RCP

¿Cuándo Parar?

SERVIZO GALEGO de SAÚDE | Xerencia de Xestión Integrada de Ourense Verín e O Barco de Valdeorras

CENTRO CULTURAL MARCOS VALCÁRCEL
DEPUTACIÓN OURENSE

Paula Fernández Ugidos
Mayo 2018

FINALIZACIÓN DE LA RCP

1. ¿Qué nos dicen las guías?
2. PCR extra – hospitalaria
3. PCR intra – hospitalaria
4. Empleo de ET – CO2
5. Oximetría cerebral
6. Conclusiones

International Liaison Committee on Resuscitation
ILCOR

American Heart Association®
life is why™
GUIDELINES 2015 CPR & ECC

EUROPEAN RESUSCITATION COUNCIL

European Resuscitation Council Guidelines for Resuscitation 2015
Section 11. The ethics of resuscitation and end-of-life decisions

Resuscitation 95 (2015) 302–311

Se considera apropiado No iniciar / Detener la RCP si:

- No es posible garantizar la seguridad de los reanimadores
- Existen lesiones mortales evidentes o signos de muerte irreversible
- Voluntades anticipadas válidas /conocimiento firme de los deseos del paciente
- Asistolia durante más de **20 minutos**, pese a SVA continuado, y sin causas reversibles

European Resuscitation Council Guidelines for Resuscitation 2015
Section 3. Adult advanced life support

Resuscitation 95 (2015) 100–147

- PCR – EH → La "Norma Universal de Finalización de la Resucitación" puede aplicarse tanto por técnicos de emergencias que realizan SVB + desfibrilación como por equipos que aplican SVA
- ET-CO2 < 10 mmHg tras 20 minutos de RCP en IOT es altamente sugestivo de mal pronóstico y escasas opciones de RCE
    - No validado en paciente no IOT

- We recommend against using $ETCO_2$ cutoff values alone as a mortality predictor or for the decision to stop a resuscitation attempt.

Derivation of a Termination-of-resuscitation Guideline for Emergency Medical Technicians Using Automated External Defibrillators

P. Richard Verbeek, MD, Marian J. Vermeulen, BScN, MHSc, Fahim H. Ali, BSc, David W. Messenger, BSc, Jim Summers, Paramedic, Laurie J. Morrison, MD, MSc

ACAD EMERG MED • July 2002, Vol. 9, No. 7

- Objetivo: determinar características PCR-EH que permitan desarrollar pautas para finalizar la RCP *in situ*
- Revisión retrospectiva (22 meses) → 662 pacientes
    - 36 RCE- EH (5.43%) → 11 alta domicilio (1.66%)
    - 626 no RCE –EH (94.56%)→ 588 exitus en SU (88.82%) → 2 alta domicilio (0.3%)

- En análisis multivariante, se asociaron con la supervivencia al alta:
    - **RCE previo al transporte → OR 45.5, IC95% 8.5 – 243.7**
    - **Desfibrilación → OR 6.9, IC95% 1.2 – 40.3**
    - **PCR presenciada por personal sanitario → OR 4.4, IC 95% 1.0 – 18.5**

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ACAD EMERG MED • July 2002, Vol. 9, No. 7

Prehospital Cardiac Arrest Patients may be considered for Termination of Resuscitation in the Field following completion of EMT-D resuscitation attempts when:

1) **There has been no return of spontaneous circulation,**

AND

2) **No Shock has been given,**

AND

3) **The arrest was not witnessed by EMS personnel.**

All other patients require continued resuscitation and emergent transport to the nearest Emergency Department.

Validation of a Rule for Termination of Resuscitation in Out-of-Hospital Cardiac Arrest

Laurie J. Morrison, M.D., Laura M. Visentin, B.Sc., Alex Kiss, Ph.D., Rob Theriault, Don Eby, M.D., Marian Vermeulen, B.Sc.N., M.H.Sc., Jonathan Sherbino, M.D., and P. Richard Verbeek, M.D., for the TOR Investigators*

N Engl J Med 2006;355:478-87.

- Evaluación prospectiva, 18 SME
- 1240 pacientes (Supervivencia global 3%)

- Descenso de transporte de 100% a 37.4 %

Table 4. Test Characteristics of the Clinical Prediction Rule for the Termination of Resuscitation (TOR) in 1240 Reported Cardiac Arrests.*

Action According to Prediction Rule	Outcome		
	Death	Survival	Total No. of Cardiac Arrests
Terminate basic life support (test positive)	772	4	776
Transportation to emergency department (test negative)	427	37	464
Total	1199	41	1240
Survival rate when termination recommended by TOR — % (95% CI)	0.5 (0.1–0.9)		
Sensitivity — % (95% CI)†	64.4 (61.6–67.0)		
Specificity — % (95% CI)‡	90.2 (88.4–91.8)		
Positive predictive value — % (95% CI)§	99.5 (98.9–99.8)		
Negative predictive value — % (95% CI)¶	8.0 (6.6–9.7)		

Prehospital Termination of Resuscitation in Cases of Refractory Out-of-Hospital Cardiac Arrest

JAMA. 2008;300(12):1432-1438

Grupo Estudio Ontario (OPALS)

- Validación de ambas reglas para finalizar RCP *in situ*
- Retrospectivo de cohortes (19 SEM) → 5505 casos de PCR-EH
  - Supervivencia global: 7.1 % (392 pacientes)

Termination-of-Resuscitation Rules

Basic Life Support

Event not witnessed by emergency medical services personnel

No automated external defibrillator used or manual shock applied in out-of-hospital setting

No return of spontaneous circulation in out-of-hospital setting

Advanced Life Support

Event not witnessed by emergency medical services personnel

No automated external defibrillator used or manual shock applied in out-of-hospital setting

No return of spontaneous circulation in out-of-hospital setting

Arrest not witnessed by bystander

No bystander-administered cardiopulmonary resuscitation

Table 2. Survival to Hospital Discharge Among Patients Meeting Criteria for the Basic Life Support (BLS) vs Advanced Life Support (ALS) Termination-of-Resuscitation Rules

	Died	Survived	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)
BLS rule						
Met 3/3 criteria	2587	5	0.506 (0.492-0.520)	0.987 (0.970-0.996)	0.998 (0.996-0.999)	0.133 (0.121-0.146)
Did not meet criteria	2526	387				
ALS rule						
Met 5/5 criteria	1192	0	0.233 (0.222-0.245)	1.000 (0.991-1.000)	1.000 (0.997-1.000)	0.091 (0.083-0.100)
Did not meet criteria	3921	392				

Abbreviations: CI, confidence interval; NPV, negative predictive value; PPV, positive predictive value.

Conclusion In this validation study, the BLS and ALS termination-of-resuscitation rules performed well in identifying patients with out-of-hospital cardiac arrest who have little or no chance of survival.

Independent Evaluation of an Out-of-hospital Termination of Resuscitation (TOR) Clinical Decision Rule

ACADEMIC EMERGENCY MEDICINE 2008; 15:517–521

Richman et al

Validation of a universal prehospital termination of resuscitation clinical prediction rule for advanced and basic life support providers☆

Resuscitation 80 (2009) 324–328

Morrison et al

Comparison of Helsinki and European Resuscitation Council "do not attempt to resuscitate" guidelines, and a termination of resuscitation clinical prediction rule for out-of-hospital cardiac arrest patients found in asystole or pulseless electrical activity☆

Resuscitation 81 (2010) 679–684

Skrifvars et al

Implementation trial of the basic life support termination of resuscitation rule: Reducing the transport of futile out-of-hospital cardiac arrests☆

Resuscitation 85 (2014) 486–491

Morrison et al

External validation of termination of resuscitation guidelines in the setting of intra-arrest cold saline, mechanical CPR, and comprehensive post resuscitation care☆

Resuscitation 85 (2014) 910–914

Diskin et al

Survival rates in out-of-hospital cardiac arrest patients transported without prehospital return of spontaneous circulation: An observational cohort study☆

Resuscitation 85 (2014) 1488–1493

Drennan et al

Duration of Prehospital Resuscitation Efforts After Out-of-Hospital Cardiac Arrest

Nagao et al

Circulation 2016; 133:1386-1396

- Tres objetivos: Pronóstico neurológico a 30 días (CPC 1 y 2), adquisición de RCE pre-hospitalaria y supervivencia a 30 días
- En Japón:
    - SME no certifican el fallecimiento
    - Todas las RCP se prolongan hasta RCE o hasta la llegada a SU hospitalario
- Registro nacional de todas las PCR-EH que reciben RCP, durante 7 años → **282183** pacientes

	RCP por testigos	No RCP por testigos
Ritmo desfibrilable	23.028 8.2%	19.383 6.9%
Ritmo no desfibrilable	104.212 36.9%	135.560 48%

Duration of Prehospital Resuscitation Efforts After Out-of-Hospital Cardiac Arrest

