



American Heart Association® | American Stroke Association®

Learn and Live®



2010美国心脏协会心肺复苏和心血管急救指南

STEPHEN D. PRUDHOMME, MS

美国心脏协会/美国中风协会全球策略部副总裁



American
Heart
Association®

GUIDELINES
CPR **ECC**
2010



公开声明

- 美国心脏协会员工
 - **AHA**建立培训课程及市场支持材料
- 注:美国食品药品监督管理局法规未能完全界定所有美国心脏协会指引中的急救方法
 - 如, 心脏骤停的低温治疗和对心脏骤停的儿童病患使用胺碘酮



心肺复苏 历史

CLOSED-CHEST CARDIAC MASSAGE

W. B. Kouwenhoven, Dr. Ing., James B. Jude, M.D.

and

G. Guy Knickerbocker, M.S.E., Baltimore

When cardiac arrest occurs, either as standstill or as ventricular fibrillation, the circulation must be restored promptly; otherwise anoxia will result in irreversible damage. There are two techniques that may be used to meet the emergency; one is to open the chest and massage the heart directly and the other is to accomplish the same end by a new method of closed-chest cardiac massage. The latter method is described in this communication. The closed-chest alternating current defibrillator¹ that was developed in our laboratories has proved to be an effective and reliable means of arresting ventricular fibrillation. Its counter-shock must be sent through the chest promptly, or else cardiac anoxia will have developed to such a degree that the heart will no longer be able to resume forcible contractions without assistance. Our experience has indicated that external defibrillation is not likely to be followed by the return of spontaneous heart action unless the counter-shock is applied within less than three minutes after the onset of ventricular fibrillation.

A study was undertaken of means of extending this time limitation without opening the chest. A method was sought that would provide adequate circulation to maintain the tone of the heart and the nourishment of the central nervous system. This method was to be at once readily applicable, safe to use, and requiring a minimum of gadgets.

One of the first attempts at enhancing circulation in the arrested heart was a closed-chest method reported by Boehm² in 1878. Working with cats, he grasped the chest in his hands at the area of greatest expansion and applied rhythmic pressure. His results were quite striking in some series of tests. Tenesdale and co-workers³ reported that by an abrupt compression of the thorax of a dog in caudal aortic blood pressures of 80 to 100 mm. Hg could be produced. No survival studies were given. Killik and Eise⁴ reported that the rocking technique of artificial respiration, by which a patient is tilted about 60 degrees in each direction from the horizontal plane, will produce a change in the blood pressure of the aorta from 35 to 70 mm. Hg. Eise⁵ hypothesized that this change will produce sufficient blood flow to nourish the heart and the brain. In 1947 Currier and Yates⁶ found that a capacitor discharge sent through the chest of a dog would be followed by a resumption of the cardiac function if applied not later than one or two and

Cardiac resuscitation of the cardiac arrest or ventricular fibrillation has been limited by the need for open thoracotomy and direct cardiac massage. As a result of extensive animal experimentation a method of external trans-thoracic cardiac massage has been developed. Immediate resuscitative measures can now be initiated to give not only mechanical artificial respiration but also adequate cardiac massage without thoracotomy. The use of this technique on 20 patients has given an overall permanent survival rate of 70%. Asystole, asystole, can now initiate cardiac resuscitative procedures. All that is needed are two hands.

one-half minutes after the onset of induced ventricular fibrillation. They reported that this time limitation might be extended to as long as eight minutes by electrical application of pressure on the thorax in the region of the heart. In tests which lasted 10 to 15 minutes 19 animals survived and 17 died. These authors, however, gave no specific information as to the method of application of the pressure. Reiser and Ballough⁷ treated cardiac arrest in children by lowering the head about 10 degrees, placing one arm underneath the patient's knees, and flexing the legs and buttocks against the chest. They reported eight successful resuscitations in patients ranging from 5 weeks to 13 years in age. Stout⁸ in 1957 reported the successful use of his method in one adult.

Experiment

With dogs used as the experimental animal, cardiac arrest in the form of ventricular fibrillation was induced. In the initial experiments more than 100 dogs, weighing from 5 to 24 kg. (11 to 52 lb.), were used in testing various methods of restoring blood by massaging the intact chest. A safe and effective method of "massaging the heart" without thoracotomy was developed. Adequate circulation for periods as long as 30 minutes was easily maintained with the dog in ventricular fibrillation. A closed-chest defibrillating shock would result in the immediate return of normal sinus rhythm in such animals.

In Fig. 1 one shows sections taken from the recording of the variations in blood flow, blood pressure, and electrocardiogram of a dog whose heart

¹Developed by James B. Jude, Baltimore, Md.; modified by James B. Jude, Baltimore, Md.; and modified by James B. Jude, Baltimore, Md.; and modified by James B. Jude, Baltimore, Md.

Kouwenhoven, Jude &
Knickerbocker.
JAMA.

1960年7月9日

OCEAN CITY MEETING

MEDICAL and CHIRURGICAL FACULTY



It's
SEMIANNUAL
MEETING
time again

Headquarters
COMMANDER HOTEL
Boardwalk and 14th Street
OCEAN CITY, MARYLAND

FRIDAY
SEPTEMBER 16,
1960

SCIENTIFIC SESSION
FRIDAY, SEPTEMBER 16, 1960
12:30 P.M.

Commander Hotel
Beach Lounge, Ground Floor

Words of Welcome
Whitmer E. Frier, M.D., President,
Medical and Chirurgical Faculty

Recent Advances in Emergency Resuscitation
An illustrated symposium

Donald W. Bassett, M.D., Professor of Anesthesiology,
The Johns Hopkins University School of Medicine.

