Tuberculosis of Meninges and Central Nervous System

The trend of deaths during the 1924-38 period is indicated by the figures below:

Period	First Half of Year		Second Half of Year	
	Average Deaths Occurring	Fall from Previous Period (%)	Average Deaths Occurring	Fall from Previous Period (%)
1924-6	1,708		1,282	
1927-9	1,535	-10.1	1,128	-12.0
1930-2	1,420	-7.5	1,074	-4.8
1933-5	1,189	-16.3	860	-19.9
1936-8	1,029	-13.5	746	-13.3

Allowing for the population increase as before, a rate of fall of at least 5% annually was to be expected, leading to the following comparison with the actual deaths registered:

Years	First Half			Second Half		
	Expected	Registered	Excess or Defect	Expected	Registered	Excess or Defect
1936-8*	—	1,062†	—	—	770†	—
1939	959†	969†	+ 10	695†	715	+ 20
1940	911	1,047	+136	660	839	+179
1941	865	1,422	+557	627	944	+317
1942	822	1,169	+347	596	—	—

* Average. † Classified according to method used from 19.0 onwards.

The increase in deaths from this form of tuberculosis began in 1940 and reached its maximum in the first half of 1941 with an excess over expectation of about 550, the excess then falling to about 350 in the first half of 1942. The total excess of deaths probably attributable to war conditions up to June, 1942, was over 1,500.

The sex-age distribution shows that while every group was affected, males aged 20 to 24, children under 10, and young adult females registered the highest relative increases. The improvement in the first half of 1942 was limited to children, males aged 20 to 24, and young adult females, other groups showing further increases.

Tuberculosis of Other Sites

To complete the picture, the trend of deaths in the pre-war period for all other forms of tuberculosis led to an expectation of an annual fall of about 6%, the numbers of deaths being as follows:

Period	First Half of Year			Second Half of Year		
	Average Deaths Occurring	Change from Previous Period (%)		Average Deaths Occurring	Change from Previous Period (%)	
1924-6	2,659			2,304		
1927-9	2,233	-16.0		1,938	-15.9	
1930-2	2,013	-9.9		1,659	-14.4	
1933-5	1,670	-17.0		1,349	-18.7	
1936-8	1,394	-16.5		1,211	-10.2	
	Expected	Registered	Excess	Expected	Registered	Excess
1936-8*	—	1,377†	—	—	1,207†	—
1939	1,216†	1,303†	+ 87	1,067†	1,094†	+ 27
1940	1,143	1,410	+267	1,003	1,188	+185
1941	1,075	1,452	+377	943	1,218	+275
1942	1,010	1,412	+402	886	—	—

* Average. † Classified according to method used from 1940 onwards.

An increase in deaths was again evident early in the war, and the excess over expectation has increased progressively, although the number of deaths fell slightly in the first half of 1942. The total excess from 1940 to June, 1942, probably attributable to war conditions was about 1,500 deaths.

For all forms of tuberculosis the cost of the war up to mid-1942 may thus be estimated as about 11,000 deaths, and the initial waves of respiratory and meningeal tuberculosis deaths seem now to be rapidly declining. But the improvement which was to be expected from the normal downward trend of the pre-war period has yet to be overtaken, and a secondary, perhaps more lasting, wave may yet appear as a delayed result of the increased incidence in active disease of the respiratory form which is believed to have occurred in 1940-1.

ARTIFICIAL RESPIRATION AT SEA

BY

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In England we are apt to think that nobody questions the supremacy of the method of artificial respiration introduced by Sir Edward Sharpey-Schafer in 1904. Yet Silvester's method is preferred in Eastern Europe and in Nordic countries, and even in an official British publication (see Refs.) Cordier writes: "All experimenters agree that Silvester's method introduces in the respiratory tract of the apparently dead subject the biggest volume of air." The figures of lung ventilation by these two methods (Table I) are, to say the least, inconclusive, and the almost ideological frenzy in the attacks of the opposing advocates leaves the impression that it is the nationality of the promoter which determines the choice of method.

TABLE I.—Lung Ventilation in c.cm.