Nagao et al

Circulation 2016; 133:1386-1396

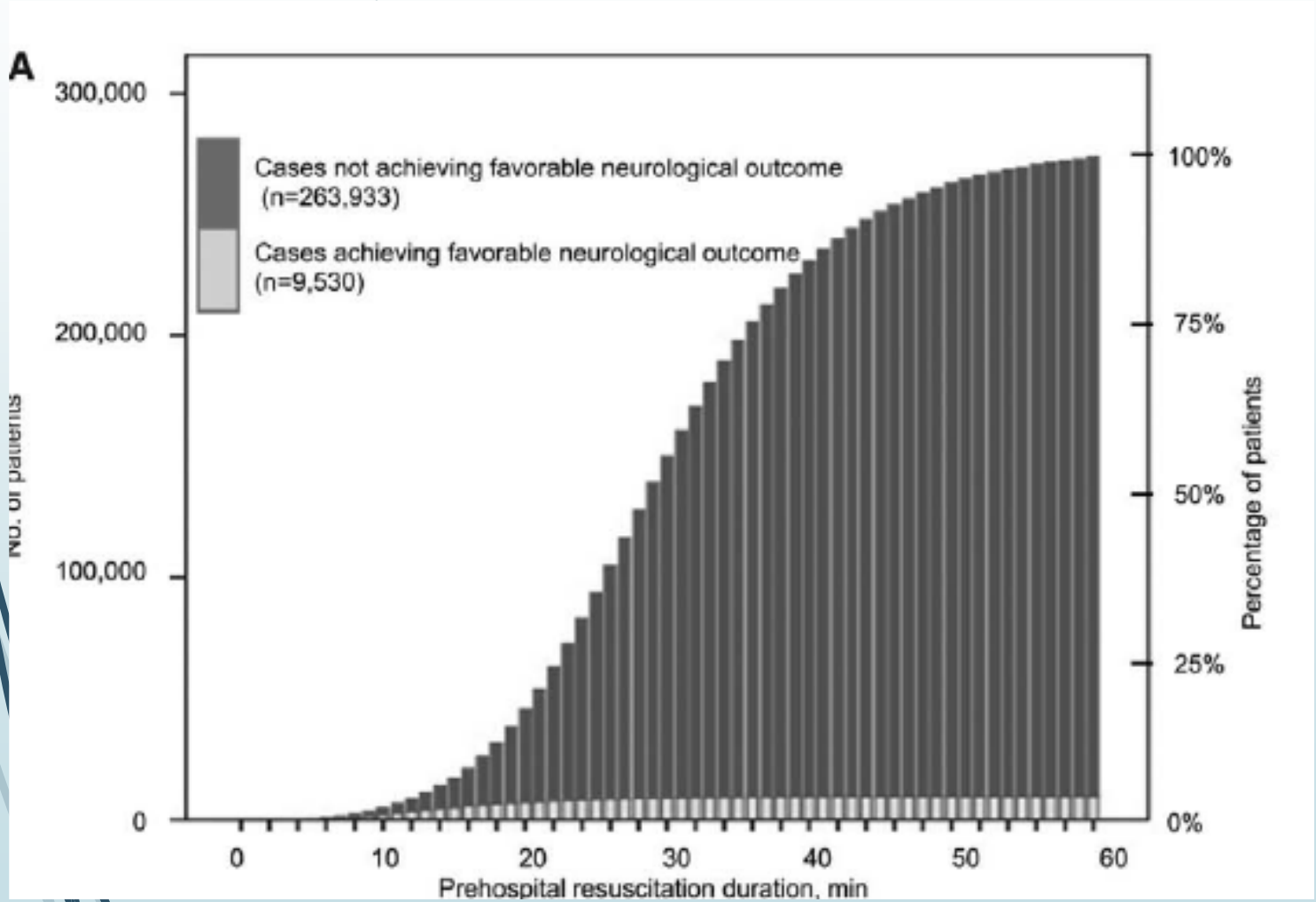
- Resultados en cada grupo ($p < 0.001$)

	RCE - EH	Supervivencia 30 días	CPC 1-2 30 días
DF / RCP testigos	31%	28.6%	20%
DF /no RCP testigos	24.9%	23%	13.2%
No DF/ RCP testigos	8.7%	4.4%	0.9%
No DF/no RCP testigos	8.2%	4.5%	1.1%

Duration of Prehospital Resuscitation Efforts After Out-of-Hospital Cardiac Arrest

Nagao et al

Circulation 2016; 133:1386-1396



- CPC 1-2 con RCP < 60 min → 3.5%
- CPC 1-2 en pacientes sin RCE-EH → 0.7%

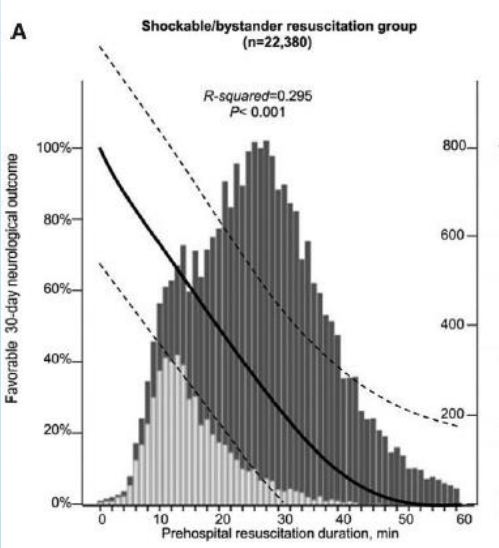
Duration of Prehospital Resuscitation Efforts After Out-of-Hospital Cardiac Arrest

Nagao et al

Circulation 2016; 133:1386-1396

Tiempos mínimos necesarios para alcanzar una sensibilidad ≥ 99% en el Pronóstico neurológico favorable a 30 días:

- 40 minutos en ritmo desfibrilable / RCP testigos
- 40 minutos en ritmo desfibriblable / no RCP testigos
- 44 minutos en ritmo no desfibrilable / RCP testigos
- 45 minutos en ritmo no desfibrilable / no RCP testigos



Conclusions

On the basis of results from the 2 shockable arrest groups, prehospital resuscitation efforts should be continued for at least 40 minutes from call receipt, including at least 33 minutes of EMS responder resuscitation efforts from scene arrival, in all adult patients with bystander-witnessed OHCA to achieve a ≥99% sensitivity of favorable 30-day neurological outcome. The costs and benefits of prolonging prehospital resuscitation efforts must be taken into consideration when these results are translated into clinical practice, and further studies are needed.

Comparing the prognosis of those with initial shockable and non-shockable rhythms with increasing durations of CPR: Informing minimum durations of resuscitation☆,☆☆

Resuscitation 101 (2016) 50–56

Grunau et al

- Objetivos: determinar la relación entre pronóstico y tiempo de RCP por profesionales y estimar el punto a partir del cual la posibilidad de sobrevivir cae por debajo de 1 %

- Análisis *post hoc* de un registro prospectivo (4 años)
- 1617 PCR-EH → Supervivencia 14% (buen pronóstico neurológico 10%)
- Tiempos medios de RCP: 36 minutos (Ritmos Desfibrilables) y 26 minutos (No Desfibrilables)

Comparing the prognosis of those with initial shockable and non-shockable rhythms with increasing durations of CPR: Informing minimum durations of resuscitation☆,☆☆

Resuscitation 101 (2016) 50–56

Grunau et al

Table 3
Logistic regression models of the full cohort.

Variable	Survival		Favorable neurological outcome	
	Crude OR (95% CI)	Adjusted OR (95% CI)	Crude OR (95% CI)	Adjusted OR (95% CI)
Time to initial ROSC (per minute increase)	0.91 (0.89–0.93)	0.92 (0.90–0.94)	0.90 (0.88–0.92)	0.91 (0.89–0.94)
Age (per year increase)	0.98 (0.97–0.99)	0.96 (0.95–0.97)	0.97 (0.96–0.98)	0.95 (0.94–0.97)
Male sex	1.60 (1.15–2.21)	1.07 (0.67–1.70)	1.82 (1.24–2.66)	1.24 (0.74–2.01)
Public location	4.80 (3.56–6.46)	1.82 (1.18–2.81)	4.71 (3.38–6.54)	1.55 (0.98–2.47)
Witnessed (by bystander or EMS)	7.29 (5.02–10.60)	1.67 (1.00–2.81)	7.71 (4.97–11.95)	1.88 (1.05–3.37)
Bystander CPR (by bystander or EMS)	2.98 (2.17–4.08)	1.15 (0.73–1.81)	3.03 (2.11–4.34)	1.15 (0.70–1.89)
Dispatch to EMS arrival (per minute increase)	0.92 (0.87–0.97)	0.89 (0.83–0.96)	0.93 (0.88–0.99)	0.92 (0.85–0.99)
Witnessed by EMS	3.04 (2.03–4.56)	3.44 (1.76–6.72)	3.21 (2.07–4.96)	3.19 (1.58–6.42)
Initial shockable rhythm	19.02 (13.47–26.87)	7.84 (5.01–12.26)	19.36 (13.03–28.76)	7.47 (4.55–12.27)

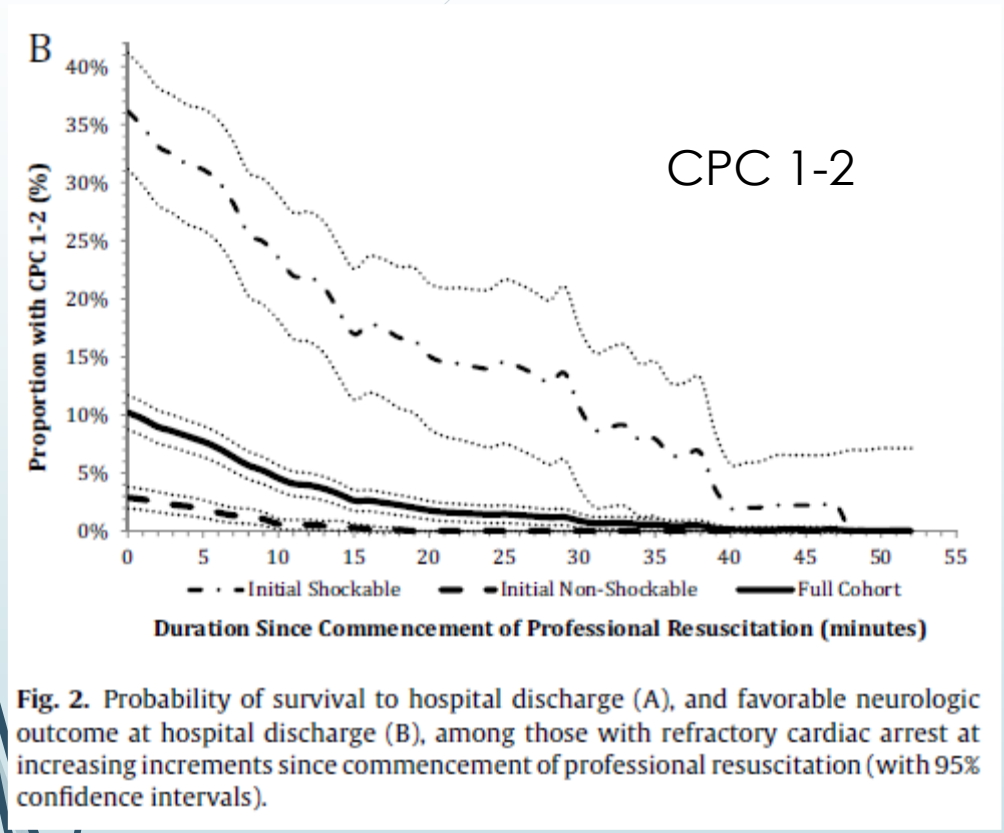
El tiempo hasta la RCE se asoció de forma independiente con la probabilidad de sobrevivir y con el pronóstico neurológico favorable, en la cohorte completa, y también en:

