.85
Hypercholesterolemia		39 (32.8)	335 (38.2)	0.26
Hypertension		44 (36.4)	344 (39.0)	0.58
Current smoker		37 (30.1)	359 (40.6)	**$<10^{-3}$**
Family history of coronary artery disease		29 (24.4)	189 (21.8)	0.52
Prior myocardial infarction		14 (11.4)	68 (7.6)	0.15
Prior PCI		20 (16.0)	104 (11.6)	0.16
Prior coronary artery bypass surgery		3 (2.4)	13 (1.5)	0.43
History of coronary artery disease*		23 (18.4)	121 (13.5)	0.15
History of PAD		6 (4.8)	30 (3.4)	0.41
History of stroke		2 (1.6)	23 (2.6)	0.51
History of Chronic kidney disease		2 (1.6)	13 (1.5)	0.89
Distance pain's onset - ICC	<25 km	3 (2.4)	438 (49.6)	**$<10^{-4}$**
	[25-50[km	37 (29.8)	294 (33.3)	
	[50-75[km	67 (54.0)	128 (14.5)	
	≥75 km	17 (13.7)	23 (2.6)	

* Combination of the 3 previous variables

PAD: peripheral arterial disease

ICC : interventional cardiology center

Results STEMI patients with PPCI and primary EMS

Distance pain's onset - ICC	HEMS			MICU			p value *
	N	Median time FMC-PPCI	Mean time FMC-PPCI	N	Median time FMC-PPCI	Mean time FMC-PPCI	
Global	124	1h: 53 mn	1h: 58 mn	891	1h: 35 mn	1h: 42 mn	**$<10^{-4}$**
<25 km	3			438	1h: 20 mn	1h: 27 mn	
[25-50[km	36	1h: 45 mn	1h: 50 mn	293	1h: 43 mn	1h: 51 mn	0.90
[50-75[km	67	1h: 56 mn	2h: 03 mn	127	1h: 59 mn	2h: 06 mn	0.58
≥75 km	17	1h: 54 mn	2h: 08 mn	23	2h: 06 mn	2h: 15 mn	0.45
missing data	1			10			

