Management of multiple trauma on scene

Part 2 : The evidences

Why aggressive management on scene is important ?

Any evidence of a positive effect ?

Prehospital care : Is it possible to observe a difference in survival ?

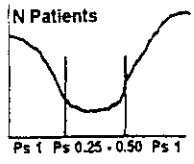
Number of trauma patients toinclude in a trial (α = 0.05, ß = 0.10) using global or individual percentage of survival

Riou , Carli et Al Anesthesiology 2001

Trauma population	Control	Expected survival improvement + 10 %	+ 20 %	+ 30 %	+ 50 %
Global %of survivors	75	77.5	80.0	82.5	87.5
Cohort needed		12018	2848	1192	374
Individual % of survivors	75	76.5	76.0	78.0	7909
Cohort needed		312400	63202	6730	3080

Increase of number of patients related to distribution

Improvement of survival by 20 %
Multiplication factor



. Gaussian	1.2
. Continuous	3.2
. «J » shape	2.5
. Bimodal « trauma »	22

Riou , Carli et Al Anesthesiology2001

Consequences of the bimodal distribution on mortality based study

- Very large multicenter study
- Subgroup of patients with low, intermediate, high Ps.
- Composite endpoint : Mortality, + sepsis, renal failure, SDRA

Mutiple trauma patients SAMU de Paris and CHU Pitié

Riou, Carli et Al ESA 1999

- 350 blunt multiple trauma patients 36 ± 16 years
- ISS 28 ± 16 RTS 6.2 ± 2.3

Head	70 %
Thorax	69 %
Abdomen	37 %
Plevis	48 %
Limbs	62 %

Evaluation of the population : Improvement of survival ?

Riou, Carli et col. ESA 1999

TRISS = 0.750 ± 0.341

277 (79 %) survivors as compared

TO 262 (75 %) predicted

W = ± 5.1 % (Z = 12.2 p < 0.001)

M = 0.65 (Zs = 0.15 NS)

Ventilation and airway control

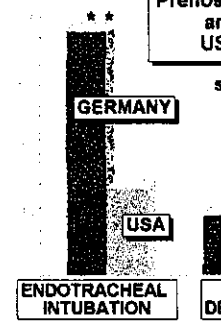
Is endotracheal intubation necessary ?

Prehospital endotracheal intubation and chest decompression US versus German system

SCHMIDT et Al J. TRAUMA 33, 548 , 199

166 U.S: Paramedics
221 GERMAN: Physician

Improvement of early survival by TRISS methodology



Success of endotracheal intubation by EMTs

Study	Success rate %	95 % C	Intubation / pers / year
BRADLEY 1998 BEMT	49	36-62	0.60
SAYRE 1998 BEMT	51	42-61	

The need of an alternative for EMT

Prehospital intubation by physicians in the French EMS system SAMU

Author	Year	n Patients	% Difficult Intubation	% Impossible
Ortlaguet SAMU 75	1995	157	16	3
Cantineau SAMU 94	1997	224	4	0
Ricard SAMU 92	1997	147	5.4	0
Adnet Multicentric	1998	691	11	1

Chest tube decompression of blunt chest injuries by physician in the field : effectiveness and complications

Schmidt et Al J. Trauma 1998, 44, 98-101

624 chest trauma / 78 chest tubes
30 Tension PNT , 18 Hemothoraces

. 6 / 624 missed minor PNT
. 4 minor problems with the tube
. No misplacement or related injuries
. No infection

Safe and effective
when performed by trained physicians

Circulation and volume loading

Is volume loading necessary ?
What is the best fluid for volume loading ?

Immediate Versus Delayed Fluid Resuscitation for Hypotensive Patients with Penetrating Torso Injuries

Bickell WH, Wall MJ, N. Engl. J. Med. 331, 1105,1994

- 598 patients with thorax and neck trauma
- Prehospital SBP ≤ 90 mmHg
- **Delayed F.R. survival 70 %**
- ***Immediate F.R. survival 62 %***

$p < 0.04$

Delay of agressive fluid resuscitation improve outcomes

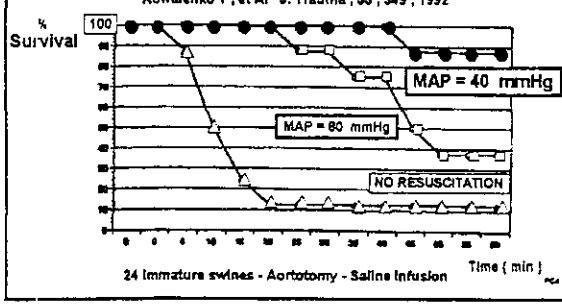
In Response: Immediate Versus Delayed Fluid Resuscitation ...