Ritmos desfibrilables	OR 0.95 (IC95% 0.92-0.97)
Ritmos no desfibrilables	OR 0.83 (IC 95% 0.78-0.88)

Comparing the prognosis of those with initial shockable and non-shockable rhythms with increasing durations of CPR: Informing minimum durations of resuscitation☆,☆☆

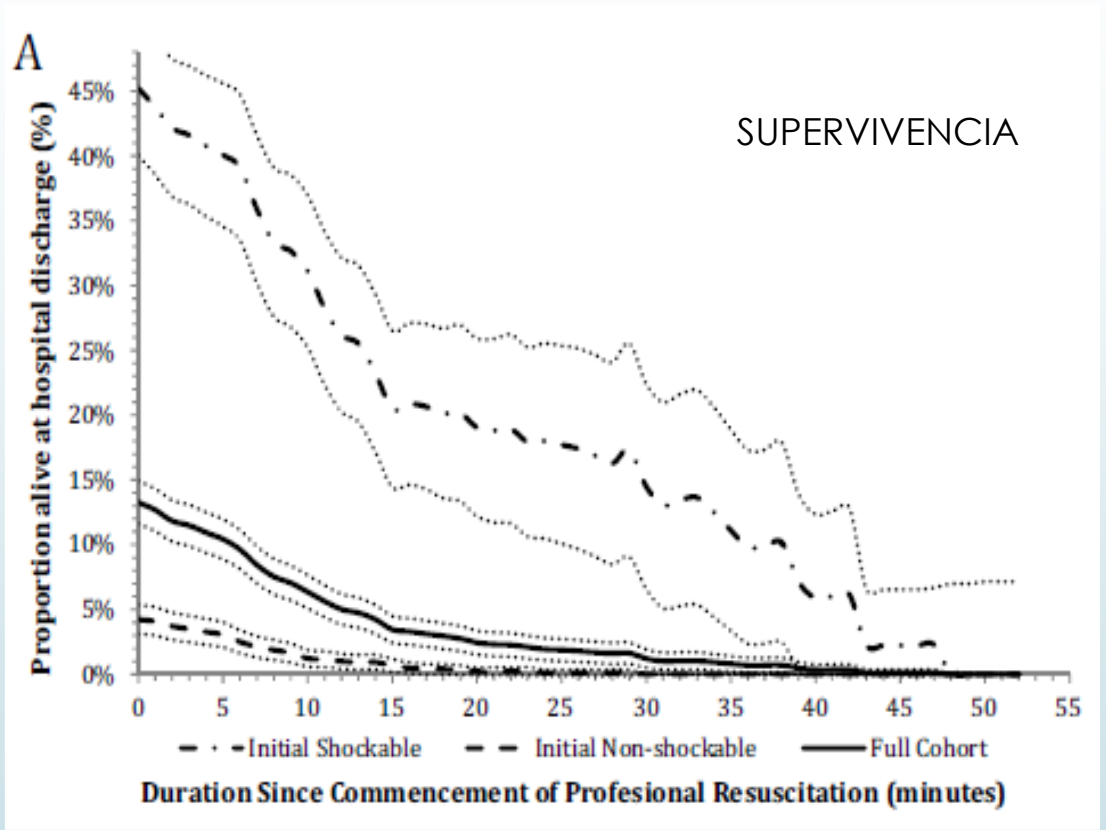
Resuscitation 101 (2016) 50–56

Grunau et al



CPC 1-2

Fig. 2. Probability of survival to hospital discharge (A), and favorable neurologic outcome at hospital discharge (B), among those with refractory cardiac arrest at increasing increments since commencement of professional resuscitation (with 95% confidence intervals).



SUPERVIVENCIA

Tiempo en el que la Supervivencia cae por debajo del 1 %:

Ritmos desfibrilables	Ritmos no desfibrilables
48 minutos	15 minutos

SURVIVAL AFTER CARDIOPULMONARY RESUSCITATION IN THE HOSPITAL

Bedell et al
N Engl J Med 1983; 309: 569-76

- 1 hospital terciario, prospectivo, 18 meses

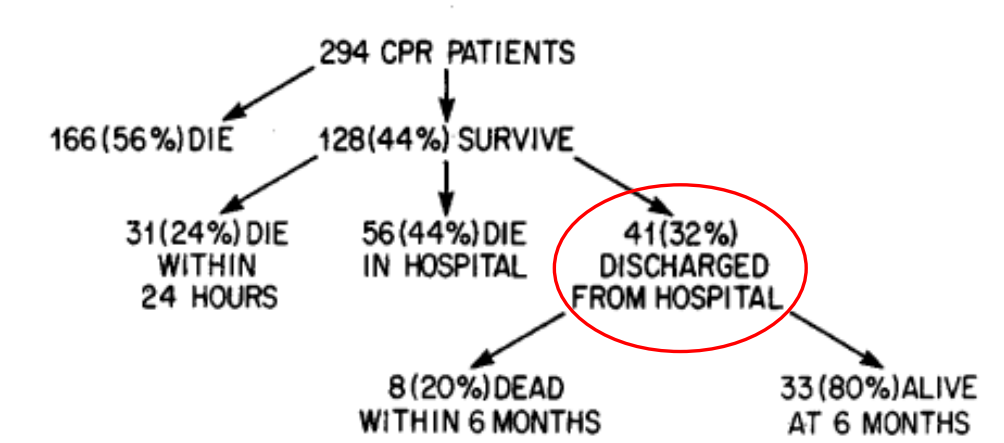


Figure 1. Outcomes of 294 Attempts at Resuscitation during the 18-Month Study Period.

Supervivencia global 14%

Table 3. Independently Significant Predictors of In-Hospital Mortality after Cardiopulmonary Resuscitation, by Logistic Regression Analysis.*

CHARACTERISTIC	ESTIMATED COEFFICIENT
Before arrest	
Hypotension (blood pressure, <100 mm Hg)	2.69
Pneumonia	2.85
Renal failure (blood urea nitrogen, >50 mg/dl [18 mmol/l])	2.75
Cancer	2.06
Homebound life style	2.13
During arrest	
Arrest duration >15 minutes	2.51
Intubation	2.35
Hypotension (blood pressure, <100 mm Hg)	2.70
Pneumonia	2.48
Homebound life style	2.24
After resuscitation	
Coma	2.40
Need for pressors	2.16
Arrest duration >15 minutes	1.87

Ninguno de los pacientes (179) que fueron reanimados > 30 minutos sobrevivieron

Predictors of Survival Following In-Hospital Cardiopulmonary Resuscitation

A Moving Target

Kenneth A. Ballew, MD, MS; John T. Philbrick, MD; Dean E. Caven; John B. Schorling, MD, MPH

Arch Intern Med. 1994;154:2426-2432

20 Minutos

Predicting in-hospital mortality during cardiopulmonary resuscitation

Scot C. Schultz, Daniel C. Cullinane, Michael D. Pasquale, Colette Magnant, Stephen R.T. Evans*

Resuscitation 33 (1996) 13–17

10 Minutos

Derivation of a Clinical Decision Rule for the Discontinuation of In-Hospital Cardiac Arrest Resuscitations

Carl van Walraven, MD, FRCPC, MSc; Alan J. Forster, MD, FRCPC; Ian G. Stiell, MD,

Arch Intern Med. 1999;159:129-134

- 1077 PCR-IH en 5 hospitales

  Supervivencia al alta: 9.6%

Table 2. Univariate Association of Patient and Resuscitation Characteristics With Survival*

Characteristic	Discharged Alive From Hospital, No. (%) Yes (n = 103)	No (n = 974)	P
Age, y			
Mean (SD)	66 (14.5)	68.1 (14.7)	.15
≥75	22 (21.4)	362 (37.2)	.001
Male	53 (52.0)	574 (58.0)	.22
Current diagnoses			
Ischemia	51 (49.5)	423 (43.4)	.20
Circulatory disease	27 (26.2)	280 (28.7)	.33
Respiratory disease	13 (12.6)	139 (14.3)	.34
Neoplasia	6 (5.8)	102 (10.5)	.14
Past diagnoses			
Ischemic heart disease	41 (39.8)	430 (44.1)	.23
Circulatory disease	35 (34.0)	399 (41.0)	.19
Hypertension	34 (33.0)	272 (27.9)	.74
Diabetes	20 (19.4)	192 (19.7)	.60
Respiratory disease	19 (18.4)	146 (15.0)	.75
Neoplasia	13 (12.6)	144 (14.8)	.27
Witnessed	94 (91.3)	770 (79.1)	.003
Initial rhythm VT or VF	58 (56.3)	280 (28.7)	.001
Minutes from collapse to CPR†	1.6 (2.0)	1.6 (2.1)	.89
Minutes from collapse to ACLS†	2.3 (2.6)	2.3 (2.9)	.93
Minutes from CPR to ACLS†	0.8 (1.4)	0.8 (2.0)	.98
Duration of arrest, min			
Mean (SD)	10.4 (11.0)	22.7 (17.6)	.001
≥5	69 (69.0)	879 (94.5)	.001
≥10	43 (42.2)	802 (82.3)	.001
Location of arrest			

Derivation of a Clinical Decision Rule for the Discontinuation of In-Hospital Cardiac Arrest Resuscitations

