

WORLD HEALTH  
ORGANIZATIONEXECUTIVE BOARD

Fifth Session

ORGANISATION MONDIALE  
DE LA SANTÉEB5/69 ✓  
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ORIGINAL: ENGLISH

USE OF RESPIRATORS IN THE TREATMENT OF POLIOMYELITIS AND PROPOSED  
ORGANIZATION OF A SYSTEM OF INTERNATIONAL LOAN OF THESE APPARATUS

Circular Letter 25-1949 on this subject was prepared following the initiative of the Belgian Health Authorities and sent in May 1949 to the Public Health Administrations of all European countries. Up to the end of December 1949 replies had been received from the following countries: Belgium, Bulgaria, Germany (British Zone), Iceland, Ireland, Luxemburg, Netherlands, Norway, Portugal, Sweden and Switzerland.

An analysis of the replies received follows:

1.A. Indications for the use of respirators

- Q. Please state, in accordance with the experience of clinicians in your country: (i) Indications for the use of respirators in the treatment of poliomyelitis, including limitations of such use.
- A. The respirator should be used in all cases of actual or imminent respiratory muscle paralysis of poliomyelitis or other origin. Prognosis is always doubtful in cases of bulbar involvement, because of the patient's limited ability to adapt himself to the respirator's rhythm (Switzerland, Ireland). Belgium holds that respirator treatment is only indicated in case of bulbar involvement, but their answer is unclear as to whether or not cases with peripheral respiratory muscle paralysis showing asphyxia are to be treated.
- Q. (ii) Experience acquired with apparatus of various types and makes - their advantages and disadvantages.
- A. Belgium - Mostly Emerson type respirators have been used. Advantages: Reliable and general satisfactory service. Disadvantages: (1) high cost, (2) very heavy weight, (3) physiotherapy is rendered very difficult while the patient is still in the respirator.
- Germany (Brit. Zone) - Both cabinet respirator. Advantages: Reliable and easily transportable. Disadvantages: No head support.

Bio-motor: " .... has always proved adequate".

Pulmotor: "satisfactory for emergency use only".

The two last mentioned have the advantage of being both easily transportable and can, in the case of failing power supply, be operated by hand.

Ireland - "Bragg-Paul" pulsator preferred. Has recently been improved, works noiselessly, is easily transportable and simple to operate.

Norway - Bo-Sahlin most widely used. Advantage: Facilitates nursing. Disadvantage: patients seem to be less comfortable than in Emerson or Drinker type respirator.

Portugal - Drinker-Collins preferred.

Sweden - Stille-Sahlin type almost exclusively used (Swedish make). Advantages: covers only part of the patient's body and therefore renders nursing more easy. Is easy to transport and to work.

Switzerland - Emerson model OC. Advantages: very solid, functions for two years uninterruptedly without breakdown. Disadvantages: (1) should have four instead of three doors on each side to make shoulders and feet more easily accessible; (2) a mobile installation to avoid formation of pes equinus, (3) improved aeration of mattress is desirable as patients usually sweat profusely; (4) the respirator's rhythm should be adjusted; (5) on the contrivances for shutting doors the use of bolts instead of rivets would facilitate replacements; (6) the head cover should be oblique to give the patient a larger field of visibility. Drinker-Collins most widely used, works satisfactorily.

Q. (iii) Types of apparatus preferred and suggestions for the improvement or standardization of these apparatus.

A. Only the last point has not been covered by replies to the question above (1.A. ii).

Sweden urges standardization particularly in respect to the kind of electricity required.

1.B. Organization of the use of Respirators in your country

Q. (a) (i) Is such use centralized on a national or regional basis?

A. Belgium - regional (Government), central (Ligue Nationale Belge contre la Poliomyélite).

Bulgaria - so far none available.

Germany (Brit. Zone) - No central organization exists.

Iceland - No central organization.

Ireland - " " "

Luxemburg - So far no respirators available.