Carli , De la Coussaye et Al N Engl J Med 1996

. Hypotension or hypovolemia ?
. No difference in SBP with and without fluid Prehospital FR = 870 ± 667 ml RL
. Compliance to the protocol
. Other ATLS procedures ?
. No analysis of the causes of death

Improved Outcome with Hypotensive Resuscitation of Uncontrolled Hemorrhagic shock in a Swine Model

Kowalenko T , et Al J. Trauma , 33 , 349 , 1992



Blood pressure target

- Multiple trauma with severe TBI:

  SAP 120 mmHg

- Unique bleeding injury in a young patient:

  SAP 90 *mmHg*

"Permissive hypotension or hypovolemia "

Prehospital volume loading

- Crystalloids
- Artificial colloids
  - Gelatins, Hydroxyethylstarch
  - No difference on survival with crystalloids
  - Advantages for prehospital care : weight limitation
- Other :
  - Hypertonic saline ± colloid
  - Oxygen carrying fluids

DCLHb in the treatment of severe traumatic hemorrhagic shock

SLOAN EP et Al JAMA 17, 282, 1999

- 18 US major trauma centers
- 112 patients with unstable vital signs
- DCLHb (up to 1000 ml) or Saline
- More complications in the DCLHb group p<0.03
- Mortality at 28 days
  - DCLHb 46 %
  - Saline 17 % p < 0.003

European prehospital study stopped

Hypertonic saline dextran in patients with traumatic brain injury and hypotension

WADE CE J Trauma, 42, 861, 1997

- Metaanalysis of 6 studies 223 patients
- AIS head injury ≥ 4 SBP < 90 mmHg
- Strafied analysis , logistic regression
- Survival
  - HSD 37.9 %
  - STD care 26.9 % p = 0.08
- Odds ratio survival until discharge 2.1 p=0.048

TBI treated by HSD are about twice likely to survive

Effect of hydroxyethylstarch in brain dead kidney donors on renal function in kidney-transplant recipients

Cittanova ML et Al Lancet 348,1620-1622, 1996

Randomized brain death donors, volume loading by HES or Gelatins

15 HES donors providing 27 recipients
12 Gelatins donors providing 20 recipients

Hemodialysis at one week
HES 9 / 27 GEL 1 / 20 p < 0.05

Creatinin (µmol/l) at 10 days
HES 312 ± 259 GEL 146 ± 70

Limitation of (prehospital) HES use in potential brain dead patients ?

Post traumatic cardiac arrest Is resuscitation worth the price ?

- Very poor prognosis
- Survival in the USA < 0.5 %
- CPR and ALS are considered futile

Post traumatic cardiac arrest

BOUILLON ET COL Anaesthetist 1996

- 636 out of hospital cardiac arrest
- 224 ALS by physicians
- 30 % admitted alive
- 2 % survival at one year

Post traumatic cardiac arrest

Barriot, Riou et Al, Med Arm 1988

49 patients , age 32 ± 2 years

19 ROSC

12 discharge alive

Survival is related to ALS interventions < 5 min : volume loading, thoracostomy, pericardiocentesis

Post traumatic cardiac arrest Is resuscitation worth the price ?

Severe Head Trauma Patient

Limitation of secondary brain injuries ?

The role of secondary brain injury in determining outcome from severe head injury

Chesnut R, Marshall I, et Al J. Trauma 34, 216-220, 1993

717 head trauma patients
GCS < 8 from the Traumatic Coma Data Bank

- Prehospital hypotension is frequent : 34.6 %
- Hypotension is very detrimental, increases mortality by 150 %
- Hypotension and hypoxia increases separately mortality

Importance of prehospital care for comatose trauma patients :

" Resuscitation protocols for brain injured patients should assiduously avoid hypovolemic shock on a absolute basis"

Aeromedical prehospital neurotrauma care and secondary sytemic insults to the injured brain

Carrel , Ravussin An Fr Anest Rean 1994

- 51 severe neurotrauma patients
- Possible insult defined as :
  SBP≤ 95 mmHg PaO2 ≤ 65 mmHg
  PaCO2≥ 45mmHg Ht ≤ 30%
- Agressive resuscitation on scene by anesthesiologists
- Low Glasgow Outcome Score (1 - 3) at 3 month

No insult : 42 % One or more : 72 %

Efficient ATLS on scene improves prognosis

Fluid resuscitation of patients with multiple injuries and severe closed head injury ?

York et al J Trauma 2000; 48 : 376-80

- Monocentric descriptive study , 34 polytrauma patients
- Traumatic brain injury CGS < 8 and ISS > 16
- Volume loading guided by
  PPC > 80 mmHg and hemodynamic monitoring
- 74 % of patients with good neurological outcome and no secondary insults
- 6 % mortality only

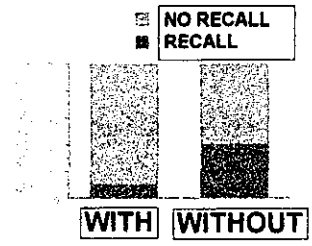
Fluid restriction is not necessary to achieve good outcome

Advantages of prehospital sedation and anesthesia on scene ?

