

## *Medical supplies management in the cholera epidemic in Somalia 1985*

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**In March/April 1985 a cholera epidemic of explosive speed affected a population of 45,000 newly arrived refugees in the town of Hargeysa in the North-West region of Somalia. Seven hundred and sixty one people were killed by the disease within ten days. Great efforts were made on regional, national and international levels in order to reduce mortality and to control the spread of the disease, and large amounts of relief supplies were immediately flown into the country from various aid organizations and governments. This paper describes the supplies management during the operation, with an emphasis on the mobilization of supplies from abroad and from the capital into the emergency area. Recommendations are offered for the organization of medical supplies during cholera outbreaks. The author worked during the epidemic as co-ordinating secretary for relief supplies in Mogadishu.**

**Key words: Logistics; Somalia; Epidemics; Cholera; Medical Supplies Management; International Relief System.**

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### INTRODUCTION

Since the second half of 1984, an increasing number of refugees from Ethiopia arrived in the North-West province of Somalia. The 30,000 refugees who arrived prior to September 1984 were transferred into a temporary holding camp at Bixindule at that time. However, by the end of March 1985, again 45,000 refugees had gathered at a site called Gannet, within the town of Hargeysa, awaiting transfer to a new holding camp (see Fig. 1). Gannet was not set up as a camp and lacked all basic infrastructure like water supply, sanitation or health facilities. The Refugee Health Unit and the Primary Health Care Programme of the Somali Ministry of Health, as well as the Save the Children Fund (U.K.), UNICEF and the World Muslim League started to provide some basic health services in

February, but there was an urgent need to transfer the refugees to a more suitable place. All the medical teams stressed the risk of a severe diarrhoea outbreak at Gannet as soon as the imminent seasonal rains started.

There had, however, not been any record of cholera in the area for more than ten years, and the massive outbreak of cholera starting on 26th March was unexpected. The official report of the Cholera Control Committee (1985) clearly shows that the disease was brought by refugees from Ethiopia.

The first cases of profuse diarrhoea and vomiting had been detected in Gannet on 22nd March, but were not diagnosed as cholera. On 26th March, all refugees were officially registered at Gannet, and unfortunately the seasonal rainfalls started on that same day. The fact that the refugees stood, during the registration procedure, for several hours in the rain and mud without latrines or a supply of safe drinking water is probably responsible for the explosive speed of the outbreak, totalling over a thousand cases in the first three days (see Fig. 2). The organization of control measures began immediately, and the Ministry of Health in Mogadishu was notified about the outbreak on 28th March. An isolation tent area was erected, and on 30th March the pathogen was identified as *Vibrio cholerae* Ogawa serotype, susceptible to both tetracycline and cotrimoxazole. The Somali government officially announced the cholera epidemic on 31st March. Mass prophylaxis of the entire camp population was carried out from 1st to 5th April, combined with an active search for cholera cases. The number of cholera cases and deaths sharply dropped after 2nd April, indicating that the epidemic was coming under control, at least in Gannet. New cases, however, were detected in increasing numbers in Hargeysa town (population approximately 300,000) and in other refugee camps in the North-West region (refugee population approximately 280,000). Vigorous and efficient control measures prevented a rapid spread and high mortality in these populations, and a proliferation of the disastrous situation at Gannet was avoided. Cholera remained endemic in the area, however, requiring continuous surveillance and control measures.

### ORGANIZATIONAL STRUCTURE OF THE CHOLERA RELIEF OPERATION

The management of the cholera epidemic in Somalia was greatly facilitated by the existence of efficient health care systems in the affected area, namely the Refugee Health Unit (RHU) in the refugee camps and the Primary Health Care Programme (PHC) within the non-refugee population. Both were well organized departments of the Somali Ministry of Health and were able to reach their respective communities through community health workers or community leaders. Both had also well-established drug supply systems in operation. The Refugee Health Unit had excellent logistic support through ELU/CARE, the Emergency Logistics Unit of the National Refugee Commission; ELU/CARE's successful operation in Somalia