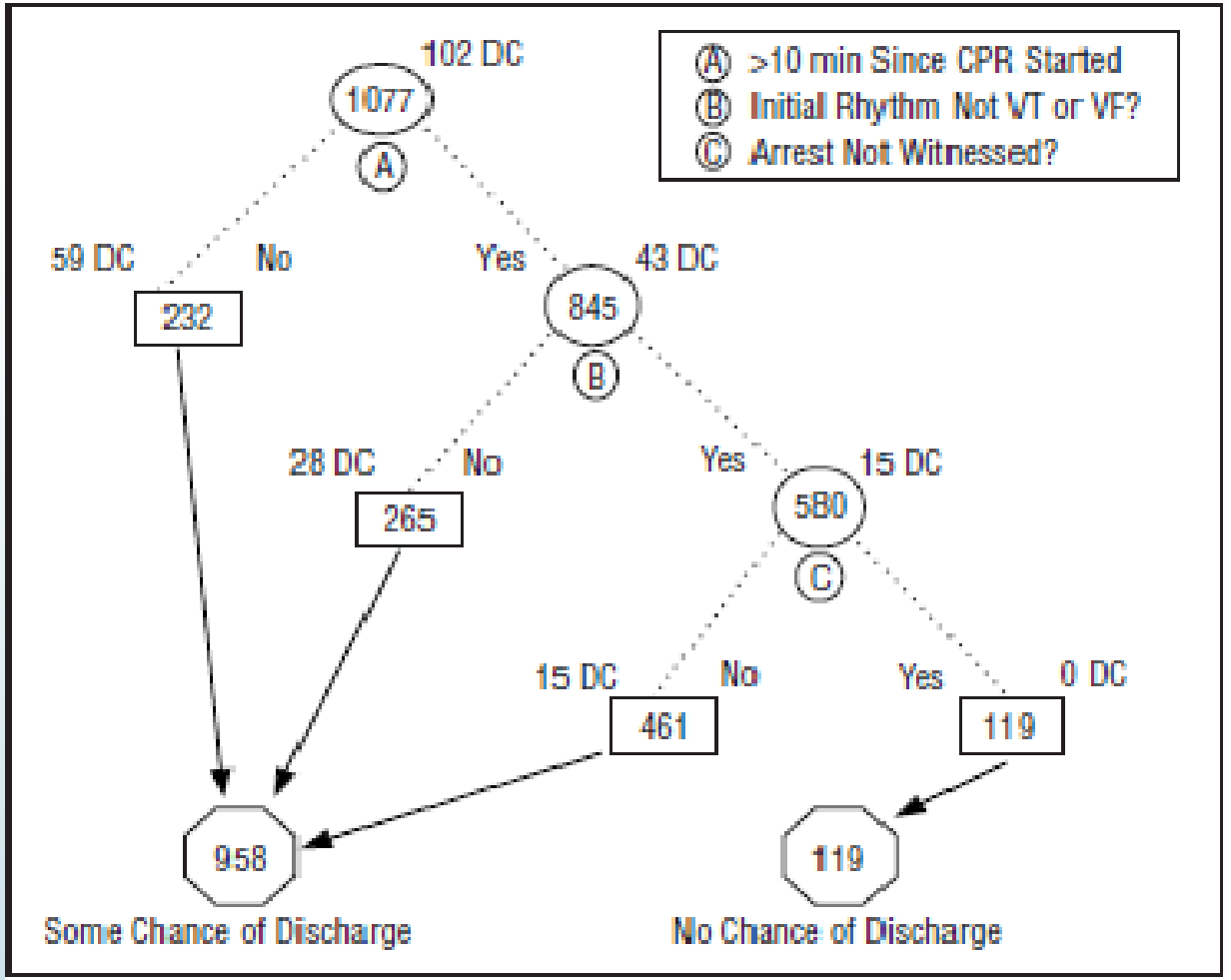
Carl van Walraven, MD, FRCPC, MSc; Alan J. Forster, MD, FRCPC; Ian G. Stiell, MD,

Arch Intern Med. 1999;159:129-134

No supervivencia si:
- RCP > 10 minutos
- Ritmo inicial no desfibrilable
- PCR no presenciada

100% sensibilidad (IC95% 0.97-1)
100% VPN (IC95% 0.97-1)

In summary, we have derived a simple and accurate decision rule that identifies all patients with a chance of surviving in-hospital cardiac arrest. The rule is explicit, easy to apply, uses objective data that are readily available at all cardiac arrests, and could significantly decrease the amount of futile postresuscitation care. If validated, the rule could be combined with astute clinical judgment to more effectively use cardiac resuscitation.



Decision rule for identifying patients with no chance of being discharged from hospital. DC indicates discharged from hospital; CPR, cardiopulmonary resuscitation; VT, ventricular tachycardia; and VF, ventricular fibrillation. Decision nodes are represented by circles. Each node contains the number of patients to which it applies.

Validation of a Clinical Decision Aid to Discontinue In-Hospital Cardiac Arrest Resuscitations

JAMA. 2001;285:1602-1606

Walraven et al

- Validación de la anterior
- Revisión retrospectiva → Datos de 2181 PCR-IH

Table 2. Decision Aid Performance for Identifying Patients Who Are Discharged From Hospital Following Attempted Resuscitation*

Decision Aid Predicted Some Chance of Discharge From Hospital	Discharged From Hospital: Yes	Discharged From Hospital: No	Total
Yes	324	1588	**1912**
No	3	266	**269**
Sensitivity	– 99.1% (95% CI, 97.1%-99.8%)		
Specificity	– 14.4% (95% CI, 12.4%-16.0%)		
Positive Predictive Value	– 17.0% (95% CI, 15.3%-18.7%)		
Negative Predictive Value	– 98.9% (95% CI, 96.5%-99.7%)		

*The clinical decision aid predicted some chance of discharge from hospital if the arrest was witnessed or the initial cardiac rhythm was ventricular tachycardia or ventricular fibrillation or the pulse was regained during the first 10 minutes of chest compressions. These patients are represented in the top row of the table above. CI indicates confidence interval.

3 supervivientes → mal pronóstico neurológico

Duration of resuscitation efforts and survival after in-hospital cardiac arrest: an observational study

Lancet 2012; 380: 1473–81
Goldberger et al

- Registro observacional multicéntrico (435 hospitales, 8 años) sobre la PCR-IH
- *End-points* primarios:
    - RCE al menos 20 minutos
    - Supervivencia al alta hospitalaria.
- Hipótesis: en los hospitales donde se prolonga más la RCP, las tasas de supervivencia son más altas
- Variable independiente: duración media (Minutos) de los intentos de RCP en los no superviviente
    - 64339 pacientes (Duración media de RCP: 17 minutos)
    - 79.9% Ritmos no desfibrilables
    - 48.5% RCE
    - 15.4% alta hospitalaria

Duration of resuscitation efforts and survival after in-hospital cardiac arrest: an observational study

Lancet 2012; 380: 1473–81

Goldberger et al

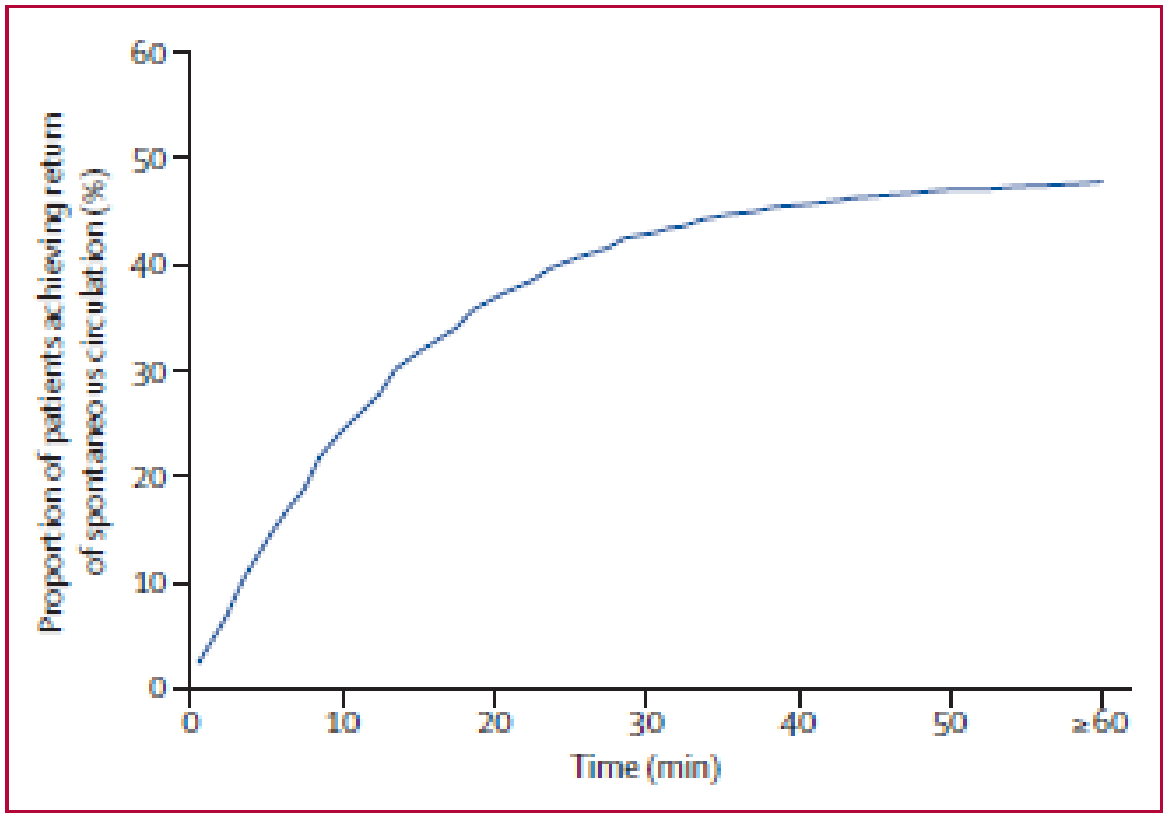


Figure 1: **Cumulative proportion of patients achieving return of spontaneous circulation**

N=64 339. Overall, 48·5% of the total population achieved return of spontaneous circulation. By 30 min, 42·5% achieved return of spontaneous circulation.

	n	Tiempo medio
≤ 10 min	5221	16 min
11 – 19 min	10083	19 min
20 – 29 min	9061	22 min
≥ 30 min	8776	25 min

Duration of resuscitation efforts and survival after in-hospital cardiac arrest: an observational study

Lancet 2012; 380: 1473–81

Goldberger et al

	Return of spontaneous circulation*			Survival to discharge†		
	Adjusted risk ratio (95% CI)	Adjusted rate	p value	Adjusted risk ratio (95% CI)	Adjusted rate	p value
Quartile 1 (13 994 patients at 113 hospitals)	1·00	45·3%	..	1·00	14·5%	..
Quartile 2 (18 783 patients at 121 hospitals)	1·04 (0·99–1·09)	47·0%	0·116	1·05 (0·96–1·14)	15·2%	0·304
Quartile 3 (19 106 patients at 107 hospitals)	1·08 (1·03–1·13)	48·8%	0·002	1·05 (0·96–1·14)	15·2%	0·280
Quartile 4 (12 456 patients at 94 hospitals)	1·12 (1·06–1·18)	50·7%	<0·0001	1·12 (1·02–1·23)	16·2%	0·021

*p for trend <0·0001. †p for trend 0·031.