Post - operative recall of surgery after trauma and shock

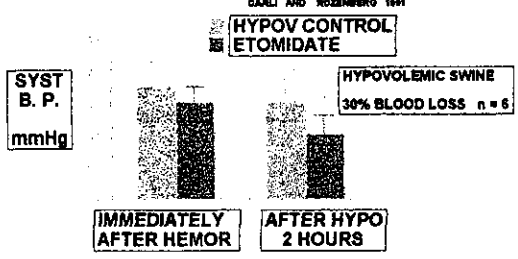
Patients with or without anesthesia

Bogetz et Al , Anesthesiology 1984



Duration of hypovolemic shock and hemodynamic effect of anesthesia

CARLI AND ROZENBERG 1991



Effect of Etomidate on B. P.
Immediately or 2 hours after hemorrhage

Rapid sequence induction for intubation by aeromedical transport team

Fing et Al, Am J Emerg Med 1998, 16, 598

84 trauma patients ISS 19 ± 11	
Successful intubation	96 %
First attempt	87 %
Failure	4 %

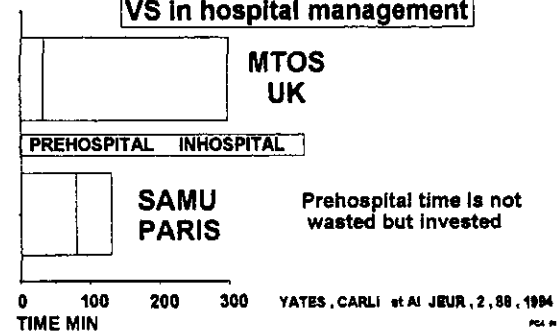
RSI is safe and effective. Pulmonary complications are related to severity of trauma and not to intubation mishap

Time on scene

- Only one component of prehospital time
- Nether been demonstrated as a pronostic index !

Spaite et Al Ann Emerg Med 32, 480, 1998

Duration of prehospital VS in hospital management



Prehospital time is not wasted but invested

YATES , CARLI et Al JEUR , 2 , 88 , 1994

Conclusion

- All trauma patients cannot be managed in the same manner
- Importance of the training of the team members
- Major area for research

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Paris SAMU strategy
for optimal pre-hospital emergency medical care
for
Myocardial infarction (MI) in 2001

P. Carli P.Sauval M.Martinez Almoyna C. Bertrand
SAMU de France

The aims of medical care *during pre-hospital phase?*

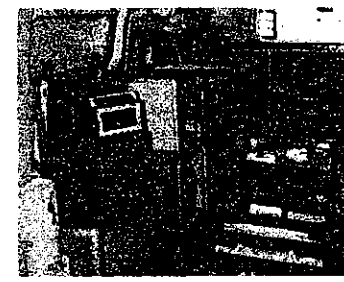
- Diagnosis
- Traitment
- Strategy

Different steps of pre-hospital Medical care

- Calling the SAMU
- MICU intervention
- ICU patient orientation
- ICU direct taking over

MICU equipment and drugs for MI

. Diagnosis :
EKG
Mini blood tests
. Treatment :
thrombolytics
anti gp2b3a
aspirin
nitroglycerin
defibrillator
syrings
électric IV pumps
oxygen
etc
. Monitoring :
EKG o2saturation



assesment strategies

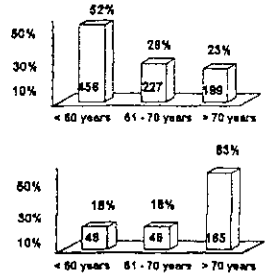
- STIM study by SAMU in France
- ESTIM study for Ile de France (Paris region and Paris city)
- Specially targeted studies

STIM SAMU 1997

- prospective data collection through Minitel
- Objectives : implementation of a strategy for MI
- All IM treated by SAMU MICU
- from 15 / 9 to 15 / 12 / 1997
- participants : 108 / 350 SAMU MICU Bases and 88 Hospital ICU

STIM SAMU study : results

1143 Patients

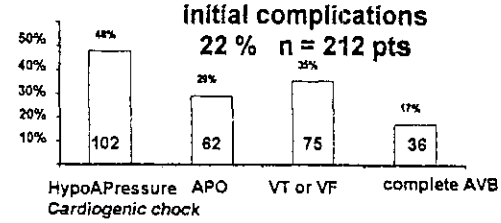


Males n = 882
Medium Age = 60 years

Females n = 261
Medium age = 72,5 ans

STIM SAMU study: results

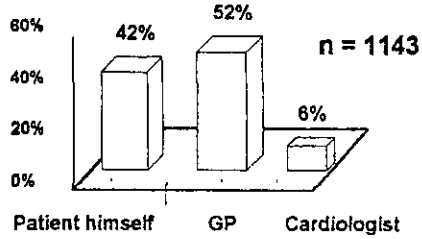
initial complications
22 % n = 212 pts



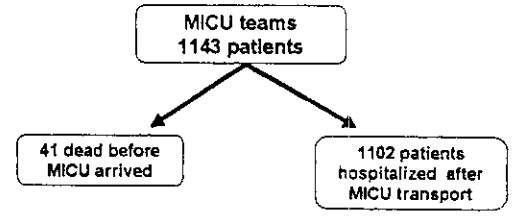
Dead before treatment 3.6 % n = 41

STIM SAMU study : results

Who called SAMU through « 15 »?