Netherlands, Norway and Portugal - No central organization.

Sweden - Partly regional and partly central (patients can be either directed to hospitals with free respirators, or a reserve of respirators sent to hospitals in need of them).

Switzerland - Regional; central additional supplies in emergencies only. (Swiss Red Cross have two respirators for loan).

Q. (ii) Are the respirators grouped in neurological centres or distributed among the various hospitals?

A. Belgium - At the four University centres and at the treatment centre in Brussels of the "Ligue Nationale Belge contre la Poliomyelite".

Iceland, Ireland, Netherlands, Norway, Sweden and Switzerland -  
In general hospitals and communicable diseases clinics.

In Portugal, three respirators are in neurological centres, one in a general hospital and one in a communicable diseases hospital.

Q. (iii) Does there exist any reserve either national or regional of these apparatus, which could be loaned to hospitals in need of them during an epidemic or to chronic cases for a long period?

A. In Ireland, there exists no reserve, but regional interchange of respirators is possible.

In Sweden, there are ten respirators for loan only, at the disposal of the public health authorities, and

In Switzerland, two respirators at the disposal of the Swiss Red Cross.

Q. (b) What is the number of respirators in use or available either centrally or locally? (Indicate types if possible).

A. Belgium - 16 (mostly Emerson type respirators).

Germany - (Brit. Zone) - Nine (two unserviceable at the moment); six more expected soon.

Iceland - One (Both Cabinet Respirator).

Ireland - 51 (27 Both Cabinet Respirators, 24, Bragg-Paul Pulsators).

Netherlands - 14 (mostly Philips).

Norway - 17 (Eight Emerson, five Bo-Sahlin and four Drinker type respirators).

Portugal - Five (Two Drinker-Collins, two Both Cabinet Respirators Dunlopillo and the corset respirator type Bragg-Paul).

Sweden - 67 (almost all Stille-Sahlin type respirators).

Switzerland - 23 (two of them for loan, the rest permanently installed); (12 Drinker-Collins, four Emerson, three Jeandupeux, two Mullikin and two of unknown type).

- Q. (c) Do organized arrangements exist for transporting respirators to patients or patients to treatment centres? (Motor or air-transport).
- A. In all the countries mentioned above provision is made only for the transport of patients to hospitals where respirators are installed; in some of them air-transport is included.
- Q. (d) (i) Does your country possess specially trained staff (technicians and nurses) for working the respirators and caring for the patients in them?
- A. Bulgaria, Iceland and Luxemburg do not claim to have trained staff. The eight other countries have locally trained nurses, while the technical maintenance of the respirators is generally done by the producer. In Switzerland the latter seem to instruct nurses also in their relevant duties.
- Q. (ii) Are there special courses for the training of such staff?
- A. No country has so far held special training courses.
- Q. (e) Have any plans been made for the improvement of the existing organization? (Indicate if they include centralization of treatment, training of specialized staff, etc.)
- A. Belgium - Two opposing views exist. The "Ligue Nationale Belge contre la Poliomyélite" tends to favour centralized treatment, while the Public Health Authorities want to decentralize it and are in favour of an international respirator reserve.

Norway - Is making arrangements for proper distribution of cases during emergencies by the Health Directorate.

Sweden - Plans to increase the number of respirators and trained personnel.

Q. (f) Any other remarks or suggestions regarding the use of respirators?

A. Iceland made an important request which reads: " .... and we feel that the step to be taken should be to collect comprehensive and reliable statistics on the results hitherto obtained; to show, not only to what extent the use of respirators may be directly life-saving, but also how great the chances of partial or complete recovery are, and how many will be completely handicapped for the rest of their lives". The attached abstract (Annex 1) from a Swedish paper gives in part the answer to this.

2. International loan of respirators from country to country or from a central stock of these apparatus

Q. (a) Do you consider that, in a country affected by an unusually severe epidemic of poliomyelitis, respirators received on loan from abroad could be put to effective use?