1. EXTERNAL CARDIAC MASSAGE AND DEPRIMERIZATION
William E. Kouwenhoven, M.D., Ph.D., Eng. Professor Emeritus of
Electrical Engineering and Lecturer in Surgery, The Johns Hopkins
University.

James B. Jude, M.D., Resident Surgeon, Johns Hopkins Hospital.

2. MODERN METHODS OF ARTIFICIAL RESPIRATION
Paul E. Hackett, M.D., Associate Professor of Anesthesiology, Uni-
versity of Maryland School of Medicine.
Peter Safar, M.D., Chief of Anesthesiology, Baltimore City Hospital,
and Associate Professor of Anesthesiology, University of Maryland School
of Medicine.

Each symposium will be held in sessions with the presenting speaker
and a panel of discussors. The sessions will be of 90 minutes in all. A new method of
resuscitation is being presented by the speakers. The sessions will be held in the
Beach Lounge, Boardwalk and 14th Street, Ocean City, Maryland. The sessions will be
held in the Beach Lounge, Boardwalk and 14th Street, Ocean City, Maryland. The sessions
will be held in the Beach Lounge, Boardwalk and 14th Street, Ocean City, Maryland.

SEE REVERSE SIDE FOR ADDITIONAL INFORMATION

胸外按压

Kouwenhoven & Jude

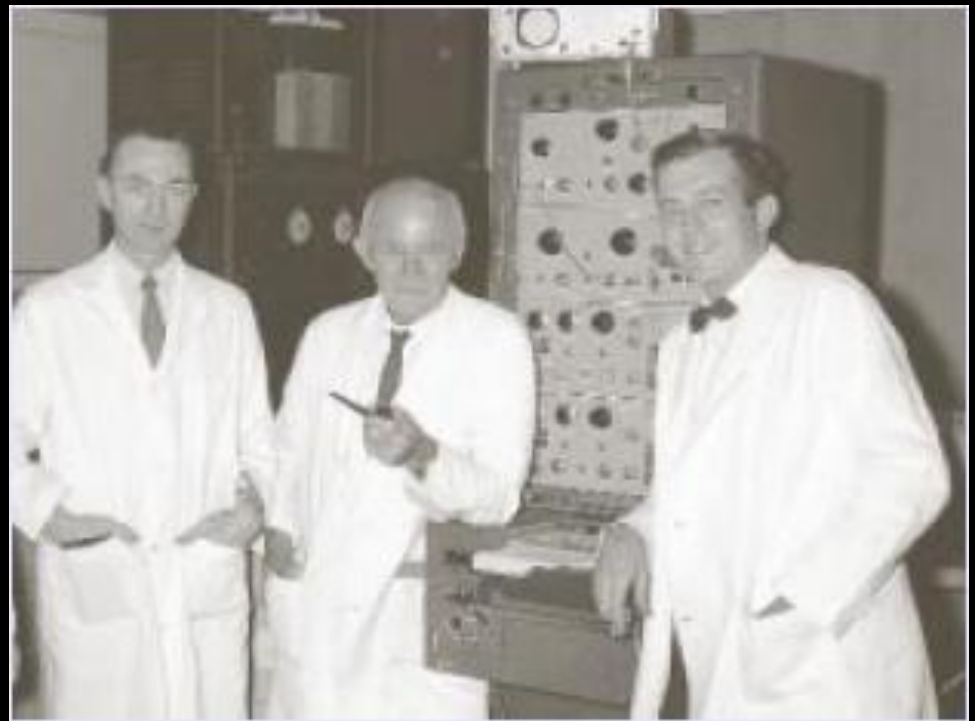
+

口对口人工呼吸

Safar & Hackett

1960 – AHA成立早期CPR基金会

1960年， Drs. James Jude, William Kouwenhoven and Guy Knickerbocker在美国医学杂志中发表了CPR对于118位病人的运用。它们是由美国心脏协会马里兰联盟成立的。



*Drs. James Jude, William Kouwenhoven,
Guy Knickerbocker (L to R)*

Another EMERGENCY METHOD OF RESUSCITATION

by Captain Martin C. McMahon,
Supervisor of Ambulance Service,
Baltimore, Maryland, Fire Department



Fire Fighter Hubert Cheek of Baltimore's Ambulance No. 2 shows technique he used successfully on a victim four days after he received the training. At his right is Dr. Kouwenhoven. Guy Knickerbocker is at Cheek's left.

NOTICE — This is a brand new technique and many medical personnel may not, as yet, have had the chance to study its application and benefits. Consequently, fire departments should consult with doctors before adopting the technique for training and standard practice.

MEMBERS of the ambulance crews of the Baltimore Fire Department recently have been applying a new technique on victims of cardiac arrest or standstill. Called "closed chest cardiac resuscitation," the technique is combined with mouth-to-mouth or mouth-to-airway artificial respiration as an emergency measure for cardiac arrest victims when no medical assistance is immediately available. The cessation of all circulation is recognized by absent respirations, cyanosis, absence of the pulses in the wrist and groin, and the absence of a heartbeat. The method is simple to understand and easy to perform and is shown in illustrations on these pages. If performed correctly, it may produce a palpable pulse and sufficient circulation to keep the brain alive and maintain the tone of the heart until medical assistance is obtained.

The victim when found should be placed on a hard surface such as a floor or sidewalk (a soft surface beneath him, such as a mattress, does not offer sufficient resistance for compression of the heart). The rescuer places the heel of one hand on the sternum, or breastbone, about two inches from the lower end. The palm of the other hand is placed on top of the first hand. Pressure is now exerted downward, compressing the heart between the breastbone and the spinal column. The largest part of the heart lies directly under the sternum, and the bones of the ribs, attached to the sternum by means of cartilage, are relaxed and flexible enough to allow compression of the chest. The heart is a valve-like chamber which allows blood to move in the correct direction when pumping, and the blood in the heart is squeezed out when external pressure is applied to the chest.