Method	Schafer (1908) Burton-Opitz (1922)	Cordier	Killick and Eve (1933)	Liljestrang et al. (1913)	Bruns (1927, 1930)
Silvester's	175	200-250	203	190	200-280
Schafer's	500	100-150	350-550	under 30	under 30

But the subject is not academic: it is urgently practical. Many otherwise uninjured men are rescued after only a short immersion and yet do not survive. This is undoubtedly because the normal methods of artificial respiration are not very efficient, need many skilled men, and are so tiring that they are not carried out thoroughly or for long enough. It was a relief to read of Eve's rocking method, which can be practised by unskilled men, efficiently and with little fatigue. Unfortunately, the impression has been created that this method requires special apparatus and is not suitable for emergencies outside hospitals. It does not seem to have become widely known. Killick and Eve (1933) have given detailed figures which show the rocking stretcher's superiority over other methods, and it is eminently practicable at sea. It is the object of this article to emphasize the simplicity of the method and to urge its adoption in ships.

Principle of Artificial Respiration by Rocking

In 1932 Eve wrote: "Formerly I regarded the breathing thorax as a concertina bellows; my present work suggests that it resembles rather a cylinder and piston. In older men the cylinder wall is often rigid and is scarcely used in respiration at rest. Hence in artificial respiration it seems much better to exploit the piston action of the diaphragm rather than to try to compress the rigid walls of the cylinder—leaving the piston flapping passively up and down and thus frustrating much of one's efforts to squeeze air in and out of the trachea." Essentially the method consists in laying the patient on a stretcher, which is pivoted about the middle on a trestle, and rocking up and down rhythmically so that the abdominal viscera push the flaccid diaphragm alternately up and down.

Apparatus

Simple apparatus is required. Although Keevil (1934) extemporized successfully, there is little time for invention when a drowning man is on deck. (Scott (1941) quotes Canadian statistics which show that if artificial respiration is given to men within a minute of electrocution 90% recover; if after 6 minutes, only 10% recover. In other words, drowning is as urgent a condition as a spurting artery.) The essential apparatus consists of (1) a plane to which the patient can be fastened; (2) a fulcrum; (3) a stop to prevent the plane sliding to and fro on the fulcrum.

1. A ladder or a door might be used, but for present purposes we can assume that a stretcher is available. The man may be held

on by an assistant; or a rope, suitably padded, may be secured to pass above and below the buttocks to prevent his slipping. We find it simpler to bandage the wrists and ankles to the handles of the stretcher. This is not only firmer but much more comfortable. The upward pull on the extended arms gives an additional Silvester effect to inspiration, and bandaging does not interfere with the "Schafer," which must continue up to the very moment of rocking.

2. A simple and practical fulcrum is the loop of a rope which is secured overhead at two points a few feet apart. Failing an overhead support with space below it, a metal bar may be fixed above a convenient space by means of two ropes, just as an acrobat's horizontal bar is fixed above a stage. The bar must be fairly strong; a broom-handle is not stout enough. However, it is more convenient to use a trestle, for which 32 to 34 in. is an ideal height: when the stretcher handles touch the deck a tilt of 45 to 50 degrees will be given. The trestle's crosspiece should be of round section at both ends. Folding trestles are always valuable, and it is well worth having four or six made. In pairs they are useful in bringing stretchers to a suitable height for surgery and major dressings. They can also be employed to maintain a man in the Fowler or Trendelenburg position.

3. A rocking stretcher will slip to and fro on a rope or trestle. In an emergency, and even during rocking, this can be prevented by hammering two nails or staples into the underside of each sidebar on both sides of the rope or crossbar. W-shaped pivots of wood or metal are better, and are easily made: they should be permanently attached below the centre points of the sidebars of several stretchers. The patient's abdomen, which sags below the level of the sidebars, is then prevented from resting on the rope or crosspiece of the trestle. These pivots must be shorter than the feet of the stretcher, or the stretcher will be unstable on the deck.

Method of Resuscitation

Immediately the man is rescued from the sea, Schafer must be started on deck. A stretcher is brought and he is rushed below. His wrists and ankles are tightly bandaged to the stretcher handles, Schafer being continued on it right up to the moment when it is hoisted quickly on to the trestle or rope. Any available man starts to rock the stretcher at the rate of a cycle every 4 or 5 seconds—that is, 12 to 15 double rocks a minute. It helps some people if they hum a tango or a slow tune, moving the stretcher at the beginning of each bar. The pumping movement should start abruptly, almost roughly, so that the abdominal contents begin to move early in the stroke. At first the handles of the stretcher should be allowed to rest on the deck at the end of the head-down stroke, the steep angle of 50 degrees giving very efficient chest drainage. Later it is easier to check the handles at about a foot from the deck. This gives a slope of 30 degrees, which is effective and is less work for the operator. If the Novox apparatus is available it should be placed on a table close to the pivot.