STIM SAMU study: results



STIM SAMU study : results

ICU Strategy

1102 patients alive when MICU arrived

No decision for re-perfusion	Strategy of re-perfusion
n= 487 44 %	n= 615 56%
Un-certain diagnosis n = 106	Pre-hospital thrombolysis
too last n = 88	n = 275
Contra-indications	Proposed angioplasty
n = 22	n = 340

No contra-indication for thrombolysis and no reperfusion n = 271

STIM SAMU : study results

re-perfusion strategy in function of age

Males	Thrombolysis	Angioplasty proposed	Total
847	n = 234	n = 256	n = 490
< 60 years	31%	51%	82%
61 à 70 years	30%	40%	70%
> 70 years	17%	26%	42%

STIM SAMU : Résultats

Strategy for re-perfusion in function of age

Females	Thrombolysis	proposed angioplasty	Total
255	n = 41	n = 84	n = 125
< 60 years	21%	40%	60%
61 à 70 years	21%	43%	65%
> 70 years	13%	38%	51%

STIM SAMU study: results

Medical intensive care by SAMU MICU mean delays

Pain – SAMU call 84 min 0 - 1380
SAMU call - MICU on site 15 min 0 - 330
MICU on site - thrombolysis 40 min 1 - 146
Pain - thrombolysis 135 min 45 - 810
(39% < 2h 95% < 6h)
Pain- ICU for angioplasty 144 min 0 - 1440

STIM SAMU study results

Delays for aging patients

. Delay pain-SAMU demand is later: 120 min vs 69 p < 0,001

even more later for females patients: 125 min vs 76 p < 0,001

. No difference for re-perfusion delay

More SAMU delays of demands for females!

STIM SAMU study : results

Incidents during SAMU MICU out of hospital phase of treatment

n= 195 patients 18%

. Cardiac rythm and conduction incidents / n = 125

. PAO n = 38

. thrombolysis due hemorragies n = 11

. *death : n = 17 with 4 hémorragies*

Discussion and conclusion of STIM SAMU study

Re-perfusion

. 25 % of MICU thrombolyses .
. 13 % of objective contra indications
. 31% of angioplasties propositions performed

MICU préhospital thrombolysis is feasible, simple and saves time

25 % of patients do not have yet any re-perfusion strategy decided in pre-hospital phase

pre-hospital phase of MI studies

re-perfusion
by pre-hospital thrombolysis saves time
EMIP : 55 minutes
MITI : 33 minutes
GREAT : 140 minutes
CAPTIM : 60 minutes
MI prehospital medical diagnosis is safe
95 % reliability in CAPTIM study

CAPTIM study conclusions

- No difference beetwin préhospital thrombolysis and angioplasty for MI treatment
- 33 % of patients thrombolysed undergo angioplasty in few hours
- The future is to be combination of drugs and coronary interventions

ESTIM$_1$

Évaluation de la Stratégie Thérapeutique de l'infarctus aigu du Myocarde

pre hospital critical care for myocardial infarction in Paris Region : Ile de France

12 months résults
March 2000 - March 2001
MI < 24h

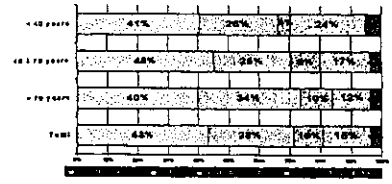
Scientific Comity C Lapandry

SAMU of IDF

ESTIM$_1$

1933 MICU out of hospital emergency interventions

Who calls SAMU depending on age

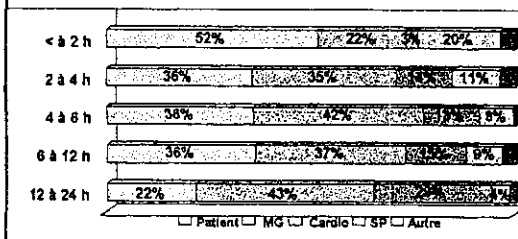


The patient calls himself the more

ESTIM$_1$

1933 MICU out of hospital emergency interventions

time delay between pain and SAMU calling

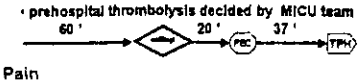


Many SAMU directly and early callings are done by patients themselve

ESTIM$_1$ time delays

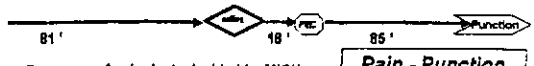
Depending on MICU decision of strategy of coronary desobstruction for **1227 /1933** patients : mean times