A. Belgium - Decidedly affirmative - as has been shown in practice already.

Bulgaria - Yes - provided they are shipped by air.

Germany - Yes - provided respirators are carefully transported.

Iceland - Possibly.

Ireland - Yes.

Luxemburg - Yes.

Netherlands - Yes - For reservations see under (b).

Norway - doubtful - perhaps in a real emergency (transportation difficulties and satisfactory present arrangements + bilateral agreement with Sweden).

Portugal - Yes - because in cases of emergency the national stocks have proved insufficient.

Sweden - doubtful - because of difficulties of making a foreign technical and nursing team work efficiently in a strange country.

Switzerland - Yes - considered useful.

Q. (b) Do you consider that the utility of such apparatus is dependent on the simultaneous loan of technicians and nurses?

A.	<u>Nurses</u>		<u>Technicians</u>	
	<u>Yes</u>	<u>No</u>	<u>Yes</u>	<u>No</u>
	Bulgaria	Belgium	Bulgaria	Belgium
	Luxemburg	Germany	Germany	Iceland
	Norway	Iceland	Luxemburg	Portugal
	Switzerland	Portugal	Norway	
			Switzerland	

Ireland and the Netherlands: Essential only if not available locally.

Q. (c) Do you consider, in principle, that it would be desirable for WHO to organize a system of country to country loan of respirators, during an epidemic, with or without personnel, or for such a system to be arranged by bilateral agreements?

A. Belgium - Neither.

Bulgaria - Bilateral.

Germany - Neither.

Ireland - Bilateral (through WHO).

Iceland - "Probably" (?)

Luxemburg - Neither

Netherlands - Bilateral.

Norway - Bilateral, as already in existence between Norway and Sweden.

Portugal - Bilateral, without personnel.

Sweden - (no opinion).

Switzerland - Neither.

Q. (d) Do you consider the constitution at a central point in Europe, by an international authority, of a stock of respirators to be placed at the disposal of countries in time of epidemic, a practical proposition?

A. Belgium - Yes, without personnel under WHO responsibility.

Bulgaria - No, considered impracticable, as the quickness of delivery of respirators plus personnel does not seem to be assured.

Germany (Brit. Zone) - No; a national stock centre with trained personnel would be the solution.

Iceland - Probably.

Ireland - No, not necessary.

Luxemburg - Yes, with personnel.

Netherlands - No.

Norway - Impractical - No.

Portugal - Yes, because in cases of emergency the national or regional stocks have been shown to be insufficient.

Sweden - (No opinion expressed).

Switzerland - Yes, by WHO.

Q. (e) Which of the two alternatives (c) or (d) would you prefer?

A.	(c)	(d)	(c) +(d)	neither (c) or (d)
	Bulgaria	Belgium	Iceland	Germany (Brit. Zone)
	Netherlands	Luxemburg	Portugal	
	Norway	Switzerland		
	Ireland			

3. Possible participation of your country in the organization of a system of loan of respirators

Q. Should a majority of the European countries respond favourably to the above questions and the WHO therefore organize a system of loan of respirators, do you believe that the Health Administration of your country would be willing to take an active part in such a system, either by loaning respirators or by means of a financial contribution towards the constitution and upkeep of an international stock?

A.	<u>Yes</u>	<u>No</u>
	Belgium	Bulgaria
	Iceland (probably)	Germany (Brit. Zone)
	Ireland	Norway
	Luxemburg (proportionally)	
	Netherlands	
	Sweden	
	Switzerland (with reservations)	

In view of the divergent opinions expressed in answer to the preceding questionnaire, the Executive Board may wish to pass the following resolution:

The Executive Board

DECIDES that until evidence is received that the formation of an international stock of respirators is desired by a majority of European Governments, no action with regard to the constitution of such a stock shall be taken.