Table 3: Return of spontaneous circulation and survival to discharge in all patients, by hospital quartile

Duration of resuscitation efforts and survival after in-hospital cardiac arrest: an observational study

Lancet 2012; 380: 1473–81

Goldberger et al

CPC 1 – 2 entre los supervivientes (p 0.131)	
< 15 minutos	81.2 %
15 – 30 minutos	80 %
> 30 minutos	78.4 %

Interpretation Duration of resuscitation attempts varies between hospitals. Although we cannot define an optimum duration for resuscitation attempts on the basis of these observational data, our findings suggest that efforts to systematically increase the duration of resuscitation could improve survival in this high-risk population.

J Am Heart Assoc. 2016;5:e002819 doi

Relationship Between the Duration of Cardiopulmonary Resuscitation and Favorable Neurological Outcomes After Out-of-Hospital Cardiac Arrest: A Prospective, Nationwide, Population-Based Cohort Study

Yoshikazu Goto, MD, PhD; Akira Funada, MD, PhD; Yumiko Goto, MD, PhD

- Observacional prospectivo (2 años)

  → 17238 pacientes

    - RCE esxtrahospitalaria

- Objetivos:

    - CPC 1-2
    - Supervivencia al mes

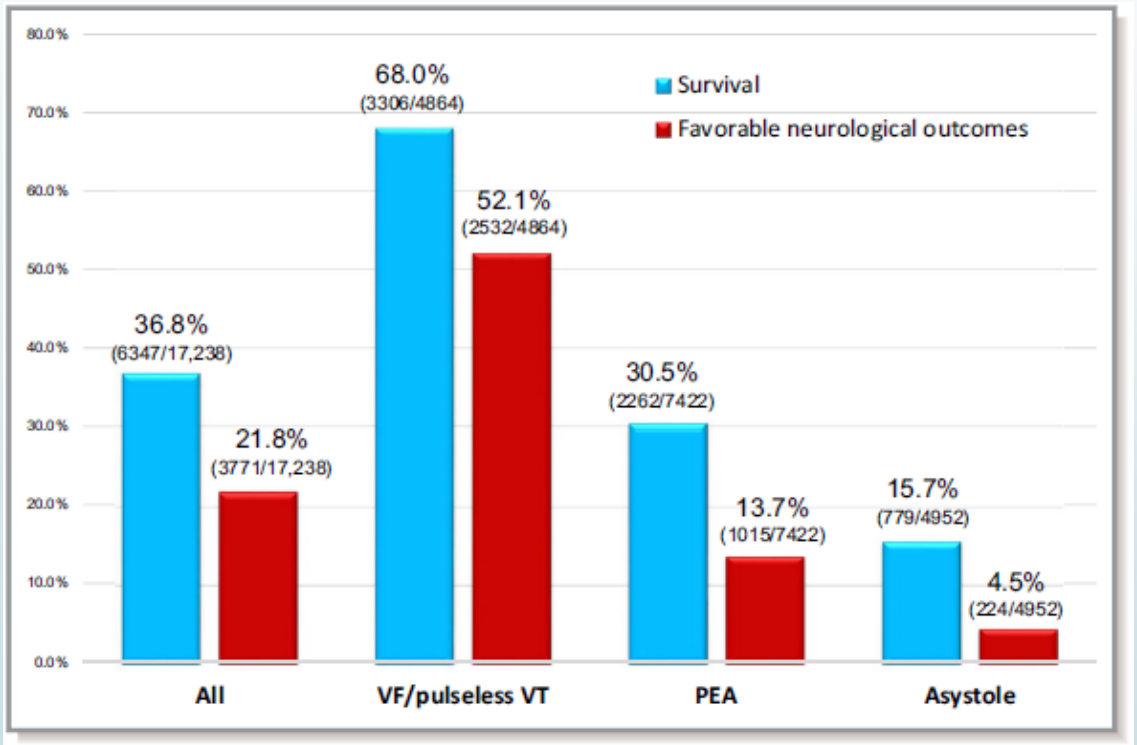


Figure 2. One-month outcomes after out-of-hospital cardiac arrest by the initial rhythm. PEA indicates pulseless electrical activity; VF, ventricular fibrillation; VT, ventricular tachycardia.

J Am Heart Assoc. 2016;5:e002819 doi

Relationship Between the Duration of Cardiopulmonary Resuscitation and Favorable Neurological Outcomes After Out-of-Hospital Cardiac Arrest: A Prospective, Nationwide, Population-Based Cohort Study

Yoshikazu Goto, MD, PhD; Akira Funada, MD, PhD; Yumiko Goto, MD, PhD

Table 2. Odds Ratios for Duration of Cardiopulmonary Resuscitation and 1-Month Outcomes in Univariate and Multivariate Logistic Regression Models

Variables	1-Month Survival		1-Month Survival With Favorable Neurological Outcomes	
	Crude OR (95% CI)	Adjusted OR (95% CI)	Crude OR (95% CI)	Adjusted OR (95% CI)
CPR duration (categorical variable), n=17 238 (100%)				
0 to 5 min, n=2312 (13.4%)	10.39 (7.90–13.89)	5.09 (3.79–6.95)	11.25 (7.92–16.56)	4.18 (2.81–6.40)
6 to 10 min, n=3618 (20.9%)	9.44 (7.21–12.57)	4.22 (3.16–5.74)	9.69 (6.84–14.21)	3.18 (2.15–4.84)
11 to 15 min, n=3513 (20.3%)	4.83 (3.69–6.43)	3.32 (2.49–4.51)	3.52 (2.48–5.19)	1.82 (1.22–2.78)
16 to 20 min, n=3043 (17.7%)	2.85 (2.17–3.81)	2.67 (1.99–3.63)	2.03 (1.42–3.01)	1.63 (1.09–2.51)
21 to 25 min, n=2284 (13.2%)	1.85 (1.40–2.49)	1.97 (1.46–2.71)	1.27 (0.87–1.90)	1.32 (0.89–2.07)
26 to 30 min, n=1287 (7.5%)	1.32 (0.97–1.81)	1.41 (1.02–1.97)	0.90 (0.59–1.40)	0.92 (0.58–1.49)
31 to 35 min, n=669 (3.8%)	1.1 (0.77–1.57)	1.12 (0.77–1.64)	1.08 (0.68–1.74)	1.11 (0.66–1.88)
>35 min, n=512 (3.0%)	Reference	Reference	Reference	Reference
CPR duration (continuous variable), min*	0.92 (0.91–0.92)	0.95 (0.95–0.96)	0.90 (0.89–0.90)	0.95 (0.94–0.95)

CI indicates confidence interval; CPR, cardiopulmonary resuscitation; OR, odds ratio.

*Odds ratios are expressed for 1-minute increments. CPR duration was defined as the time from initiation of CPR by emergency medical services personnel to prehospital return of spontaneous circulation.

J Am Heart Assoc. 2016;5:e002819 doi

Relationship Between the Duration of Cardiopulmonary Resuscitation and Favorable Neurological Outcomes After Out-of-Hospital Cardiac Arrest: A Prospective, Nationwide, Population-Based Cohort Study

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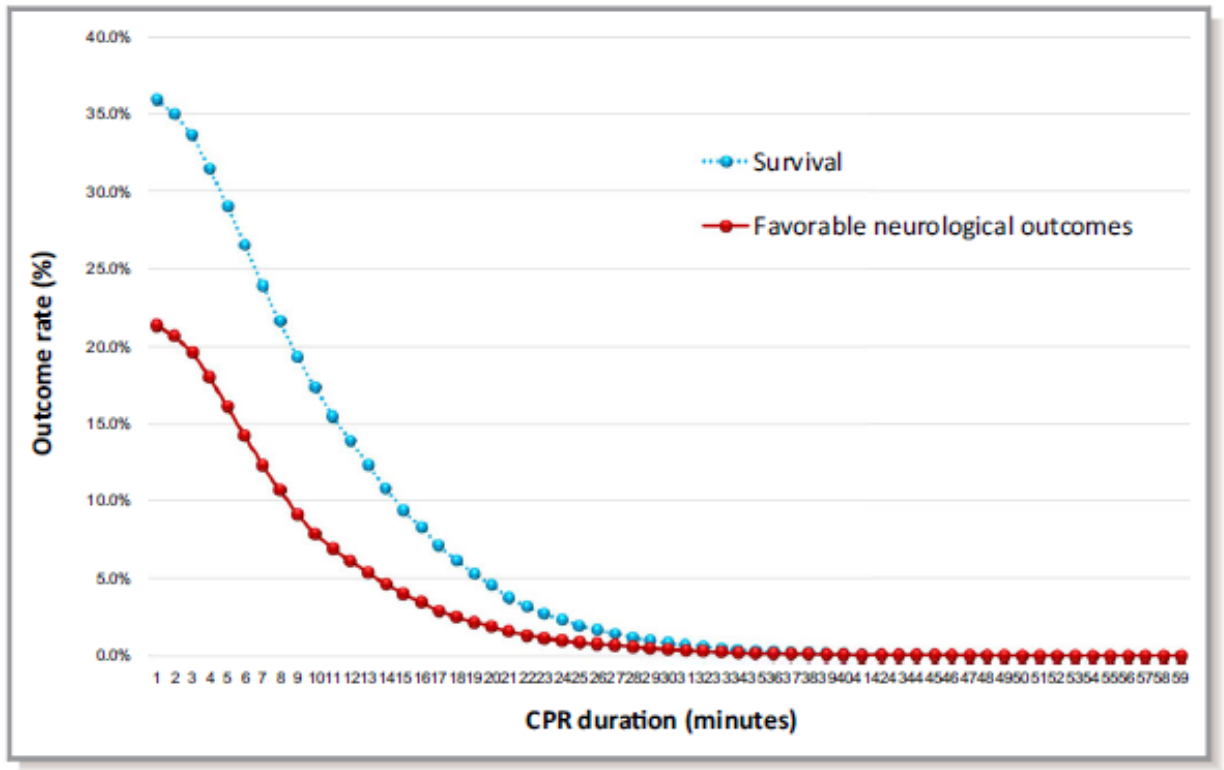