- prehospital thrombolysis decided by MICU team



Cardiac pain
1 h 57

Pain



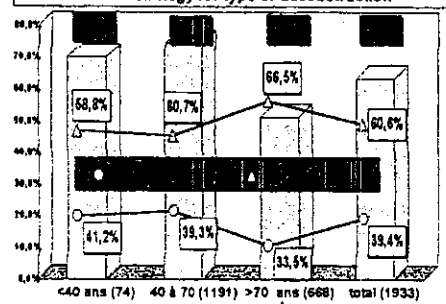
- Emergency Angioplasty decided by MICU

Pain - Punction
3 h 04

Angioplastie nécessite 1h 07 en plus

ESTIM$_1$ 1933 out-of-hospital MICU interventions

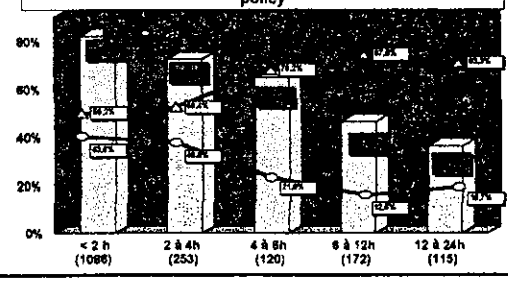
strategy for type of desobstruction



Depending on age

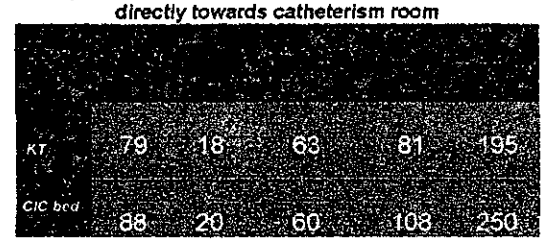
ESTIM$_1$ 1933 out-of-hospital MICU interventions

Pre hospital MICU team decision for coronary desobstructive policy



Catheterisation decided by pre hospital MICU team

Delays depending on choice between an ICCU bed or directly towards catheterism room

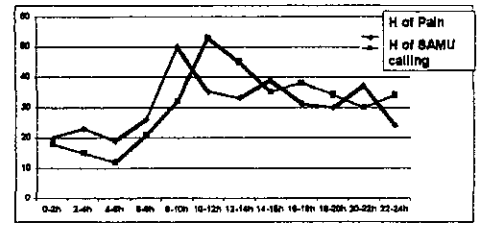


Avantages of direct access in coronary catheterisation room

several SAMU MICU results in Paris

ESTIM study : Hours in a day of callings to SAMU of Paris for MI

Données ESTIM Paris année 2000 juin à 2001 juin



ESTIM SAMU of Paris

Données ESTIM Paris année 2000

strategical MICU care delays

305 patients IDM < 12 h

n = 305	Pain Calling	Pain MICU	Pain ICU bed	Pain Puncture
Thrombolysis	97	113	166	240 h
Angioplasty	121	137	221	263 h
Medical care	176	195	269	480 h

ESTIM

Données ESTIM Paris année 2000

Comparison of care delays: male / female

	pain calling	pain thrombolysis	pain punction	pain medical care
Men n = 258	138	163	241	231
Women n = 78	172	175	288	304

mean age : men = 63 women = 65

Time delais of critical care when GP or cardiologist « on the site » call for MICU in *second* intervention

Dotties ESTIM Paris années 2000

pain - calling	calling-MICU	Pain-Thrombolysis	Pain-Angioplasty	Pain medical care
209	33	274	313	268

GP for MI « on the site » EKG diagnosis " = 100 min lost

strategy for MICU dispatch for MI at level of the calling « medical regulation for MI »

- What thoracic pain needs MICU?
- Who needs to be directed to direct ICCU bed?

Medical regulation for thoracic pains

Viggiano et col SFAR 2000

study during 21 month

MICU interventions : n = 1906

= 1565 cardio-vasculair diseases

Calling from :

G1 : laymen = 51 %

G2 : EMT = 30 %

G3 : GP = 19 %

SAMU « medical regulation » for thoracic pains

Study on pertinence of SAMU « medical regulation »

During : 21 month

1906 MICU interventions with 1565 cardio-vascular pathologies

	justified MICU	non justified MICU
G1 n (%)	718 (73)*	258 (27) †
G2 n (%)	386 (67)	192 (33) †
G3 n (%)	324 (87)*	48 (13) †

Why a direct admission in ICCU beds of MICU patients suffering was justified?

Telion et Col AFAR 2000

rétrospective study for one year

	coherent diagnosis process (%)	gravity of the case(%)	Cardiac critical care needed (%)	MICU cardiologic protocols (%)
ICCU admissions N = 175	159 (91 %)	100 (57 %) * #	147 (84 %)	155 (89 %)

Thoracic pain : cardiologic protocol for SAMU MICU

Acute MI
Diagnosis on Clinical and EKG signs

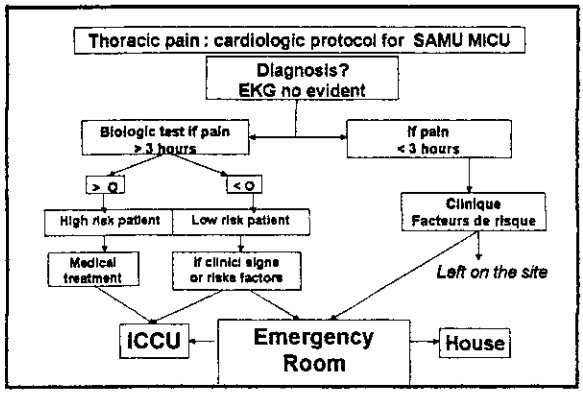
medical treatment

Anti gp2b3a

Pre-hospital Thrombolysis

Directly to KT room

ICCU



Conclusion

- Public Information : SAMU calling through the « 15 » , MI and chest pains
- Coordination between differents levels of medical care
- Cardiologists-SAMU coordinated, clear and efficient policy
- Periodic evaluation of quality of pre and in-hospital MI emergency critical care