When rocking is in progress and the Novox is working, there is time to remove the man's clothes and to rub him down gently. He is covered with warm blankets, if possible an electric blanket. Hot-water bottles are placed around him, and some form of heating apparatus such as a hotplate may be introduced below the stretcher. The outer blanket may be allowed to hang down on each side of the stretcher to keep the warm air below.

Advantages of Eve's Rocking Stretcher

1. *It is Efficient.*—If doctors and first-aid men could make a personal trial of Schafer's, Silvester's, and Eve's rocking methods there would be few who would willingly use either of the older methods for longer than the time taken to fetch a stretcher and trestle. In view of the conflicting figures of earlier writers, the opinion of many volunteers may be of value. All agree that whereas the Schafer method produces a quick expiratory gasp, rocking gives a prolonged expiration of much greater volume. During Schafer it is difficult to auscultate any sound of inspiration, nor can the conscious patient feel it: during rocking it is easily heard and felt. This is so when the methods are practised on conscious men of normal tone: the difference will be greater in unconscious men. Henderson and Haggard (Cordier, loc. cit.) showed that chest elasticity is considerably diminished within 10 minutes of cessation of respiration; and everybody who has used Schafer's method on drowned men will agree that after the first few compressions far less air is expelled than when one

is practising on healthy men, elasticity being noticeable by its absence. Schafer demands chest elasticity; rocking does not.

2. *It is Much Simpler and Less Tiring.*—Any bystander can carry on efficiently after watching only a few moments to pick up the rhythm. Consequently it can be kept up for many hours or even days without skilled assistance. Since recovery has taken place after 8 hours of unconsciousness, work must be continued for that time or until rigor mortis sets in. With several casualties, and using the older methods, this may be impossible, for it involves the whole-time employment of many skilled men and their reliefs. Absolutely any "gash hand" can rock a stretcher rhythmically.

3. The patient can be stripped and warmed while rocking is going on. Wounds and burns of the trunk may be cleaned.

4. The stomach and respiratory tract are drained not only by gravity but by the pressure of the abdominal viscera.

5. In patients with wounds of the front of the body which need early treatment the method can be employed with the wounded man lying on his back. In this position the tongue must be held forward.

6. The method can be used for patients suffering from electrocution and gas poisoning, and it is a valuable alternative to the "iron lung" in cases of respiratory paralysis. The tilted stretcher is also useful for gravity drainage of the body cavities. It can be employed for counterextension (Eve, 1939; Blackburne, 1939).

7. It is harmless, and the ribs or liver cannot be injured. At rocking rates over 15 a minute there may actually be hyperventilation; but with the Novox apparatus in position there is no risk of washing out the CO₂. The complete lack of any feeling of sea-sickness during rocking may be explained by Boothby's observation that 75% of sea-sickness can be cured by oxygen inhalation.

Medical officers and first-aid personnel are urged to submit themselves to the rocking. It looks very unpleasant, but they will be amazed to find that there is no uncomfortable strain on the arms or legs—in fact, there is a tendency to go to sleep. For the first time, they will not even have to bother to breathe!

Summary

Eve's rocking method of artificial respiration is described. The patient is placed on a stretcher and rocked through a total angle of 60 to 90 degrees 12 to 15 times a minute. The method is especially suitable for ships, as it is efficient, simple, un-fatiguing, and needs no skill. Simple apparatus is desirable and useful, but is not necessary.

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J. J. Miller and T. M. Saito (*J. Pediat.*, 1942, 21, 31) record their observations on 100 children who underwent concurrent immunization with combined alum-precipitated diphtheria and tetanus toxoids and *H. pertussis* vaccine. The results were satisfactory as determined by Schick tests, tetanus antitoxin titrations, *H. pertussis* agglutination tests, and exposure to whooping-cough. Concurrent injections of fluid diphtheria and tetanus toxoids together with *H. pertussis* vaccine yielded relatively poor responses in tetanus antitoxin but satisfactory immune responses with respect to diphtheria and whooping-cough. In tetanus immunization a three-months interval between the first and second injections of combined alum-precipitated toxoids is recommended; and a third injection of alum-precipitated tetanus toxoid without diphtheria toxoid three or four months afterwards.