The correct pressure will vary according to the size of the rescuer and his victim and can be determined readily by the rescuer. The pupils of the eyes of a victim of cardiac arrest or standstill will dilate, but if an adequate amount of blood is being moved, the pupils will start to contract. The rescuer should apply his pressure at a rate of between 60 and 80 times per minute, approximately in the range of the natural

beat of the heart. The technique should be continued where the victim is found and on the litter of an ambulance until it reaches the hospital.

If possible, the hospital should be alerted beforehand as to the nature of the case and informed of what techniques are being applied. In Baltimore, ambulance crew members call fire department headquarters by radio, and then headquarters alerts the hospital emergency room by telephone.

When such a victim is brought into the Johns Hopkins Hospital, doctors use an electrocardiograph and an external defibrillator in attempting resuscitation.

In April, 1960, Captain McMahon was invited to a demonstration of the closed chest cardiac massage technique at the Johns Hopkins Hospital. (*Ed note. Readers of FIREMEN magazine will recall that Captain McMahon worked with Dr. Peter Safar in developing the airway used in mouth-to-airway artificial respiration. See FIREMEN for December, 1958.*) When he saw the demonstration, the Captain asked for instructions for the ambulance crews in the Baltimore City Fire Department. Three classes were scheduled immediately and 105 persons attended. Four days after the first class had been trained, two members of Ambulance Crew No. 2 used the technique on a sixty-year-old man who was found unconscious, cyanotic, nonbreathing and pulseless. As they had been trained, fire fighters Hubert Cheek and Marvin Burkendine removed the victim from his bed to the floor. One man started the closed chest cardiac massage and the other started mouth-to-airway artificial respiration. Shortly afterwards, the victim's pulse was beating, and within five minutes he was gasping. He was then lifted to an ambulance litter and taken to the Johns Hopkins Hospital, with oxygen being administered on the run. Hospital personnel took over the task and the victim was successfully revived.

Dr. William B. Kouwenhoven, of Johns Hopkins University, Lecturer in Surgery at the hospital, is principally responsible for the closed chest cardiac massage technique. He is also chiefly responsible for the invention of the "external defibrillator" used by the

1963

Prepared by
THE COMMITTEE ON
CLOSED CHEST CARDIOPULMONARY RESUSCITATION
of the
HEART ASSOCIATION OF MARYLAND

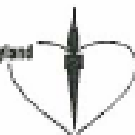
James R. Jude, M.D. — Chairman

Leonard Scherlis, M.D.

Mary E. Farr, R.N.

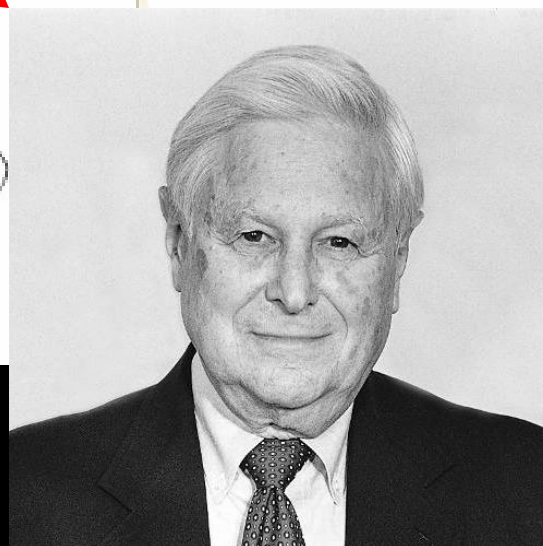
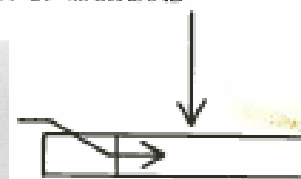
April 1962

Heart Association of Maryland
418 N. Charles Street
Baltimore 5, Maryland



CARDIO- PULMONARY RESUSCITATION

A MANUAL FOR INSTRUCTORS —
PREPARED AND PUBLISHED BY
THE HEART ASSOCIATION OF MARYLAND



Dr. Leonard Scherlis

1963 —成立AHA第一个“CPR委员会”

1966 – AHA合作创立第一个CPR标准

Cardiopulmonary Resuscitation

Statement by the Ad Hoc Committee on Cardiopulmonary Resuscitation of the Division of Medical Sciences, National Academy of Sciences-National Research Council

In May 1966, the work of an ad hoc Committee on Cardiopulmonary Resuscitation culminated in a Conference on Cardiopulmonary Resuscitation at the National Academy of Sciences-National Research Council (NAS-NRC). This study was undertaken in response to inquiries from the American National Red Cross and other national and federal agencies concerned with the need for standardized techniques of performance, training, and retraining requirements, and designation of the categories of persons to be taught mouth-to-mouth ventilation and external cardiac compression under present limitations on the supply of instructors. The ad hoc committee carefully reviewed and discussed these matters with representatives of over 30 national organizations attending the conference. The full proceedings of the conference will be published by the NAS-NRC. A summary of the recommendations of the ad hoc committee follows.

In November 1958, a Conference on Artificial Respiration was held at the National Academy of Sciences-National Research Council, and led to the publication in January 1959 of a "Statement on Emergency Artificial Respiration Without Adjunct Equipment." This statement unanimously endorsed the mouth-to-mouth and mouth-to-nose techniques of artificial respiration as the most practical methods of emergency ventilation without adjunctive equipment for all ages, sexes, and ages. Since that time, the most effective techniques and equipment have been developed.