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SAMU and helicopters

Catherine BERTRAND, MD, Ph.D.
SAMU de France / Creteil

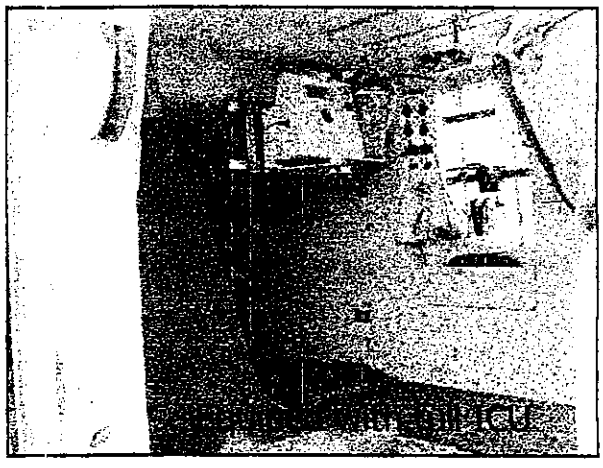
Regulations & types,
Daily & exceptional use,
Equipment, teams, cost

MICU HELICOPTERS

- Based at the Hospital
- Equipped for ICU
- SMUR
- European Regulation: dual-engine
- SMUH / AIR AMBULANCE

HELICOPTER SPECIFICATION MANUAL over 3 years

- Service according to performance class 1 aimed for 2004
- Helicopter based at the hospital
- Rental cost:
  - fixed costs + flight time >= 300 H / year
- 24/24H
- ICU Pre-equippement carried on board
- Experienced pilot



MICU Helicopters

- 2 flight modes:
  - Emergency: second pilot if poor weather conditions
  - Air Ambulance: non-urgent planned flights
- *All hospitals should have convenient & close helipad*
  - Including newly constructed HPs...

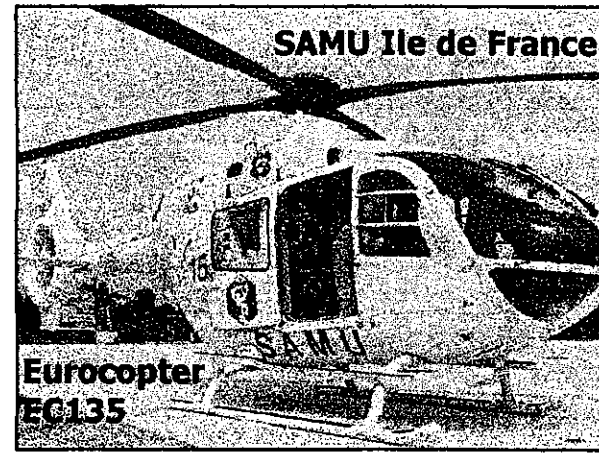
C. BERTRAND SAMU 94 – Japan 2001

SAMU 94 Henri Mondor Helipad is ~10m to triage room

The « Ile de France helicopter »

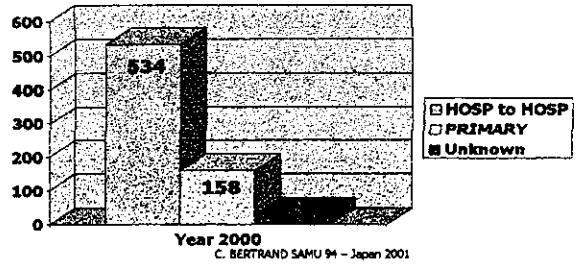
- 1 Eurocopter EC135
- Based at Henri Mondor Hospital, in Créteil (94000 France)
- Shared by 8 SAMU (= « Départements »)
- For 10 M of inhabitants in the Paris region
- 721 missions
- 689 hours of flight in year 2000

C. BERTRAND SAMU 94 – Japan 2001



The « Ile de France helicopter »

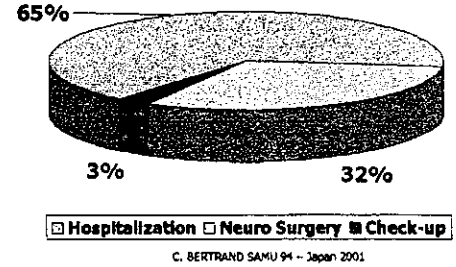
721 missions in Year 2000



C. BERTRAND SAMU 94 – Japan 2001

The « Ile de France helicopter »

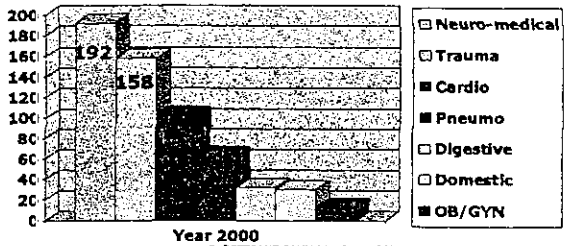
Purpose of transportation in Year 2000



C. BERTRAND SAMU 94 – Japan 2001

The « Ile de France helicopter »