** Student's t-test if n>30 else Wilcoxon signed-rank test*

FMC: first medical contact

PPCI: primary percutaneous coronary intervention

ICC : interventional cardiology center

Factors associated with the HEMS

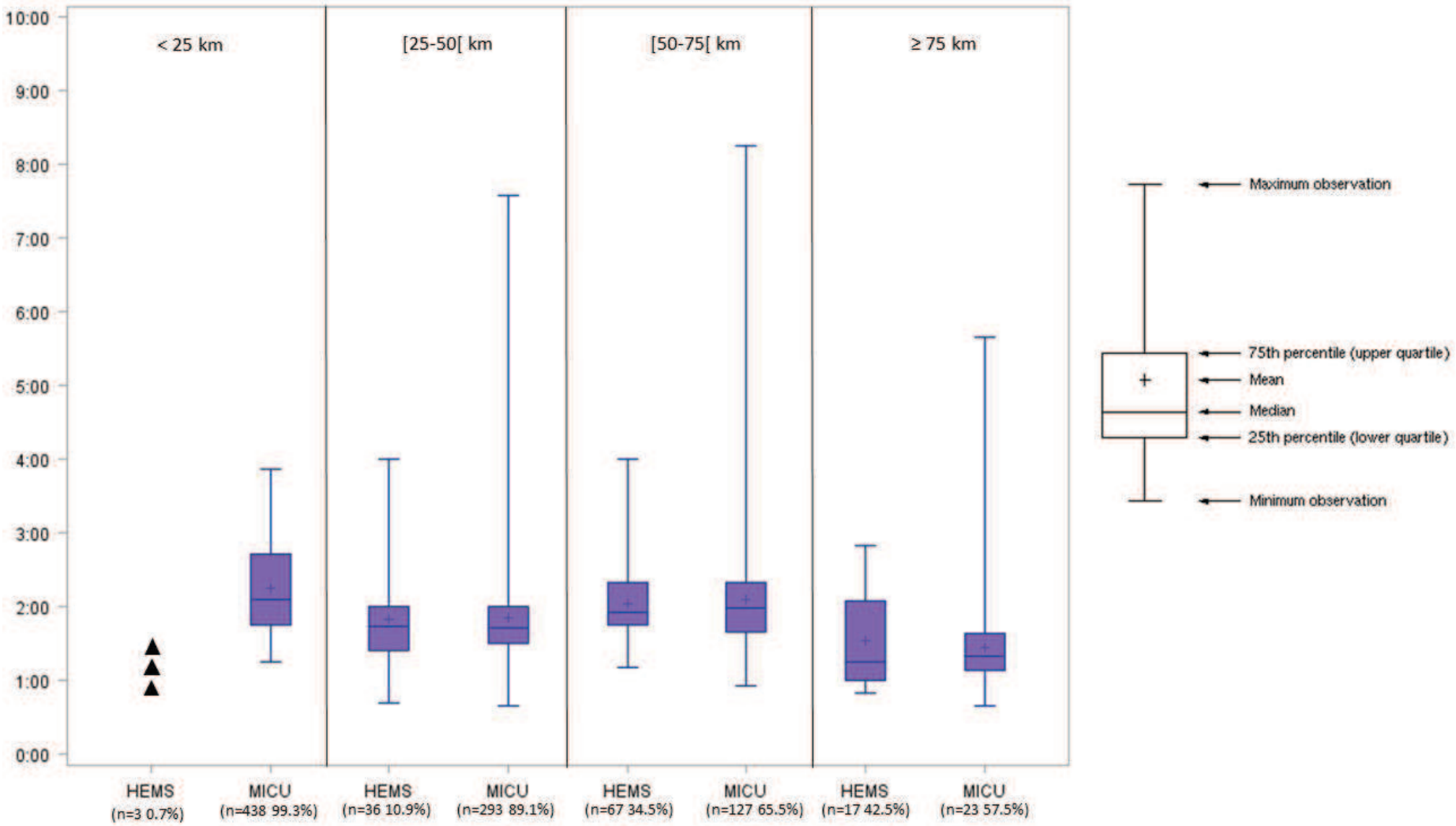
		HEMS (n=125 12.3%)	p value
Distance pain's onset - ICC	<25 km	3 (0.7)	**$<10^{-4}$**
	[25-50[km	37 (11.2)	
	[50-75[km	67 (34.4)	
	≥75 km	17 (42.5)	
Department of pain's onset	18 - Cher	1 (0.5)	**$<10^{-4}$**
	28 - Eure-et-Loir	20 (10.2)	
	36 - Indre	32 (45.7)	
	37 - Indre-et-Loire	14 (4.6)	
	41 - Loir-et-Cher	45 (32.1)	
	45 - Loiret	2 (2.8)	
	Outside CVL region	11 (40.7)	
ICC	Clinique Oréliance	14 (12.8)	**0.01**
	CH Chartres	31 (14.2)	
	CH Bourges	34 (12.5)	
	Clinique Saint Gatien	2 (1.9)	
	CHRU de Tours	44 (14.2)	
Time of FMC during standart working hours*	Yes	76 (15.4)	**$<10^{-2}$**
	No	49 (9.4)	

*8 AM to 8 PM except week end days

ICC : interventional cardiology center

Age, sex, ischemia localisation, EMS call, FMC, time symptom onset-FMC were not significant

Mean and median FMC-PPCI time (except times of more than 12 h) according to the transport and the distance between the place of pain and the nearest ICC



Discussion

1. In many European countries, the EMS structure is made up of ambulances and HEMS staffed by emergency Physicians.
2. For patients with STEMI transferred for PCI have called dispatch center within 90 minutes of initial presentation.
3. The network organization using doctors in the ambulances (or HEMS) increase the delay to reach the patient.
4. On the scene, the EMS staff communicates directly with the PCI cardiologist to reduce the delay for a primary PCI in less than 120 mn after the FMC.
5. In a well-developed STEMI system, D2D times within 90 to 120 minutes appear most feasible for hospitals within 30-minute transfer drive time.
6. Helicopter transport did not offer D2D time advantages for transferred STEMI patients. Our results offer important insights into the impact of transfer time and mode of transport on achievement of guideline goals for D2D time in the treatment of STEMI patients.
7. Several potential explanations exist for our findings,:
   - time associated with preparation and deployment of air transportation
   - the potential selection of air transport cases with more complexity
   - distance from the patient to the PCI.

Conclusions

1. In our CRAC registry, helicopter transport was associated with
   - longer DTB times
   - better overall D2D times for STEMI patients with symptom occurring over 75 km distance to the hospital
2. Our findings suggest the need for continued systems improvement to reduce first medical contact to DTB times
3. Need further studies in decision making in transport choice
   - to reduce transport times
   - reexamination of how to make the best air versus ground transport decision