In 1962, the Ad Hoc Committee on Cardiopulmonary Resuscitation was established. Its primary purpose was to study the effectiveness of training and periodic retraining, the personnel taught, the selection of cases, and numerous other factors. These considerations have guided the ad hoc Committee on Emergency Cardiopulmonary Resuscitation in formulating the following recommendations.

In an editorial in *Circulation* in September 1962,¹ closed-chest cardiopulmonary resuscitation was endorsed as a medical procedure. Subsequently, the method was reclassified as an emergency procedure in a second editorial in *Circulation* in May 1965.² This was endorsed by the American Heart Association, the American National Red Cross, the Industrial Medical Association, and the US Public Health Service, which strongly recommended that the technique should be applied by "properly trained individuals of medical, dental, nursing and allied health professions and of rescue squads."

Since publication of the second editorial, the American Heart Association, the Public Health Service, and other organizations have inaugurated intensive training programs in cardiopulmonary resuscitation in response to the widespread interest and enthusiasm of highly motivated persons at all levels from first aid workers to professional medical personnel. Their experience have indicated that clinical results vary widely and depend upon the exact technique taught, the effectiveness of training and periodic retraining, the personnel taught, the selection of cases, and numerous other factors. These considerations have guided the ad hoc Committee on Emergency Cardiopulmonary Resuscitation in formulating the following recommendations.

ASAC Steps

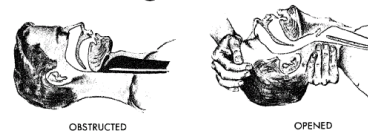
Emergency cardiopulmonary resuscitation is performed in the following order:

1. Airway
2. Breathing
3. Circulation

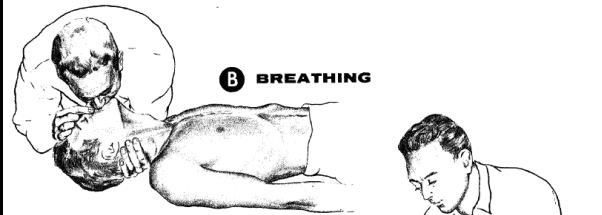
Heart-Lung Resuscitation

National Academy of Sciences-National Research Council

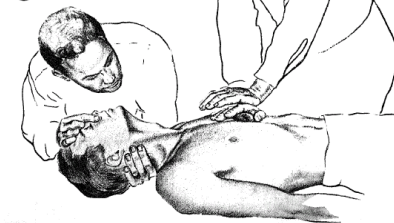
A AIRWAY



B BREATHING



C CIRCULATION



1966年，AHA和国家科学研究所和国家科研委员会创立第一个CPR标准和执行

1972 –第一个综合的小区CPR培训项目

第一目标是在西雅图培训至少100,000公民。

西雅图持续成为全世界最高心脏骤停存活率的地区。



西雅图消防队长



Dr. Leonard Cobb

Standards for
Cardiopulmonary
Resuscitation (CPR)
and Emergency Cardiac Care (ECC)

1974
AHA第一本 心肺复苏和心
血管急救指南

1. Early Ages -
Flagellation Method
2. Early Ages -
Heat Method



3. 1530 -
Bellows Method
4. 1711 -
Fumigation Method



5. 1770 -
Inversion Method
6. 1773 -
Barrel Method



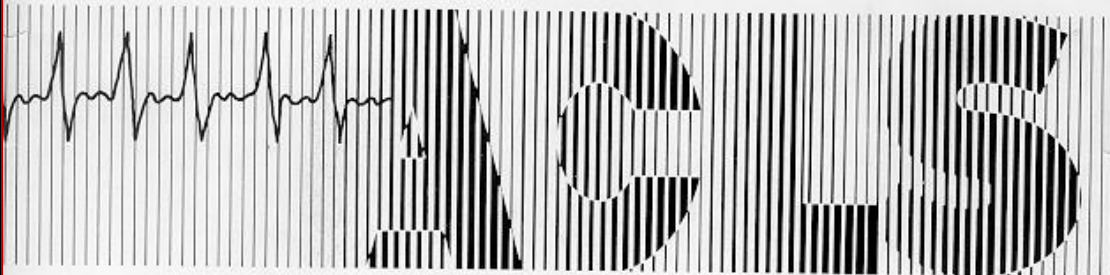
7. 1803 -
Russian Method
8. 1812 -
Trailing Horse Method