Figure 3. Dynamic probability of 1-month survival and 1-month survival with favorable neurological outcomes by CPR duration. CPR indicates cardiopulmonary resuscitation.

Probabilidad de:	20 min RCP	30 min RCP
Supervivencia	4.6 %	0.8 %
CPC 1-2	1.9 %	0.4 %

No supervivientes > 53 minutos

Conclusions

CPR duration was independently and inversely associated with 1-month survival and 1-month survival with favorable neurological outcomes after OHCA. The critical prehospital CPR duration for OHCA, which was needed to achieve prehospital ROSC and produce >99% of OHCA patients with 1-month survival with favorable neurological outcomes, was 35 minutes in patients with shockable rhythms and PEA, and 42 minutes in those with initial asystole.

Prediction of outcome of cardiopulmonary resuscitation from end-tidal carbón dioxide concentration

Callaham et al.
Crit Care Med 1990.18; 358

55 pacientes, 14 RCE

Valor inicial 15 mmHg → Predictor de RCE:

Sensibilidad 71%	VPP 91%
Especificidad 98%	VPN 91%

TABLE 3. $PetCO_2$ values (mean ± SD) for all potentially perfusing rhythms (EMD) and nonperfusing rhythms (VF and asystole) combined

Rhythm	+Pulse		−Pulse		*p*-Value
	N	$PetCO_2$ (torr)	N	$PetCO_2$ (torr)	
Perfusing	9	20 ± 14	10	6 ± 4	<.01
Nonperfusing	4	11 ± 5	31	5 ± 4	<.005

End-Tidal Carbon Dioxide Measurements as a Prognostic Indicator of Outcome in Cardiac Arrest

Ahrens et al.
Am J Crit Care 2001; 10:391-98

127 pacientes
Supervivencia alta 13.7%

- PetCO2 > 20 mmHg
  - Supervivencia 94.4%
- PetCO2 < 17.5 mmHg
  - Supervivencia 8.1%

Table 4 Survival at different end-tidal carbon dioxide values after start of cardiopulmonary resuscitation

Time, min	End-tidal carbon dioxide, mm Hg	No. of patients who: Survived code, yes/no	Survived 24 hours, yes/no	Survived to discharge, yes/no
0 (baseline)	<10	8/39	6/41	1/44
	10-20	14/24	7/31	2/32
	>20	30/8	25/13	12/22
5	<10	4/34	2/36	1/36
	10-20	10/28	5/33	1/36
	>20	33/6	27/12	11/22
10	<10	2/36	2/36	1/37
	10-20	7/18	4/21	0/23
	>20	29/9	22/16	11/24
15	<10	1/30	1/30	1/30
	10-20	8/17	5/20	1/22
	>20	12/5	10/7	4/11
20	<10	1/27	1/27	1/27
	10-20	1/12	1/12	0/13
	>20	12/1	10/3	4/8
Final	<10	1/47	1/47	1/47
	10-20	7/20	3/24	0/25
	>20	45/7	35/17	15/30

For differences between patients who survived to discharge and patients who did not, *P* for 15 min = .02, *P* for 20 min = .006. For all other times and variables, *P*<.001.

A pilot study examining the role of regional cerebral oxygen saturation monitoring as a marker of return of spontaneous circulation in shockable (VF/VT) and non-shockable (PEA/Asystole) causes of cardiac arrest☆

Resuscitation 84 (2013) 1713–1716
Ahn et al

55 pacientes, PCR - IH; 52 % RCE

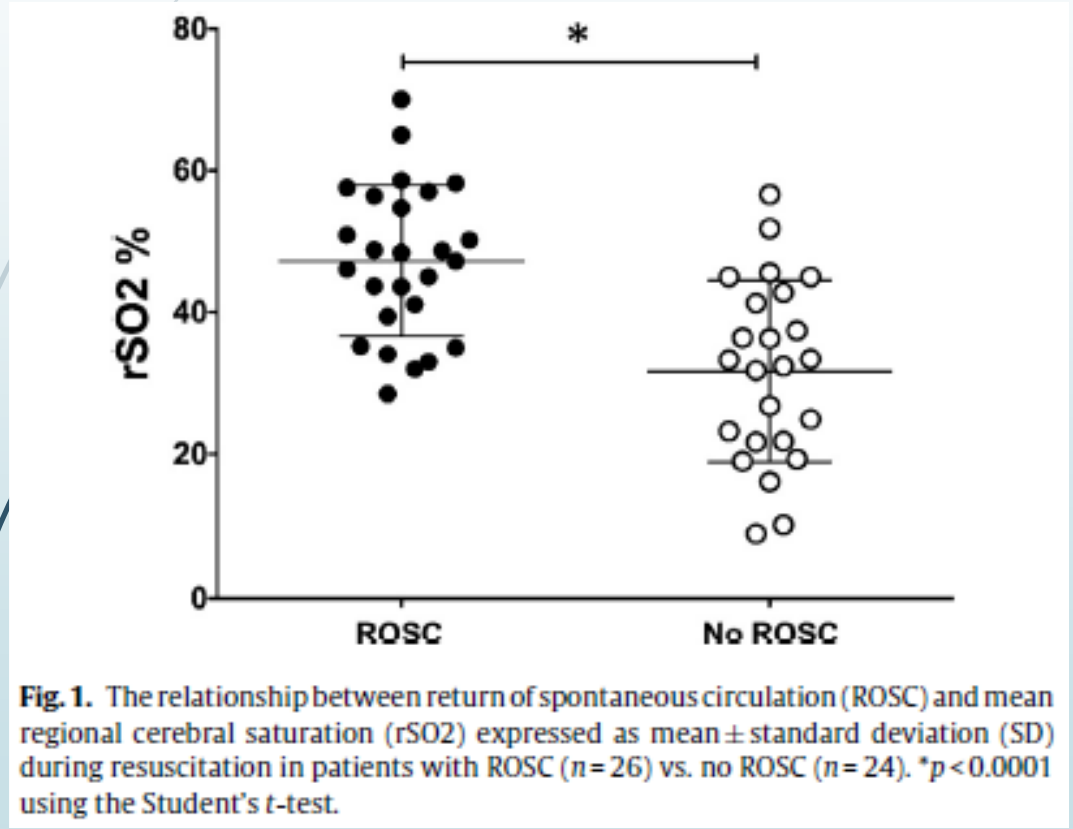


Fig. 1. The relationship between return of spontaneous circulation (ROSC) and mean regional cerebral saturation (rSO2) expressed as mean ± standard deviation (SD) during resuscitation in patients with ROSC ($n = 26$) vs. no ROSC ($n = 24$). *$p < 0.0001$ using the Student's t-test.

	RCE	No RCE
rSO2 %	47.2 ± 10.7	31.7 ± 12.8

$p < 0.0001$

Ningún paciente con rSO2 < 30% sobrevivió

Application of cerebral oxygen saturation to prediction of the futility of resuscitation for out-of-hospital cardiopulmonary arrest patients: a single-center, prospective, observational study☆,☆☆,★

Can cerebral regional oxygen saturation predict the futility of CPR?

American Journal of Emergency Medicine 32 (2014) 747–751

Fukuda et al

- Prospectivo unicéntrico observacional (1 año) → 69 pacientes con PCR-EH en los que se midió rSO2

	RCE	No RCE	P
rSO2 inicial	28.5 %	18.2 %	0.0002

Table 2
Receiver operating characteristic curve analysis of non-ROSC prediction

	Cutoff	AUC (95% CI)	*P*	OR (95% CI)	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)
Cerebral oxygen saturation							
Initial lower cerebral rSO_2	26.0%	0.714 (0.535-0.844)	.0033	10.07 (2.74-37.06)	88.7% (82.8-93.4)	56.3% (36.9-71.9)	87.0% (81.3-91.7)
Initial higher cerebral rSO_2	28.0%	0.650 (0.488-0.784)	.1788	4.64 (1.42-15.14)	73.6% (67.3-78.8)	62.5% (41.6-79.8)	86.7% (79.2-92.8)
Initial average cerebral rSO_2	23.0%	0.677 (0.506-0.811)	.0235	4.22 (1.30-13.68)	71.7% (65.4-79.9)	62.5% (41.5-79.9)	86.4% (78.7-92.7)
Blood pH	6.886	0.620 (0.459-0.759)	.1687	4.28 (1.29-14.21)	66.0% (59.6-70.9)	68.8% (47.4-84.9)	87.5% (79.0-93.9)
Lactate	8.2 mmol/L	0.627 (0.436-0.786)	.1081	7.35 (1.75-30.91)	92.5% (87.5-96.5)	37.5% (21.0-51.1)	83.1% (78.6-86.7)

The AUC was greater for the prediction of non-ROSC when initial lower cerebral rSO_2 values (0.714; $P = .0033$) were used than when other indicators were used. The optimal cutoff of initial lower cerebral rSO_2 was 26.0%. The OR of initial lower cerebral rSO_2 of 26% or less for not achieving ROSC was 10.07 (95% CI, 2.74-37.06).