Pathologies in Year 2000



C. BERTRAND SAMU 94 – Japan 2001

MICU Helicopters 1991-1995

- 35 « regions » have a helicopter
- 24 helicopters full time + 12 on short notice
- 12 680 missions / year
- 4 490 primary, 8290 secondary (HP to HP)
- SAMU White: 62 %
- Sécurité Civile Red: 30 %
- Gendarmerie Blue: 8 %
- Flights for Search & Rescue are not done by SAMU

C. BERTRAND SAMU 94 – Japan 2001

Survey on Helicopter use by SAMU (1)

- 61 SAMU participated
- 15 days in August 1998
- 448 Primary missions
- 370 H to H missions
- 304 Potential missions
  - Would have used helicopter if available

C. BERTRAND SAMU 94 – Japan 2001

Survey on Helicopter use by SAMU (2)

Enquête prospective sur les transports sanitaires héliportés

Période du ../../1998 .. heure à ../../1998 .. heure

SAMU ☐ Equipe Smur de ☐ Date ../../98

Nature du lieu de prise en charge du patient:

Etablissement hospitalier ☐
- Aire de poser intrahospitalière sans relais
- Aire de poser intrahospitalière avec relais ambulance
- Aire de poser extrahospitalière avec relais ambulance

ou

Site extra hospitalier ☐
- Aire de poser répertoriée
- Aire de poser non répertoriée

Destination : Type de mission :

Aire de poser sans relais par ambulance — Jour aéronautique
Aire de poser avec relais par ambulance — Nuit

Survey on Helicopter use by SAMU (3)

Indication de la demande : Age du patient: ☐

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐

Indication du (des) motif (s) prioritaire(s) ayant conduit au choix du transport héliporté :
- Etat du patient
- Nombre insuffisant d'équipes SMUR disponibles obligeant à raccourcir les missions
- Eloignement de l'établissement hospitalier d'accueil

Réponse apportée :

Voie aérienne ☐ — Par défaut, voie terrestre ☐

avec : — car :
- Hélicoptère sanitaire — Problème météorologique
- *Autre hélicoptère* — *Hélicoptère indisponible sur autre mission*
- Absence d'hélicoptère

Lequel : _____ Autre _____

Survey on Helicopter use by SAMU (4)

Descriptif de la mission héliportée ou terrestre:

S'agit-il d'un transport intra-départemental? ☐ SMUH ☐
Interrégional? ☐ AIR AMBULANCE ☐

Temps de vol total de l'hélicoptère ☐

Ville et hôpital de prise en charge _____
Ville et hôpital de destination _____

Temps de vol de l'hélicoptère :	à l'aller	au retour
avec l'équipe sans malade	☐	☐
sans équipe	☐	☐
équipe avec malade	☐	☐

L'équipe était à vide : à l'aller ☐ au retour ☐

Survey on Helicopter use by SAMU (5)

Classification of transportation request

1. Life-threatening or disaster cases
2. Extreme emergencies
3. Emergencies within 2 to 6 hours
4. Fragile or unstable patients
5. Donor or Organs for transplantation
6. Quick transportation of the SMUR team

C. BERTRAND SAMU 94 – Japan 2001

Survey on Helicopter use by SAMU (6)

Qualification of transportation purpose
(Can be one or several of...)

- Condition of patient
  - Always severe
- Lack of manpower in SAMU / SMUR
  - Need to shorten the mission
- Long distance
  - *Access or transportation*

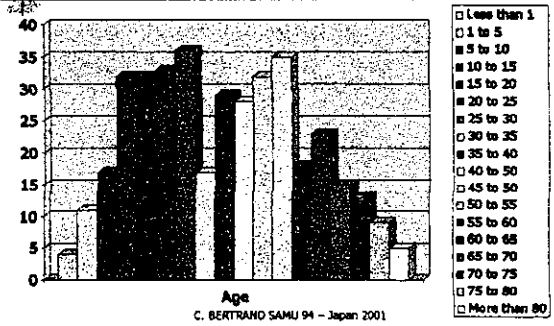
C. BERTRAND SAMU 94 – Japan 2001

Survey on Helicopter use by SAMU (7)
Primary Missions (448 missions)

- 5% during night time
- 75% on « wild » dropping zones
  - Outside of previously registered zones
- 50% needed relay helico to ambulance
  - Upon arrival to hospital with far away DZ
- 51% in SAMU white helico, 30% in blue, 18% in red, 1% in private helicos
- Average duration 82 minutes is HALF of the estimated time if not by helicopter

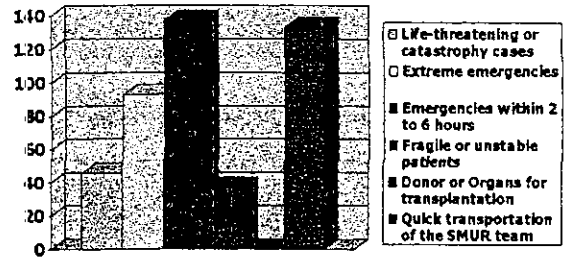
C. BERTRAND SAMU 94 – Japan 2001

Survey on Helicopter use by SAMU (8)
Primary Missions: Average Age 38.2 Y



C. BERTRAND SAMU 94 – Japan 2001

Survey on Helicopter use by SAMU (9)
Primary Missions (448 missions)