American Heart Association 7320 Greenville Avenue, Dallas, Texas 75231

1975 AHA第一个高级心血管生 命支持课程

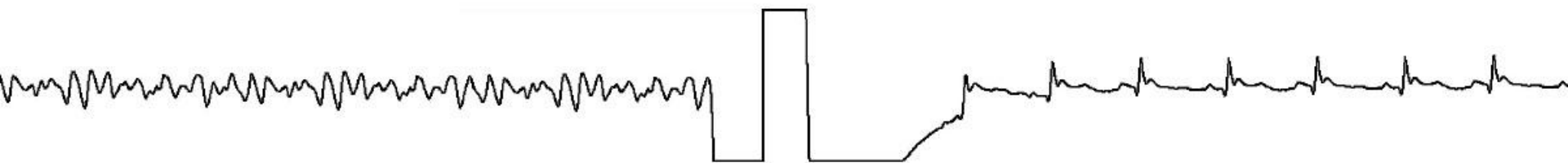


**ADVANCED
CARDIAC
LIFE
SUPPORT**

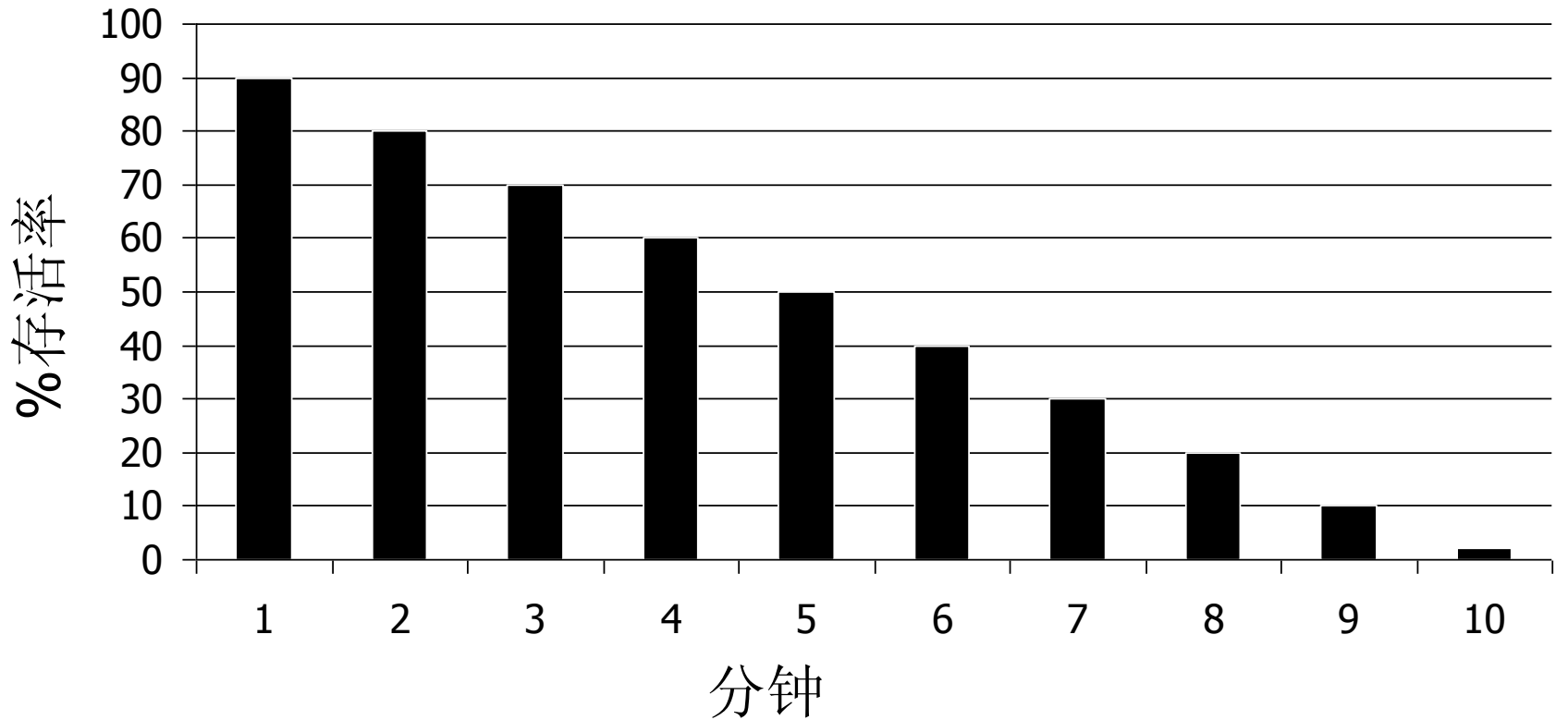
© 1975 AMERICAN HEART ASSOCIATION
79-034-B
75-79-1628
11-60-258