ANNEX

Swedish Results of Poliomyelitis Treatment

by Rolf Bergman and Sven Huldt

(Abstract)

Between 1934 and 1945, there were 834 cases of respiratory paralysis due to poliomyelitis treated by the Sahlin-Stille respirator. This treatment resulted in:

Life-saving	13%		
		Regaining of full working ability	3%
		Regaining of partial working ability	5%
		Complete incapacitation	5%
Death	87%		

63% of all patients were males. Men and women showed equal chances of survival. The chances of survival decrease definitely with advancing age.

Length of treatment required:

75%	- 1 week or less
8%	- 2 weeks
17%	- over 2 weeks (of these 5% over 3 months)

Five cases needed treatment over one year, and three could still not be released from the respirator after two years.



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## A D D E N D U M

Replies to Circular Letter 25-1949 have now been received from the following four countries: Great Britain, Hungary, Poland and Turkey, which brings the total of countries having replied up to fifteen. The replies with respect to particular questions are analyzed as follows:

1.A. Indications for the use of respirators

- Q. (ii) Experience acquired with apparatus of various types and makes - their advantages and disadvantages.
- A. Great Britain - Cabinet type respirators have been used almost exclusively. The one most commonly used is the Both-Nuffield type. To a lesser degree the Drinker and the Bragg-Paul types are used.

Both-Nuffield Cabinet RespiratorAdvantages

1. The technique is more easily acquired and applied.
2. Leaks are more easily compensated for.
3. One size of apparatus suits adults and children.
4. Probably more effective in producing respiratory exchange.
5. Patient can be fitted more rapidly to the respirator.

Bragg-Paul RespiratorAdvantages

1. Easy of application to the patient.
2. Ordinary bed can be used.
3. Easily transported.
4. Patient is readily accessible for orthopaedic and nursing care.

5. Where pharyngeal paralysis exists with secretion complications it is useful in prevention of lung collapse (atelectasis).

#### Disadvantages

1. It produces forced expiration followed by a somewhat shallow inspiration dependent on elastic recoil of the patient's chest.
2. The patient is uncomfortably conscious of positive pressure induced by the inflatable belt.
3. Demands added attention to maintain adequate air pressure within the chest.
4. Patients who have been treated previously with the Cabinet type do not take kindly to the Bragg-Paul machine.

#### Drinker Respirator

##### Advantages

It has certain refinements which facilitate certain aspects of nursing inside the respirator.

##### Disadvantages

The apparatus is heavy and difficult to transport.

#### Stille-Sahlin Respirator (Swedish make)

##### Advantages

1. Freedom from encompassment in a box, all limbs being outside the machine and no sealing of the neck is required.
2. The range of vision of surroundings is very little curtailed.
3. Greater freedom for nursing, coupled with ability to obtain orthopaedic and physiotherapeutic treatment. It does not appreciably reduce the difficulty of dealing with the excretions.

#### Bio-Motor Respirator

##### Disadvantage

Patients object to the excessive abdominal wall movement and to the pressure of the edges of the bell-shaped dome on the pelvis and the lower parts of the chest.

Apparatus which operate on the suck and blow principle are considered of immense value when patients have to be removed partially or completely from Cabinet type respirators for nursing attention, and their use is contra-indicated when abundant secretion of the respiratory tract is present.

1.B. Organization of the use of Respirators in your country

- Q. (a) (i) Is such use centralized on a national or regional Basis?
- A. Great Britain - No central organization exists ( a Regional organization is planned).
- Q. (ii) Are the respirators grouped in neurological centres or distributed among the various hospitals?
- A. Great Britain - In general hospitals and neurological centres.
- Q. (iii) Does there exist any reserve either national or regional of these apparatus, which could be loaned to hospitals in need of them during an epidemic or to chronic cases for a long period?
- A. Great Britain - No reserve exists, but experience has shown that supplies are sufficient to meet all demands for acute as well as chronic cases. Transfer of respirators is freely done, particularly in London.
- Q. (b) What is the number of respirators in use or available either centrally or locally? (Indicate types if possible).
- A. Great Britain - 638
- Both-Nuffield Cabinet type - 534.
- Drinker (made by Siebe Gorman in the U.K.) - 52.
- Bragg-Paul type respirator - 49.
- Stille (Swedish make) - 1.
- Bio-Motor (originated from Vienna, Austria) - 1.
- Turner Cuirass type respirator - 1.
- Q. (c) Do organized arrangements exist for transporting respirators to patients or patients to treatment centres? (Motor or air-transport).
- A. Great Britain - Yes, in London only, by motor to the hospital in which the patient in need is accommodated.