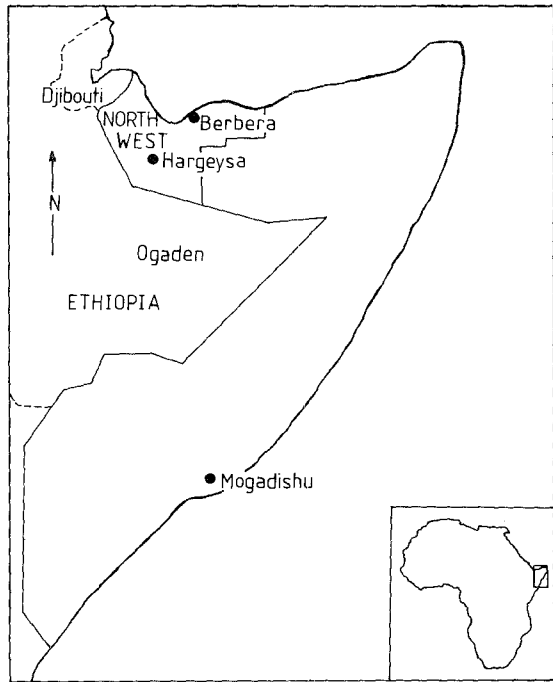


Fig. 1. Map of Somalia.

has been described elsewhere (Kemball-Cook and Stephenson, 1984). The Primary Health Care Programme in the North-West region was supported by a strong UNICEF regional office in Hargeysa. In Hargeysa, cholera control measures were directed by a Cholera Control Committee, consisting of Ministry of Health officials and expatriate advisers, which met every morning to discuss day-to-day work and also produced daily information bulletins. Medical supplies management in Hargeysa was centralized on 3rd April by the establishment of the Hargeysa Central Cholera Stores, headed by an experienced UNICEF/PHC pharmacist adviser and supported by national pharmacists sent from Mogadishu. Warehouses and transport for the medical supplies were provided by ELU/CARE.

Also in the capital Mogadishu, a Cholera Control Office of the Ministry of Health, as well as regular meetings with all involved agencies, were established. There remained, however, some uncertainty as to which of the top officials of the Ministry of Health was actually directing the cholera control efforts. The pharmacist adviser of the Refugee Health Unit and the director of the Department of Medical Supplies of the Ministry of Health were appointed co-ordinating secretaries for cholera relief supplies in Mogadishu. They co-ordinated the appeal for relief goods and prepared the first emergency supply orders. Starting from 3rd April, a regular cholera relief supplies report was produced, which listed the pledges for and arrivals of relief