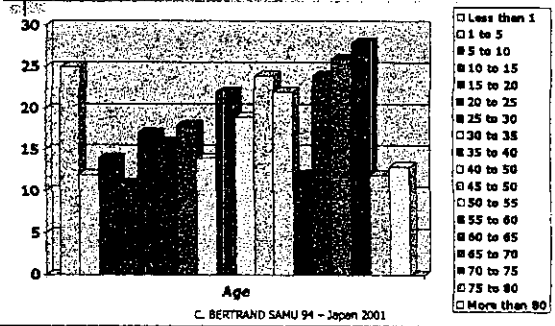
Survey on Helicopter use by SAMU (10)
Qualification of transportation purpose

% of missions	22%	42%	34%	2%
Condition of patient	✓	✓	✓	✓
Lack of manpower in SAMU / SMUR			✓	✓
Long distance		✓	✓	

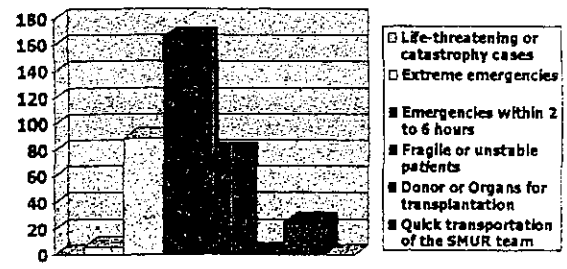
Survey on Helicopter use by SAMU (11)
H to H Missions (370 missions)

- 10% during night time
- 49% needed relay helico to ambulance
  - Upon departure from hospital w/ far away DZ
- 66% needed relay helico to ambulance
  - Upon arrival to hospital w/ far away DZ
- 83% in SAMU white helico, 10% in red, 5% in blue, 2% in private helicos
- Average duration 111 minutes is HALF of estimated time if not by helicopter

Survey on Helicopter use by SAMU (12)
H to H Missions: Average Age 42.7 Y



Survey on Helicopter use by SAMU (13)
H to H Missions (370 missions)



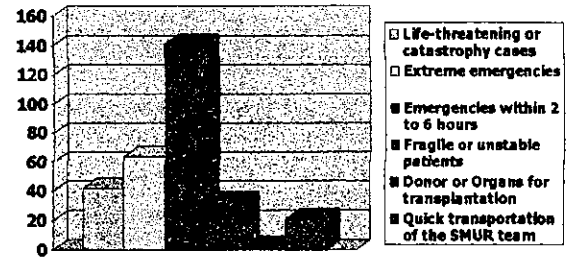
Survey on Helicopter use by SAMU (14)
Qualification of H to H transportation purpose

% of missions	23%	34%	36%	7%
Condition of patient	✓	✓	✓	✓
Lack of manpower in SAMU / SMUR			✓	✓
Long distance		✓	✓	

Survey on Helicopter use by SAMU (15) Potential Missions (304 wishes)

- Potential missions would have been made by helicopter if available
- 54% Primary, 46% H to H
- 24% during night time

Survey on Helicopter use by SAMU (16) Potential Missions (304 wishes)

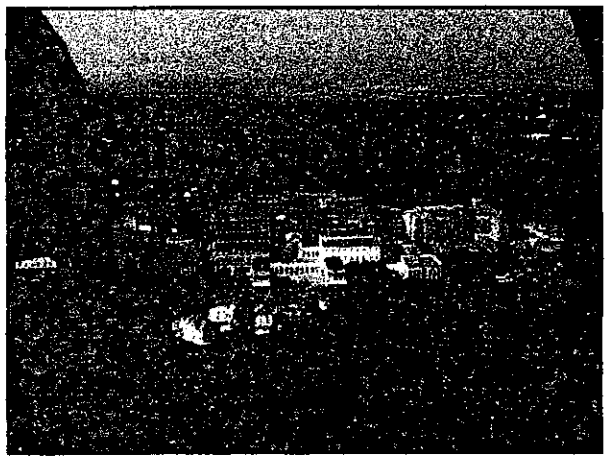


Survey on Helicopter use by SAMU (17) Qualification of Potential transportation purpose

% of wishes	19%	28%	13%
Condition of patient	✓	✓	✓
Lack of manpower in SAMU / SMUR			✓
Long distance		✓	

Reasons for transport by Helicopters

- Rapid access to site reduces delay
- Primary RENDEZ-VOUS technique
- Norias if many victims
- HP to HP transfers
- SMUR team over extended



PRIMARY « RENDEZ VOUS » TECHNIQUE

- First team travels by land route
- Diagnosis / known destination
- Helicopter is sent to rendez-vous
- Landing site secured
- *Short missions*
  - norias (shuttle loop transit)