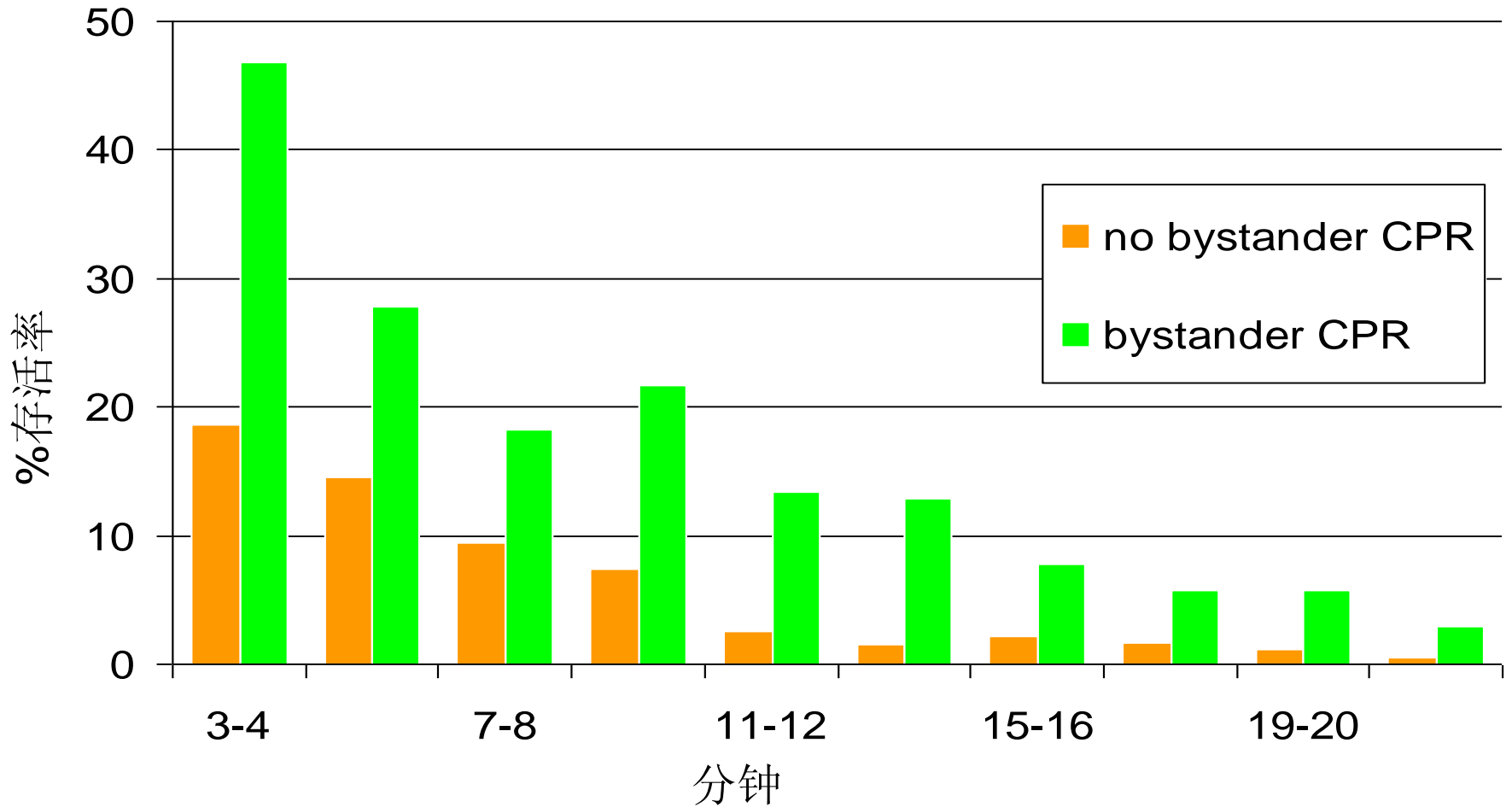
简短介绍美国AED历史



除颤时间和目击室颤心脏骤停存活率的关系



1个月的病患存活率和除颤时间的关系 (有旁观者和无旁观者的CPR)



1975

在美国第一次AED的使用发生在西雅图消防队



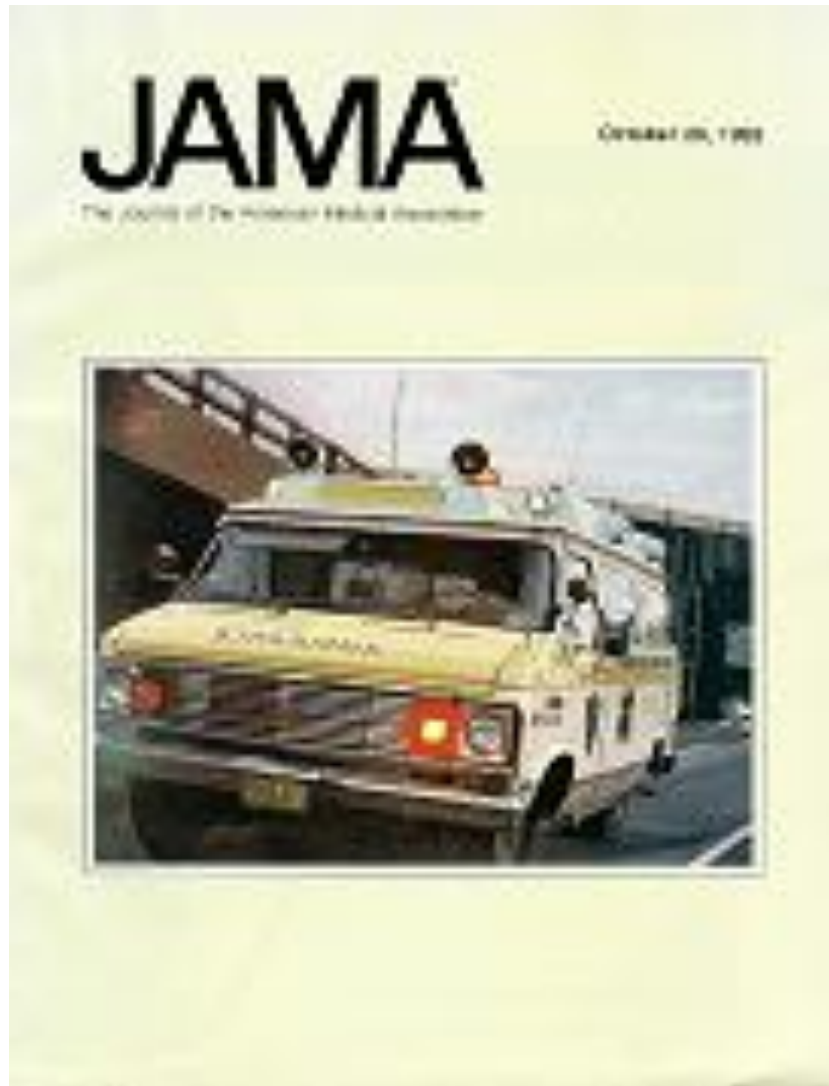
Gordon Vickery,
西雅图消防队队长.



Dr. Leonard Cobb,
Medic One
医学总监



1992



AHA ECC指南建议提高使用AED从而缩短院外心脏骤停患者从“心脏停跳到起搏的时间”

1994

AHA PAD（周边动脉疾病）会议和声明

Circulation. 1995;92:2740-2747.

Circulation. 1995;92:2763.