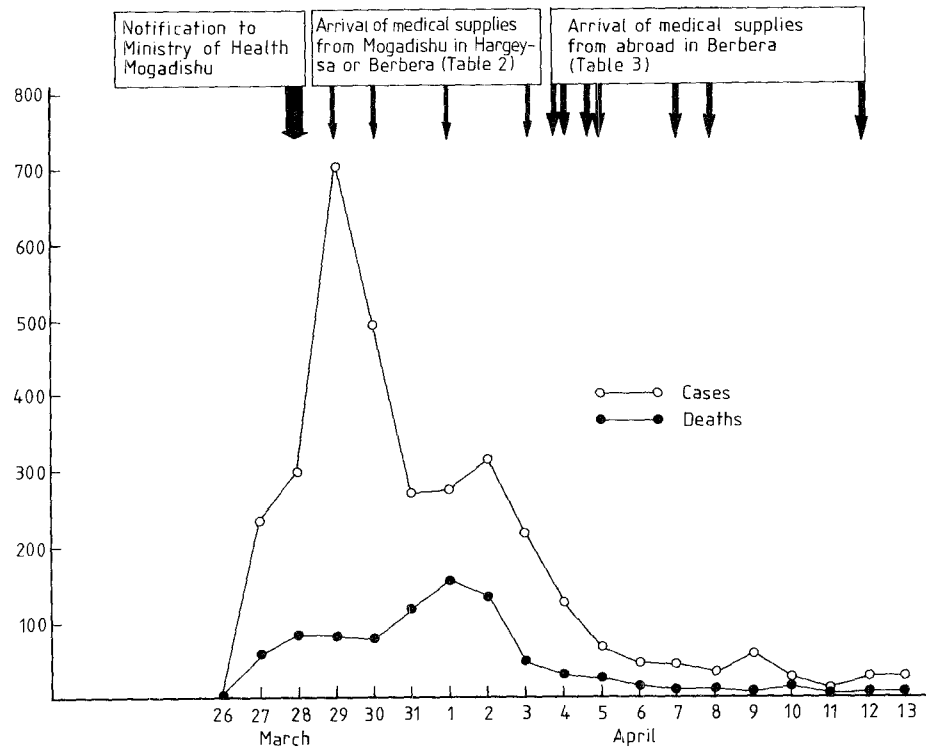


Fig. 2. Cholera cases and deaths in Gannet, and arrivals of medical supplies.

supplies from different organizations with their arrival dates and exact contents. This document proved very important for informing the donor agencies which items were still in urgent need.

On 30th March, the cholera control offices of Hargeysa and Mogadishu started direct radio communications with each other, which greatly facilitated the co-ordination of work. It became apparent, however, that for the numerous technical details of the supply management, an additional direct radio link was necessary between the responsible supply managers in Hargeysa and Mogadishu; this was established on 4th April. In general, co-operation between all government institutions and international and voluntary agencies was good throughout the epidemic.

### MOBILIZATION OF IN-COUNTRY RESOURCES

Table 1 shows the stocks of drugs relevant to cholera treatment which were available in the country at the beginning of the epidemic. The UNICEF-supported Primary Health Care Programme in the North-West region and especially the Refugee Health Unit had considerable amounts of antibiotics and oral rehydration salts (ORS), but hardly any intravenous fluids, which are essential for the treatment of cholera. The World Health Organization, however, had established an emergency stock of 2,500 l. intravenous (i.v.) fluids for possible cholera outbreaks, after a few cases of cholera had been detected at the southern border of Somalia with Kenya in the end of 1984. This stock

became of paramount importance for the initial response to the epidemic.

No other organizations or Ministry of Health departments had significant amounts of relevant drugs, especially since there had been a shortage of i.v. fluids in the country for several months.

In Hargeysa, the available medical supplies (see Table 1) were quickly put into use. Also, the Ministry of Health immediately provided additional personnel, so that the number of medical staff in Gannet rose from five to 113 within six days. On the evening of 28th March, the director of the Refugee Health Unit (RHU) in Mogadishu received a radio message about an outbreak of diarrhoea with cholera-like symptoms and high mortality in Gannet. Within hours, the Minister of Health and the representatives of the World Health Organization (WHO) and the United Nations High Commissioner for Refugees (UNHCR) were contacted, and the Minister of Defense ordered a small military airplane to transport the first medical supplies to Hargeysa the next morning.

Two additional airplanes with medical supplies from WHO and RHU stores were sent into the affected area on 30th March. Table 2 lists the first consignments sent from Mogadishu to the North-West region. In summary, the entire available stock of i.v. fluids in the country was moved into the affected area within four days.

Jet airplanes could not land in Hargeysa, but only in the larger airport of Berbera, where supplies were unloaded onto waiting ELU/CARE or UNICEF trucks and

Table 1. Stocks of drugs relevant to cholera in Somalia at the beginning of the epidemic (26th March 1985)

Drug	Unit	Hargeysa		Mogadishu		Total
		RHU	PHC	RHU	WHO	
Ringer Lactate (or Hartmann) i.v. solution	litre	644	—	595	2,500	3,739
Oral rehydration salt	27.5 g	60,000	72,500	345,000 (+230,000*)	50,000	757,000
Tetracyclin 250 mg	caps	—	†	886,000	50,000	936,000
Co-trimoxazole 480 mg	tbl	94,800	192,000	491,000 (+842,000*)	—	1,619,800
Co-trimoxazole syrup 240 mg/5 ml	100 ml	1,404	5,704	37,446	—	44,554
Cetrimide powder	kg	30	—	132	—	162
Chlorhexidine conc. solution 20%	100 ml	—	1,219	—	—	1,219

\*Supplies in Mogadishu harbour, awaiting clearance.