Increase in cerebral oxygenation during advanced life support in out-of-hospital patients is associated with return of spontaneous circulation

Genbrugge *et al. Critical Care* (2015) 19:112

- Prospectivo, observacional, unicéntrico
  49 PCR-EH

	No RCE	RCE	p
rSO2 máx	40 % ± 16	52 % ± 14	< 0.01
rSO2 media	31 % ± 4	42 %± 8	0.02
%tiempo rSo2 < 30%	25 (0 a 100)	1 (0 a 37)	0.03

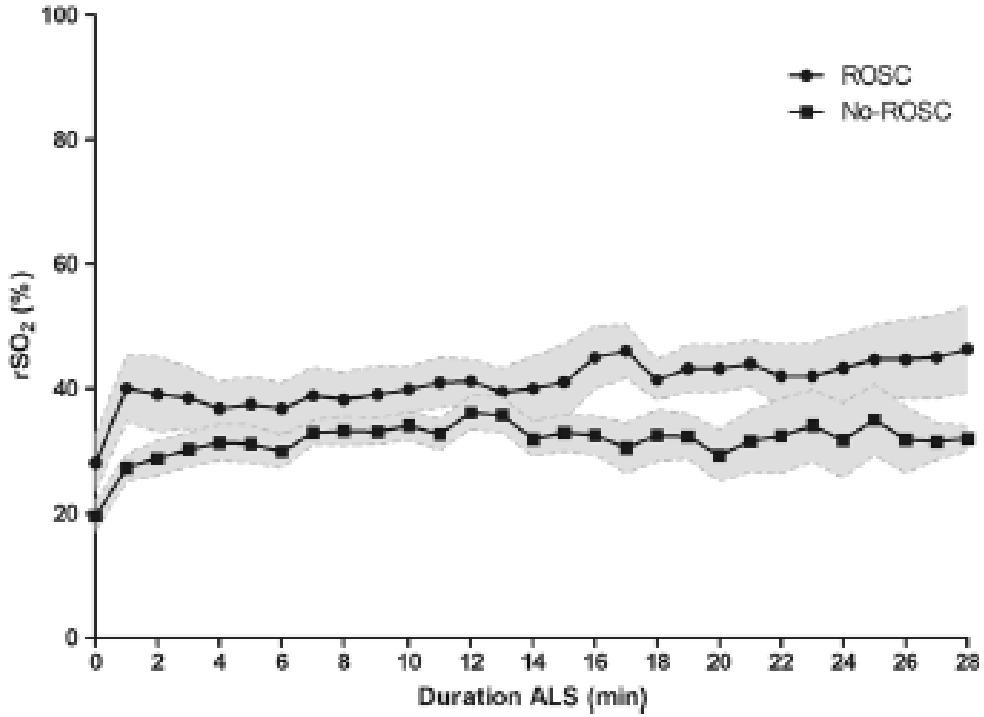


Figure 2 Course of cerebral oxygen saturation during advanced life support. Mean cerebral oxygen saturation (rSO_2) values ± standard error of mean during advanced life support (ALS) in patients with return of spontaneous circulation (ROSC) and no ROSC.

Cerebral Oximetry During Cardiac Arrest: A Multicenter Study of Neurologic Outcomes and Survival*

Parnia et al
Crit Care Med 2016; 44:1663–1674

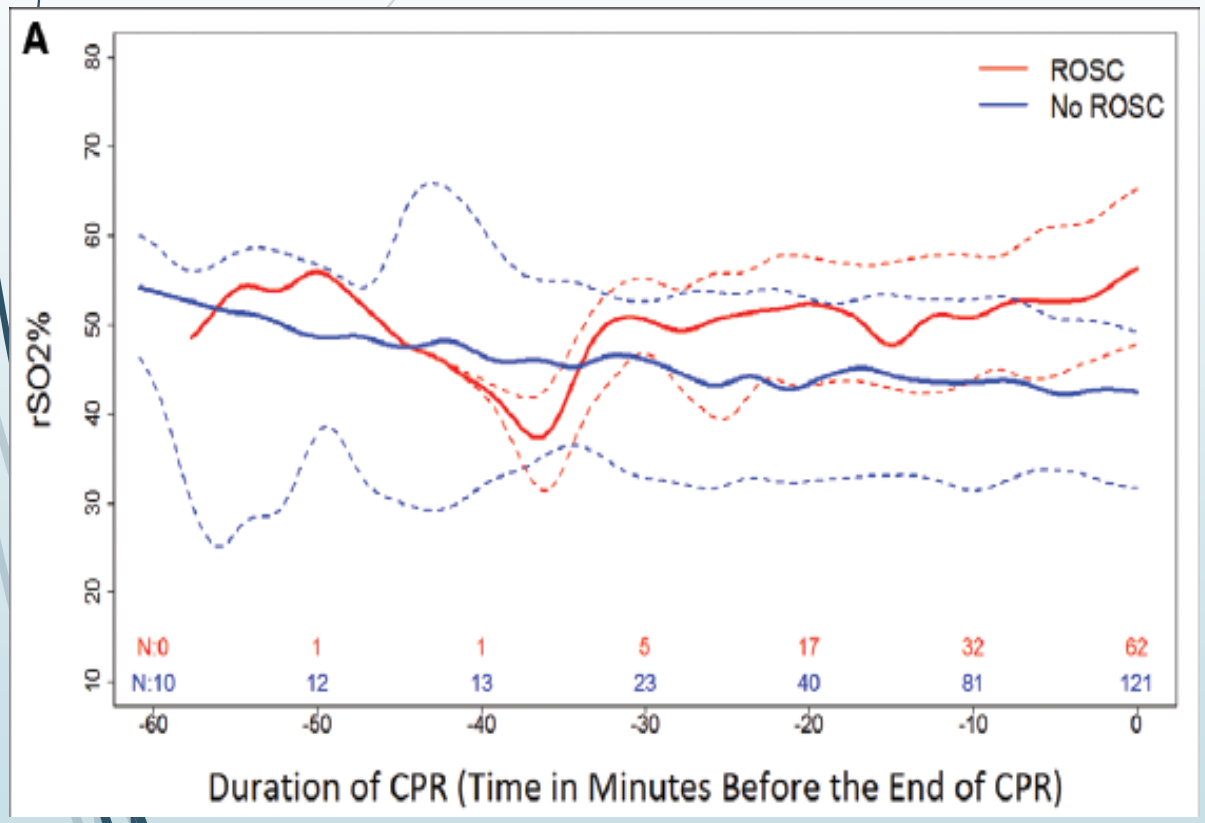
- Prospectivo, multicéntrico (3 años) → inclusión 183 PCR-IH (duración > 5 minutos)
  - 33.9% RCE
  - 7.1% CPC 1-2
  - 66.7% AESP

	RCE	No RCE	p
rSO2 media	51.8 ± 11.2 %	40.9 ± 12.3 %	< 0.001
rSo2 > 50% (% tiempo)	56.59 ± 35.39	24.29 ± 33.84	< 0.001

	CPC 1-2	CPC 3-5	p
rSO2 media	56.1 ± 10 %	43.8 ± 12.8 %	< 0.01

Cerebral Oximetry During Cardiac Arrest: A Multicenter Study of Neurologic Outcomes and Survival*

Parnia et al
Crit Care Med 2016; 44:1663–1674



CONCLUSIONS

Cerebral oximetry is a real-time, noninvasive monitor for use during CPR. Increasing rSo_2 to greater than or equal to 65% favors ROSC, whereas rSo_2 less than 25% strongly favors the inability to achieve ROSC/survival or CPC 1–2. Higher rSo_2 during CPR may optimize the chances of achieving survival with favorable neurologic outcomes.

Conclusiones:

- Bajo nivel de evidencia
- Necesidad de más estudios
- Individualización
- 30 – 40 minutos → ritmos desfibrilables
- ET-CO2 < 10 mm Hg
- Oximetría cerebral > 60 % → prolongar tiempos

  < 30 % → mal pronóstico

OURENSE
11 de MAYO
XXXI REUNIÓN SOGAMIUC 2018

Table 1. Categories of Cerebral Performance.*

Category	Classification	Description
1	Good cerebral performance	Patient is conscious, alert, and able to work and lead a normal life. Patient may have minor psychological or neurologic deficits (e.g., mild dysphasia, hemiparesis that is not incapacitating, or minor cranial-nerve abnormalities).
2	Moderate cerebral disability	Patient is conscious and has sufficient cerebral function to be able to work part time in a sheltered environment or perform activities of daily living (e.g., dress, travel by public transportation, or prepare meals) independently. Patient may have hemiplegia, seizures, ataxia, dysarthria, dysphasia, or permanent changes in memory or mental status.
3	Severe cerebral disability	Patient is conscious, dependent on others for daily support (in an institution or at home with an exceptional effort made by the family), and has at least limited cognitive ability. A wide range of cerebral abnormalities may be present, ranging from the ability to walk but with severe memory disturbance or dementia precluding independent living to paralysis and the ability to communicate only with the eyes (as in the locked-in syndrome).
4	Coma or vegetative state	Patient is unconscious, unaware of surroundings, and without cognitive ability; no verbal or psychological interaction with the environment.
5	Death	Patient is certified as brain dead or dead.

Volume 63, No. 4
October 1965

Ann Inter Med

Cardiac Resuscitation

A 1-year Study of Patients Resuscitated Within a University Hospital

EDWARD J. STEMMLER, M.D., *Philadelphia, Pennsylvania*

Los inicios…..