为AED制造商提供了指导

在美国，只有**30%**的紧急医疗服务系统在救护车里装置了除颤器

价格范围：**\$4000至\$10 000**

1998

底能量，非升级型双相AED进入市场



高效率电击

底耗量（轻便电池，更耐电）

低价

2000

AED零售开始（需要处方）

心脏骤停存活率法案(H. R. 2498)通过美国代表大会:

- **AED放置联邦政府大楼**
- **为AED使用者或拥有者提供保护**

2002

第一个“家庭使用AED”通过FDA（美国食品药品监督管理局）的审批，可销售

在院前心脏骤停患者中，旁观者AED使用频率为2%。但随时增长

Culley et al., *Circulation*. 2004;109: 1859–1863

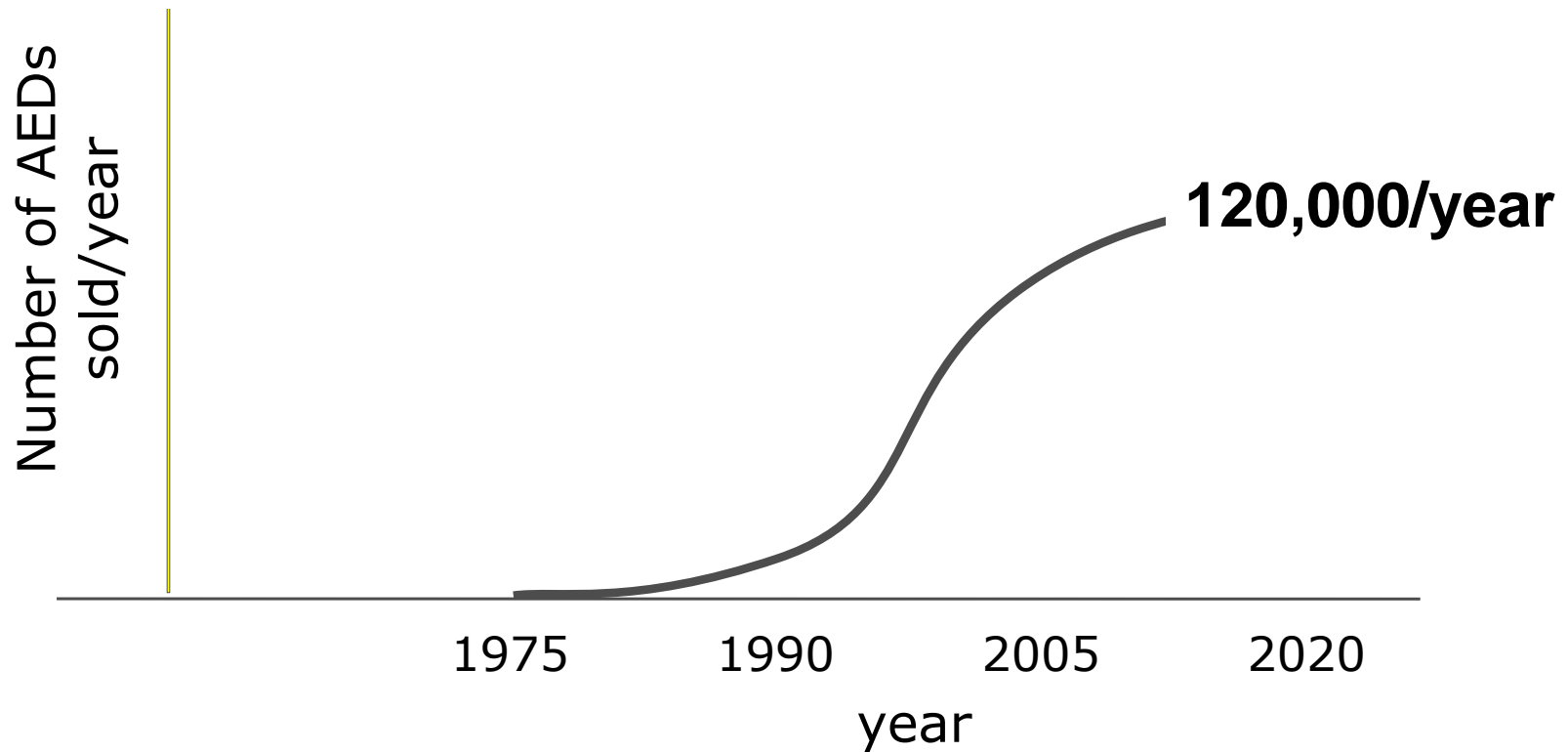
2004

美国联邦航空管理局要求所有商用客机设置**AED**

美国食品药品监督管理局接触**AED**需处方销售条例

2009

每年美国AED销售达 120,000



AED时间表

EMS第
一次使
用AED

AHA
PAD
大会

60万
每年
销售

2%
使用
率

AED
w/o
Rx

120万
每年
销售



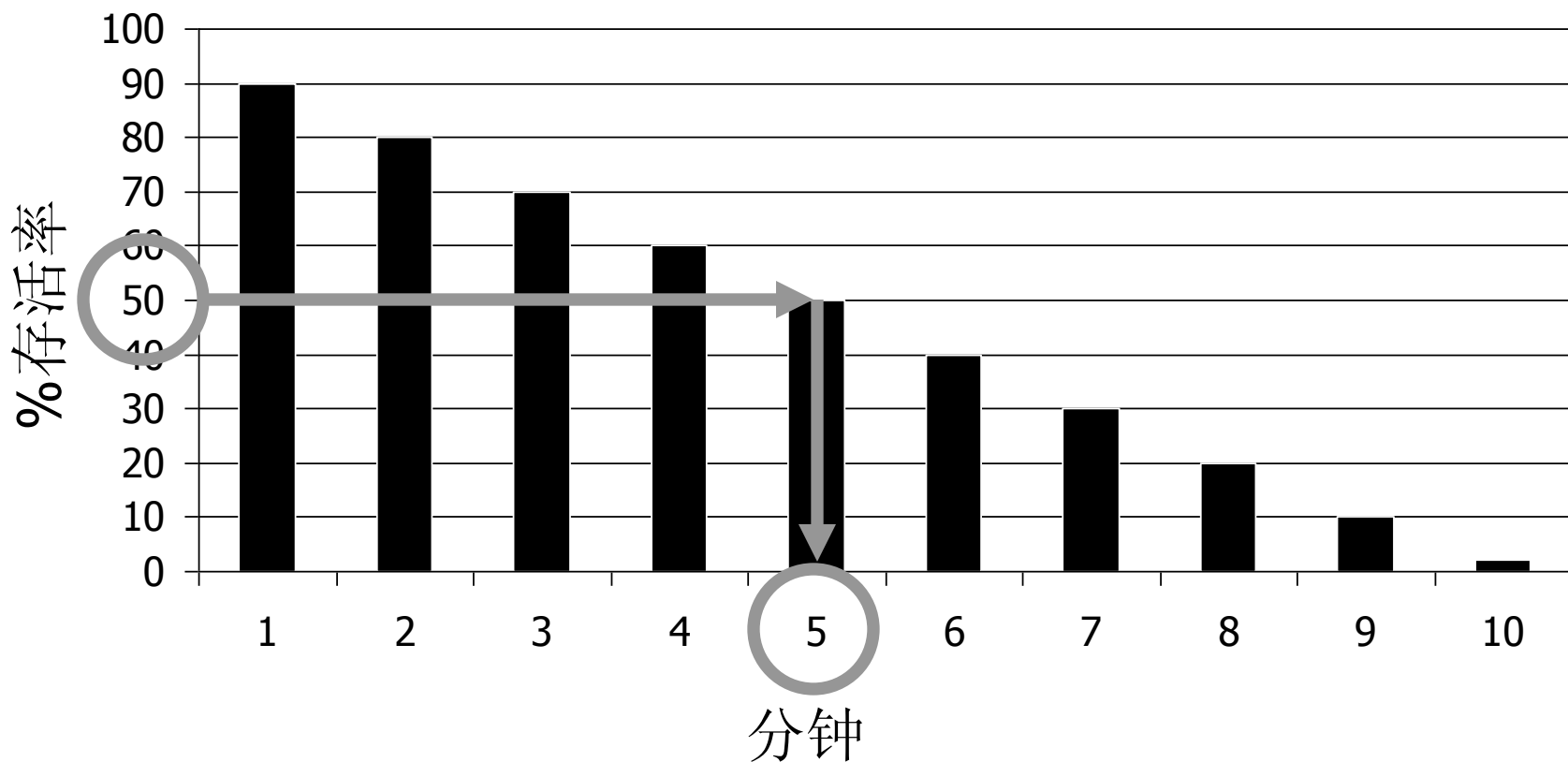
“早期使用者”

“早期大众化”



早期除颤策略

除颤时间和目击室颤心脏骤停存活率的关系



来自EMS迅速应对

Rea et al., Circulation. 2006;114:2760-2765.

King County, Washington (西雅图除外)

- **1位EMS**
- **目击室颤心脏骤停: 46 %存活率to DX**
- **目击者CPR: 72.4 %**
- **医疗急救人员平均应对事件: 5.7分钟. (SD 2.7)**

第一目击者的迅速应对

White, et al., Resuscitation 65 (2005) 279–283.

Rochester, Minnesota

- 警察和消防队**AED**训练/配置