†Data not available.

PHC = Primary Health Care Programme Stores.

RHU = Refugee Health Unit Stores.

WHO = World Health Organization Stores.

Table 2. Relief supplies and personnel sent from Mogadishu to Hargeysa  
29th March 1985 to 3rd April 1985

Date sent	Date received	Means of transport	i.v. fluids (litres)	Other supplies	Personnel
29th March	29th March	Military airplane	300	40,000 tetracycline caps 32 kg cefrimide powder 800 nasogastric tubes	1 RHU official
30th March	30th March	Somali Airlines	1,770	240,000 tetracycline caps 65 kg cefrimide powder Laboratory equipment	—
30th March	30th March	Somali Airlines	—	—	Five Ministry of Health officials; WHO Microbiologist
30th March	4th April	ELU/CARE truck	—	151,000 oral rehydration salt and water supply equipment	—
1st April	1st April	Somali Airlines	1,000	240,000 tetracycline caps	Vice Minister of Health and thirty-one doctors and nurses
3rd April	3rd April	Somali Airlines	—	100,000 tetracycline caps 400,000 cotrimoxazole caps 4,050 cotrimoxazole syrup 100 ml	—

transported to Hargeysa; they reached Hargeysa within a few hours after arrival of the airplanes.

The provision of safe drinking water was a very important aspect in the management of the epidemic. The Ecumenical Relief and Development Group for Somalia (ERDGS), the Refugee Water Supply Division of the Somali Government and OXFAM (U.K.) constructed the necessary facilities in Gannet within a few days.

#### MOBILIZATION OF INTERNATIONAL AID

The Ministry of Health held the first meetings concerning the epidemic with aid and relief agencies on 29th March, and after the disease was confirmed to be cholera on 30th March, the Somali government officially appealed to the international community for help. First orders for medical supplies were already placed on 29th and 30th March by UNHCR and the League of Red Cross Societies, and many others followed (see Table 3). On 28th March, the representative of the World Health Organization and the RHU pharmacist adviser estimated the daily consumption of i.v. fluids in Gannet to be 300 l. This turned out to be a serious underestimation, since Hargeysa reported by radio on 31st March a consumption of 1,200 l./day — while the

entire stock of the country was 3,700 l. initially! Efforts for quick procurement were again increased after this desperate situation became apparent, and an additional large order was placed by UNICEF with its supply office UNIPAC at Copenhagen. On request of the UNDP representative in Mogadishu, the United Nations Disaster Relief Organization (UNDRO) launched an international appeal for aid on 3rd April.

In the following days, the Cholera Control Office in Mogadishu, with the assistance of WHO and the RHU pharmacist adviser, worked out an official list of requirements for the epidemic. It was based on a WHO recommendation that preparations should be made for an epidemic producing within one month 50,000 patients with clinical symptoms of cholera. This list is shown in Table 4. 50,000 patients was a worst-case scenario, and fortunately only about 10% of this number of cases actually occurred over the following weeks, thanks to efficient control measures.

Relief supplies from abroad started to reach the affected area on 4th April. Table 3 gives an overview of the consignments of medical supplies arriving until 15th April.

Originally, there was a Red Cross airplane with 15,000 l. of i.v. fluids from Addis Ababa scheduled to land in

Table 3. Consignments of cholera relief supplies from international donors, arriving in Somalia until 15th April

Arrival date	Funding agency	Estimated tons	Number of personnel	Place of arrival	Date ordered	Delivery time
3rd April	Red Cross	5	—	Mogadishu	30th March	4 days
4th April	French Government	6	—	Berbera	*	*
4th April	Red Cross	12	5	Berbera	30th March	5 days
5th April	UNICEF	37	—	Berbera	1st April	4 days
5th April	UNHCR	20	—	Berbera	29th March	7 days
5th April	Red Cross	1	—	Mogadishu	*	*
6th April	Red Cross	6	2	Mogadishu	30th March	7 days
7th April	German Emergency Doctors	20	1	Berbera	31st March	7 days
7th April	Italian Government	12	—	Mogadishu	*	*
8th April	Medecins sans Frontieres	20	9	Berbera	3rd April	5 days
9th April	U.S. AID	1	—	Mogadishu	*	*
12th April	OXFAM and Save the Children Fund (U.K.)	36	3	Berbera	*	*
13th April	Islamic African Relief Agency	7	—	Mogadishu	*	*
13th April	Egyptian Government	6	12	Mogadishu	*	*
14th April	West German Government/ERDGS	6	—	Mogadishu	2nd April	12 days

\* Dates not known.