TABLE 3. Survival According to Rhythm at the Time of Cardiac Arrest

Rhythm	Patients	Survived More Than 1 hr		Survived More Than 24 hr		Discharged Alive	
	no.	*no.*	*%*	*no.*	*%*	*no.*	*%*
Ventricular fibrillation	33	12	36	5	15	3	9
Asystole	45	19	42	8	18	2	4
Rhythm unknown (no EKG recorded)	25	5	20	0		0	
Total	103	36	35	13	12	5	4.8

Circulation. 2017;136:00–00.

2017 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations Summary

Olasveengen et al

- Sobre el tema que nos ocupa, no aporta nada

The International Liaison Committee on Resuscitation—Review of the last 25 years and vision for the future

Gavin D. Perkins*, Robert Neumar, Koenraad G. Monsieurs, Swee Han Lim,

Resuscitation 121 (2017) 104–116

Sobre el tema que nos ocupa, no aporta nada

Comparison of Helsinki and European Resuscitation Council "do not attempt to resuscitate" guidelines, and a termination of resuscitation clinical prediction rule for out-of-hospital cardiac arrest patients found in asystole or pulseless electrical activity☆

Resuscitation 81 (2010) 679–684

M.B. Skrifvars[a,*], T. Vayrynen[b], M. Kuisma[b], M. Castren[c], M.J. Parr[a], J. Silfverstople[d], L. Svensson[e], L. Jonsson[e], J. Herlitz[f]

Helsinki DNAR guidelines: No iniciar RCP en los siguientes supuestos:

- Asistolia:
  - Con parada no presenciada
  - Si la ambulancia se demora más de 10 minutos desde el aviso a la llegada al lugar
  - No se obtiene RCE tras 20 minutos de SVA
- En AESP:
  - Con parada no presenciada y no RCE tras 10 minutos de SVA
  - Si la ambulancia se demora mas de 15 minutos
  - Si no se obtiene RCE tras 20 minutos de SVA

en estas situaciones no se consigue sobrevivir con CPC de 1 o 2

La RCP por testigos no cambia el pronóstico

Excluyen la hipotermia, el casi ahogamiento y el trauma penetrante

Acta Anaesthesiol Scand 2008; 52: 81–87
T. VÄYRYNEN, M. KUISMA, T. MÄÄTTÄ and J. BOYD

Medical futility in asystolic out-of-hospital cardiac arrest

Table 3

Multivariate analysis of factors univariately associated with survival (with $P<0.5$).

	Short-term mortality			Long-term mortality		
	Adjusted OR	95% CI	*P*	Adjusted OR	95% CI	*P*
Male gender	1.43	1.00–2.05	0.048			
Increasing age (years)				1.04	1.02–1.07	0.003
Arrest at home	1.58	1.11–2.25	0.011	4.33	1.75–10.71	0.002
Cardiac cause	2.86	1.97–4.15	<0.0001	4.27	1.35–13.56	0.014
Bystander-witnessed arrest	0.42	0.28–0.62	<0.0001	0.09	0.02–0.43	0.003
Bystander-CPR				4.18	1.15–15.13	0.030
Increasing FRU response time (unit)	2.01	1.12–3.60	0.019			
Increasing ALS response time (unit)				11.42	1.91–68.07	0.007
Defibrillated	0.50	0.34–0.74	<0.0001			

Cases in which resuscitation was not attempted are excluded. Increases in FRU and ALS response times are expressed in natural logarithmic units. Therefore, EMS-witnessed cases are excluded. Only significant associations ($P<0.05$) are shown. FRU, first responding unit; ALS, advanced life support; CPR, cardiopulmonary resuscitation; OR, odds ratio. OR above 1 indicates increased chance of mortality, OR below 1 indicates increased chance of survival.

Futilidad = Situaciones en las que el tratamiento no proporciona posibilidades de supervivencia con buena calidad de vida

1% de posibilidades de supervivencia se ha sugerido como punto de corte para definir la futilidad médica

Predictors of Survival Following In-Hospital Cardiopulmonary Resuscitation

A Moving Target

Kenneth A. Ballew, MD, MS; John T. Philbrick, MD; Dean E. Caven; John B. Schorling, MD, MPH

Arch Intern Med. 1994;154:2426-2432

- Identificar a los pacientes que no se benefician de RCP puede reducir tanto el sufrimiento de los pacientes como los costes sanitarios
- Objetivo: determinar la supervivencia de la PCR intra-hospitalaria e identificar variables que puedan predecir la supervivencia
- De los 313 pacientes con PCR, el 61.3 % fallecieron el día de la parada; de los supervivientes ese primer día, otro 22.7% fallecieron durante la hospitalización. Supervivencia: 16%
- La sepsis se asoció con mal pronóstico. La hipertensión con la supervivencia
- Durante le periodo de estudio, 1417 pacientes hospitalizados sufrieron PCR → solo 313 se reanimaron → pacientes muy seleccionados, de ahí la tasa de supervivencia mayor que otros casos (uso importante de ONIR)

Table 7. Admission, Prearrest, and Intra-arrest Variables Associated With Survival to Discharge: Multivariate Analyses Using Stepwise Logistic Regression

Variable	β	SE	Odds Ratio of Survival	95% Confidence Interval	P
Admission variables (n=286)*					
Unable to eat independently	−0.97	0.30	0.38	0.20-0.71	.001
Hypertension	0.89	0.32	2.4	1.3-4.6	.006
Prearrest variables (n=251)†					
Hypertension	0.88	0.32	2.4	1.3-4.6	<.001
Intra-arrest variables (n=313)					
Duration <5 minutes	1.83	0.36	6.2	1.4-12.7	<.001
Ventricular tachycardia	1.02	0.38	2.8	1.3-5.8	.007
Asystole	−2.13	1.0	0.12	0.02-0.92	.041

Predicting in-hospital mortality during cardiopulmonary resuscitation

Scot C. Schultz, Daniel C. Cullinane, Michael D. Pasquale, Colette Magnant, Stephen R.T. Evans*

Resuscitation 33 (1996) 13–17

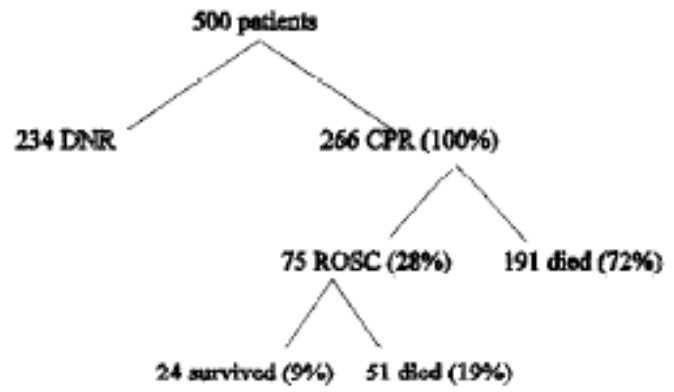


Fig. 1. Summary of 500 cardiopulmonary arrests.

Table 3
CPR variables affecting survival

Variables	No.	Survived (*n* (%))	Death (*n* (%))	*P*
Code duration (min)				
≤10	40	19 (48)	21 (52)	
>10	226	5 (2)	221 (98)	0.0001
pH-Value				
<7.2	105	7 (7)	98 (93)	
≥7.2	75	8 (11)	67 (89)	0.61
P_{O_2}-Value				
<50	75	1 (1)	74 (99)	
≥50	105	14 (13)	91 (87)	0.004
Setting				
ICU	87	5 (6)	82 (94)	
Ward	77	9 (12)	68 (88)	
OR	5	2 (40)	3 (60)	>0.05[a]
CCL	6	1 (17)	5 (83)	
ER	91	7 (8)	84 (92)	

Retrospectivo, 3 años,
266 estudiados

Mal Px → > 60 años, pO2 baja,
RCP > 10 minutos

Derivation of a Clinical Decision Rule for the Discontinuation of In-Hospital Cardiac Arrest Resuscitations

Carl van Walraven, MD, FRCPC, MSc; Alan J. Forster, MD, FRCPC; Ian G. Stiell, MD,

Arch Intern Med. 1999;159:129-134

Background: Most patients undergoing in-hospital cardiac resuscitation will not survive to hospital discharge.

Objective: To derive a decision rule permitting the discontinuation of futile resuscitation attempts by identifying patients with no chance of surviving to hospital discharge.

Patients and Methods: Patient, arrest, and outcome data for 1077 adult patients undergoing in-hospital cardiac resuscitation was retrieved from 2 randomized clinical trials involving 5 teaching hospitals at 2 university centers. Recursive partitioning was used to identify a decision rule using variables significantly associated with death in hospital.

Results: One hundred three patients (9.6%) survived to hospital discharge. Death in hospital was significantly more likely if patients were older than 75 years ($P<.001$), the arrest was unwitnessed ($P = .003$), the resuscitation lasted longer than 10 minutes ($P<.001$), and the initial cardiac rhythm was not ventricular tachycardia or fibrillation ($P<.001$). All patients died if there was no pulse 10 minutes after the start of cardiopulmonary resuscitation, the initial cardiac rhythm was not ventricular tachycardia or fibrillation, and the arrest was not witnessed. As a resuscitation rule, these parameters identified all patients who survived to hospital discharge (sensitivity, 100%; 95% confidence interval, 97.1%-100%). Resuscitation could have been discontinued for 119 (12.1%) of 974 patients who did not survive, thereby avoiding 47 days of postresuscitative care.

Conclusions: A practical and highly sensitive decision rule has been derived that identifies patients with no chance of surviving in-hospital cardiac arrest. Prospective validation of the rule is necessary before it can be used clinically.

Arch Intern Med. 1999;159:129-134

American Journal of Emergency Medicine (2012) 30, 236–239

Pulseless electrical activity in cardiac arrest: electrocardiographic presentations and management considerations based on the electrocardiogram

Chris Mehta [a,b], William Brady MD [b,c,*]

- AESP
- Supervivencia baja (2 – 5%) → pero diversa por que engloba múltiples etiologías
- Búsqueda de las causas reversibles
- AESP y pseudo-AESP

- FC > 60 lpm
- QRS < 0.12 seg

→ Asociación con mejor pronóstico