- 目击室颤心脏骤停: **46 %**存活率**to DX**
- 目击者**CPR: 48.2 %**
- 平均“电话求救电击” : **5.6 ± 1.5 min.**

AED进入公共场所

Caffrey, et al., NEJM 2002;347:1242-7.

芝加哥机场。伊利诺伊州芝加哥市

- 目击者
- 目击室颤心脏骤停: 1岁患者中, **62.5 %**存活率.
- 目击者**CPR: 94.4 %**
- 平均“电话求救电击” : **<5分钟.在50 %**的成功存活案例中



非医务人员AED课程

Valenzuela, et al. NEJM 2000;343:1206-9.

赌场。内华达州拉斯韦加斯

- 保安人员**CPR/AED**培训
- 目击室颤心脏骤停: **59 %**存活率**to DX**
- 目击者**CPR: 49 %**
- “倒下-电击” 时间: **4.4 ± 2.9**分钟

非医务人员AED课程

PAD Trial Investigators. N Engl J Med 2004;351:637-46.

24个北美区域，993个小区的参与者参与了

- **>19,000 CPR/AED-接受培训的志愿者**
- **所有心脏骤停: 23.4 %存活率to DX**
- **目击者CPR: 64.8 %**
- **“呼叫-至第一次电击”时间: 6.0±4.7分钟**

高危人群中AED

Bardy et al. NEJM 2008;358:1793-804.

AED设置在2495户高危人群中（有过Anterior-wall Q-wave或没有过Q-wave MI）

- 家庭对**CPR**和**AED**使用操作熟悉
- 室颤心脏骤停: **28.6 %**存活率to **DX**
- 目击者**CPR**频率:无报告
- “致电求救”时间:无报告

5个策略总结

EMS迅速应对

“第一目击者”迅速应对

AED进入公共场所

设立非医务人员的AED课程

高危人群家里设置AED



谢谢!

STEPHEN D. PRUDHOMME, MS

美国心脏协会/美国中风协会全球策略部副总裁