Hargeysa already on 1st April. This flight would have entirely altered the supply situation during the epidemic; it was cancelled, however, for unknown reasons. It appears that the cancellation was not ordered, as originally believed, by the Ethiopian government, but by misinformed officials of the League of Red Cross Societies.

The first cholera relief consignment to arrive in Somalia had been procured by the League of Red Cross Societies in Nairobi/Kenya. It arrived in Mogadishu on a regular passenger flight in the late evening of 3rd April. Immediate transport to Hargeysa seemed unwise at that time, since three large relief airplanes were scheduled to land in Berbera the next morning. From 4th April, medical supplies from the international community reached the North-West region. The first six consignments arriving in Berbera will be briefly analyzed in the following; they are presented in the order of their arrival, under the name of their respective funding agency.

#### 1. 4th April: French Government

This shipment arrived on a French military airplane from Djibouti. It is not known to this author who had prepared the request to the French government. The supplies delivered were 6,000 l. of dextrose intravenous solution, which is inappropriate for cholera treatment. They were therefore, in spite of their timely arrival, not useful.

#### 2. 4th April: League of Red Cross Societies

This charter airplane arrived in Berbera from Oslo via Cologne. The original request had been made by the Mogadishu representative of the League of Red Cross Societies, based on a proposal by the RHU pharmacist adviser. Unfortunately, the Norwegian Red Cross did not follow this list, but sent supplies such as a field surgical unit and many drugs inappropriate for cholera. No packing list accompanied the shipment. Therefore, it did not substantially improve the shortage of medical supplies.

#### 3. 5th April: UNICEF

The original request was prepared by the Ministry of Health, adapted to comply with the UNIPAC emergency stockpile list and telexed by UNICEF Mogadishu to UNIPAC Copenhagen on 1st April. UNIPAC responded within 36 hours, confirming that most items were in stock and suggesting substitutes for unavailable items. A U.S. government airplane had been promised by the American Embassy in Mogadishu to pick up the supplies on 1st or 2nd April. This airplane, however, did not reach Copenhagen until 4th April, and took off with the relief goods the same day. It was denied immediate overflying rights over Ethiopia, changed course into the airspace of North Yemen without permission by the Yemeni authorities, and was forced by the air force of North Yemen to land in Sanaa for inspection. After 24 hours of delay, it reached Berbera on the morning of 5th April. The contents of this shipment

were entirely appropriate and corresponded to the request made by the Ministry of Health, except for a last-minute substitution of ampicillin syrup for tetracyclin syrup; ampicillin is not indicated for cholera. It had clear packing lists and could be unpacked and used with no delay. Together with the UNHCR shipment arriving on the same day, it resolved the desperate supply situation in the Hargeysa cholera epidemic.

#### 4. 5th April: UNHCR

UNHCR was the first agency during the epidemic to telex a request for emergency medical supplies to their headquarters. The goods, arriving on a chartered cargo airplane from Amsterdam in Berbera on 5th April, were appropriate and corresponded to the original request, and together with the UNICEF consignment ended the shortage of medical supplies in the epidemic.

Its usefulness, however, was somewhat diminished by the lack of a packing list, which considerably delayed unpacking and distribution.

#### 5. 7th April: German Emergency Doctors (GED)

The Hargeysa representative of the GED telexed a request to his headquarters from Berbera on 31st March. GED had stockpiles for a cholera emergency and largely followed the request of their representative in Hargeysa. A commercial cargo plane delivered the goods on 7th April. This shipment was highly appreciated by the medical staff in the emergency, for it complemented the previous shipments with a lot of useful equipment such as hospital tents, torches, handwashing bowls etc.