Q. (d) (i) Does your country possess specially trained staff (technicians and nurses) for working the respirators and caring for the patients in them?

A. Great Britain - Nurses are specially trained, technicians acquire knowledge of apparatus by experience.

Q. (ii) Are there special courses for the training of such staff?

A. Great Britain - No.

Q. (e) Have any plans been made for the improvement of the existing organization? (Indicate if they include centralization of treatment, training of specialized staff, etc.)

A. Great Britain - A Working Party has been investigating the problems associated with Breathing Machines in U.K. during the past nine months and is in process of evolving a plan for the distribution, periodic examination, maintenance, transfer, and registration of all breathing machines in the U.K. This plan will involve a degree of concentration of the machines to secure better care, maintenance and knowledge in the operation of machines.

Q. (f) Any other remarks or suggestions regarding the use of respirators?

A. Great Britain - A reasonable supply of spare parts is essential and a specific list of points in need of inspection should be attached to every machine; Technical personnel to give advice; Book of instruction should be with every machine.

2. International loan of respirators from country to country or from a central stock of these apparatus

Q. (a) Do you consider that, in a country affected by an unusually severe epidemic of poliomyelitis, respirators received on loan from abroad could be put to effective use?

A. Great Britain - No. The variety of types is too great.

Hungary - Doubtful.

Poland - Yes.

Turkey - Yes.

Q. (b) Do you consider that the utility of such apparatus is dependent on the simultaneous loan of technicians and nurses?

A.	<u>Nurses</u>		<u>Technicians</u>	
	<u>Yes</u>	<u>No</u>	<u>Yes</u>	<u>No</u>
	Great Britain		Great Britain	
	Poland		Poland	

Total summary (including previous report EB5/69):

—	—	—	—
6	4	7	3

Hungary - not answered  
Turkey - not answered

Q. (c) Do you consider, in principle, that it would be desirable for WHO to organize a system of country to country loan of respirators, during an epidemic, with or without personnel, or for such a system to be arranged by bilateral agreements?

A. Great Britain - Neither.

Hungary - Neither.

Poland - Neither.

Turkey - Not interested, as poliomyelitis is a very rare disease in Turkey.

Q. (d) Do you consider the constitution at a central point in Europe, by an international authority, of a stock of respirators to be placed at the disposal of countries in time of epidemic, a practical proposition?

A. Great Britain - No.

Hungary - No.

Poland - Yes. (Poland wants to be able to get 20 respirators on loan from a central equipment stock).

Turkey - Not interested.

Q. (e) Which of the two alternatives (c) or (d) would you prefer?

A.	(c)	(d)	(c) + (d)	neither (c) nor (d)
		Poland		Great Britain ("c) would be the lesser of two evils".)
				Hungary (the establishment of national centres seems to be desirable.)
				Turkey

Total summary (including previous report EB5/69):

—	—	—	—
4	4	2	4

3. Q. Should a majority of the European countries respond favourably to the above questions and the WHO therefore organize a system of loan of respirators, do you believe that the Health Administration of your country would be willing to take an active part in such a system, either by loaning respirators or by means of a financial contribution towards the constitution and upkeep of an international stock?

A.

Yes

No

Poland

Great Britain  
Hungary  
Turkey

Total summary (including previous report (EB5/69):

—	—
8	6

These additional data do not alter the conclusions arrived at in the previous report EB5/69.