#### 6. 8th April: Medecines Sans Frontieres (MSF) with the Governments of Holland and Belgium

The intervention by MSF, with financial support from Holland and Belgium, was triggered by the appeal by the United Nations Disaster Relief Organization (UNDRO), launched on 3rd April. MSF had already prepared for a medical operation in Somalia, and medical supplies were ready for airlift. These were, however, drugs not especially selected for a cholera emergency, and were only of limited use for the epidemic. A second MSF shipment, arriving some weeks later, brought more specific relief supplies.

More relief consignments continued to arrive in the following days and weeks. Table 3 summarizes the arrivals until 15th April; but also after that date material aid was received from various governments and agencies. Beginning on about 7th April, these supplies were directed to Mogadishu, since the limit of the storage space of Hargeysa was reached, and cases of cholera appeared in the capital and in the refugee camps in the southern part of Somalia.

A substantial part of the requirements listed in Table 4 were met by the international response. Some items, however, remained in short supply, and their procurement turned out to be problematical, since hardly any agency was

willing to allocate further funds for the control of the epidemic once the initial acute emergency phase was over.

As shown in Table 3, some organizations did not only send supplies but also medical personnel. Their help was highly welcome, but probably not decisive for the control of the epidemic. Qualified medical personnel were desperately needed in the first days of the epidemic, but, as Fig. 2 shows, the external aid only arrived after the first outbreak of cholera had largely ceased in Gannet.

## DISCUSSION

The 1985 cholera epidemic in Somalia was, in its initial focus at Gannet, extremely explosive in its speed (see Fig. 2). This epidemic, with its potential of spreading out into the population of Hargeysa and the surrounding villages and refugee camps, presented an extreme challenge to the medical and non-medical organizations involved in its control, and likewise to the managers of medical supplies for this operation.

In spite of all efforts, the case fatality rate of patients admitted to the isolation area in Gannet was approximately 22%, the large majority of the deaths occurring in the first ten days of the epidemic. Even taking into account the poor nutritional status of the refugees, such a high mortality clearly indicates that patients did not receive adequate care. The main reason for this shortcoming was the overwhelming speed of the epidemic: "Within the four days from 26th to 29th [of March], the daily number of cases admitted to the Gannet isolation area went from two to 662. This meant over 1,000 patients suddenly requiring intensive care, obviously an impossible task in primitive conditions and with so few staff" (Cholera Control Committee, 1985). It should be added that, especially since there was initially no medical infrastructure or community organization which could have been used for an active case-finding in Gannet, many patients died in their huts before receiving any medical attention. In Hargeysa town, for instance, where the disease spread slower and the medical infrastructure was better, the case fatality rate was around 5%, and even lower in some of the other refugee camps.

The management of supplies was at least so successful that no major part of the mortality had to be attributed to a lack of medical supplies. The official report of the Cholera Control Committee in Hargeysa (1985) concludes: "Although stocks of infusions and antibiotics ran dangerously low and had to be used conservatively, they never actually ran out, thanks to prompt delivery of emergency supplies from Mogadishu and later from international donors." The main bottleneck in the first days was a lack of experienced personnel to administer i.v. fluids, rather than the lack of these fluids. If, however, all patients had received the necessary amount of infusions, stocks would have clearly been depleted within three or four days.

Table 2 shows that the medical supplies available in the capital were very quickly mobilized and sent into the emergency area. Also, the relief goods arriving from international donors could be transported to Hargeysa and utilized with minimal delay. The success of the logistical

Table 4. Official list of requirements for the cholera epidemic in Somalia

Item	Unit	Quantity
<b>a. i.v. fluids and administration sets</b>		
Lactated Ringer i.v. solution	1,000 ml	120,000
Lactated Ringer half strength i.v. solution with Dextrose 5%	1,000 ml	40,000
Giving sets for i.v. fluids	each	100,000
Scalp vein set 19 G (butterfly needle)	each	50,000
Scalp vein set 21 G (butterfly needle)	each	50,000
Scalp vein set 23 G (butterfly needle)	each	30,000
Intravenous catheter 16 G	each	30,000
<b>b. Drugs</b>		
Oral rehydration salt 27.5 g sachet	each	800,000
Tetracyclin 250 mg caps	caps	4,000,000
Tetracyclin syrup 125 mg/5 ml	60 ml	50,000
Tetracyclin inj. 250 mg/2 ml	vial	10,000
Co-trimoxazole tbl 480 mg	tbl	2,000,000
Co-trimoxazole syrup 240 mg/5 ml	100 ml	15,000
Promethazine inj. 50 mg/2 ml*	vial	20,000
<b>c. Disinfectants</b>		
Cetrimide conc. sol. 40%	5 l.	400
<b>d. Dressing materials</b>		
Cotton wool	kg	2,000
Adhesive tape 2.5 cm	5 m roll	2,000
<b>e. Feeding tubes</b>		
Nasal feeding tube 8 FR 380 mm infant	each	4,000
Nasal feeding tube 22 FR 800 mm adult	each	4,000
<b>f. Equipment for isolation camps</b>		
Tents for hospital use (80 m <sup>2</sup> )	each	40
Folding cut adult size	each	1,000
Plastic sheeting vinyl 910 mm	meter	8,000
Bucket 10 l. graduated	each	2,000
i.v. stand, double hook	each	500
Blankets	each	20,000
<b>g. Equipment of drinking water provision</b>		
OXFAM Water Storage Package (incl. 3 tanks 30 m <sup>3</sup> each)	package	4
OXFAM Water Distribution Package (incl. 1 ring pipe with 40 taps and a pump)	package	4
OXFAM Water Pumping Package (incl. 1 pump for pumping shallow wells)	package	4
Water containers 5 litres with lid and handle	each	20,000
Calcium hypochlorite (HTH) dry powder	kg	2,500
<b>h. Sanitation tools for latrine digging</b>		
Shovels	each	1,000
Pick-axes	each	1,000
Wheel barrows	each	400
<b>i. Soap for personal hygiene</b>		
Soap	300 g bar	500,000
<b>j. Communication facilities</b>		
Radio transmitters	each	5
<b>k. Vaccines*</b>		
Cholera vaccine	doses	10,000

This list was prepared by the Somali Ministry of Health. It was calculated for an epidemic producing 50,000 patients with clinical symptoms of cholera.

\*This should be omitted; see Recommendations for comments.

operation was mainly due to the existence of efficient logistical and drug supply systems in Somalia, namely the ELU/CARE organization and the drug stores of the Primary Health Care Programme and the Refugee Health Unit. The emergency stock of i.v. fluids, which had been established by the World Health Organization in Mogadishu, was of paramount importance for the first days of the epidemic.

Table 3 documents that the international response to the epidemic was quick and massive. However, as can be seen from Fig. 2, it still came too late to meet the peak of the disaster. Unfortunately, the first two shipments from international donors arriving in the emergency area proved to consist mainly of inappropriate medical supplies; most of the following, however, consisted of useful items.

For the co-ordination of the appeal and the supplies management, pharmacist advisers with several years experience in Somalia were made responsible, both in Hargeysa and Mogadishu. Their experience and local knowledge facilitated a smooth logistical operation.

All Ministry of Health personnel worked with extraordinary effort and devotion during the epidemic, and the Somali government gave every support to the necessary operations, including the supplies management. In a time when western media mainly report about difficulties and failures in relief operations in developing countries, it will be emphasized here that the international relief goods for the Somali cholera epidemic reached the emergency area complete and with no delay, and that the Somali government was devoted and co-operative throughout the operation.

However, in retrospect several mistakes in the supplies management became apparent, which contributed to the shortage of drugs in the first days:

1. The reserve stocks of i.v. fluids in the country were too small and should have been augmented after the first suspicions about cholera in Kenya and Ethiopia.
2. The disease was diagnosed too late. Provisions should have been made for an earlier laboratory diagnosis of cholera throughout the country.
3. The daily consumption of i.v. fluids was at first (28th March) seriously underestimated, and this estimation was only corrected three days later.
4. In retrospect, it can be seen that the quickest way to bring i.v. fluids to Hargeysa would have been procurement in Nairobi/Kenya and direct airlift to Hargeysa by a commercial charter flight. Also, the supplies from UNIPAC may have arrived three days earlier if ordered immediately.

The most serious fault, however, for which both international organizations and the Somali government have to take responsibility, was that a situation was allowed to develop at Gannet where 45,000 refugees were crowded into an unsuitable area with no water supply, no latrines and insufficient health care facilities and food rations. The introduction of cholera into Somalia would not have caused

any substantial death toll if the disease had not found this ideal breeding site at Gannet.

## RECOMMENDATIONS

General recommendations for the medical supplies management in disasters have been published (PAHO/WHO, 1983). From the experience of the described cholera epidemic, some lessons can be learned for the logistics in future cholera outbreaks:

1. The best medical preparedness for a cholera epidemic is a solid health infrastructure, especially a community-based Primary Health Care Programme with due priority on diarrhoeal disease control.  
Likewise, the best logistical preparation for a medical emergency is the establishment of an essential drug supply system with experienced personnel, efficiently administered drug stores and emergency stocks for the initial management of an epidemic.
2. Early diagnosis of cholera is most crucial for an immediate response. Once there is a risk of the disease being introduced, possibilities for a quick laboratory diagnosis of cholera must be established. The appropriate method is the distribution of e.g. Cary-Blair transport media to all peripheral health facilities, together with some training in the simple procedures of taking stool swabs. The actual laboratory examination of stool samples can be done in central laboratory facilities.
3. Experienced medical supply officers or pharmacist advisers should manage the logistical work, both in the emergency area and in the capital where the appeal for relief supplies has to be co-ordinated. All requests for supplies must be channelled through these people in order to avoid confusion and duplications.  
To inform all involved organizations, government bodies etc., daily information bulletins should be edited, containing epidemiological data as well as pledges for and arrivals of relief supplies.
4. Table 4 shows the official list of requirements for the cholera epidemic prepared by the Somali Ministry of Health with assistance from international advisers. It gives a good overview of the kind of supplies needed for a cholera emergency as well as their relative amounts.  
The folding cots, plastic sheeting and graduated buckets are intended for the construction of cholera beds, which are important for the management of cholera patients in the acute phase. Cholera vaccines and tetracycline injections, however, have no role in the control of a cholera epidemic and should be omitted from the list.
5. The estimation of the *absolute* amount of medical supplies needed for the management of a cholera epidemic is very difficult, the main problem being the estimation of the number of clinical cases which will develop in a given population. In Gannet, where the conditions were extremely bad with a very crowded population, no sanitary facilities and no safe drinking



water, as much as 7.7% of the population were affected, whereas in the established refugee camps and in the town of Hargeysa, with good water supplies, an efficient health infrastructure and rigorous control measures, the affected percentages were only 0.18 and 0.15%, respectively. Medical experts differ in their opinion whether or not the amount of i.v. fluids needed for the management of cholera patients can be greatly reduced by the consequent and early use of oral rehydration fluids. The official list of requirements for the described cholera epidemic (Table 4) was based on an average of 3 l. per case, following a suggestion of the WHO representative in Somalia. For the complete management of a cholera case with i.v. fluids, however, 7 l. would be more appropriate.

6. The most rapidly available international source of relief goods is probably UNIPACs Emergency Stockpile at Copenhagen (see Table 3). If possible, it should be used as first choice for quick procurement, using UNICEF's country office as contact. Supplies should be airlifted by a commercial cargo airplane, which is usually more quickly available than foreign military planes. Orders must comply with UNIPACs Emergency Stockpile List, given in the UNIPAC catalogue.
7. All relief consignments must be accompanied by clear packing lists, in order to allow quick identification and utilization of the supplies. Omission of packing lists is a

serious and unnecessary, but nevertheless common mistake by relief organizations.

8. A special bottleneck experienced in the Somali cholera epidemic was the shortage of laboratory supplies and experienced laboratory technicians for surveillance during the epidemic. It is recommended that organizations involved in medical relief operations establish emergency stocks of complete sets of reagents for cholera diagnosis. This would require only marginal amounts of money and storage space, but could be highly useful in an epidemic.

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