

ASSISTANCE FOR
VICTIMS OF
ANTI-PERSONNEL MINES

NEEDS,
CONSTRAINTS
AND STRATEGY



INTERNATIONAL COMMITTEE OF THE RED CROSS

Dr Robin M. Coupland FRCS
Surgeon
International Committee of the Red Cross

This document is intended to go some way towards portraying the plight of victims of anti-personnel mines and to describing their needs in purely medical terms. The constraints faced in providing surgical care and rehabilitation are also described. An accurate assessment decides the most appropriate form of assistance in each situation. The conclusion introduces a strategy whereby competent assistance may reach more mine victims.

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ICRC PHYSICAL REHABILITATION PROGRAMMES AND SURGICAL MISSIONS

1979 - 1997

COUNTRY	ICRC PHYSICAL REHABILITATION PROGRAMMES	ICRC SURGICAL MISSIONS
Afghanistan	1987 - 97	1981 - 97
Angola	1979 - 97	1986 - 89
Area under Palestinian authority (Gaza)	-	1991
Azerbaijan	1994 - 97	-
Burundi	-	1993 - 94
Cambodia	1991 - 97	1979 - 95
Chad	1981 - 92	-
Colombia	1992 - 94	-
Congo (Ex-Zaire)	-	1996
Eritrea	1982 - 95	-
Ethiopia	1979 - 94	1990 - 91
Georgia	1994 - 97	-
Iraq	1994 - 97	1991 - 92
Kenya	1992 - 97	1986 - 97
Lebanon	1982 - 95	1983 - 85
Mozambique	1981 - 95	-
Myanmar	1986 - 95	-
Nicaragua	1985 - 93	-
Pakistan	1981 - 96	1981 - 96
Russian Federation (Chechnya)	-	1996
Rwanda	1996 - 97	1994 - 97
Sudan	1985 - 96	1994 - 96
Syria	1983 - 95	-
Thailand	-	1979 - 94
Uganda	1988 - 90	-
Viet Nam	1989 - 95	-
Yemen	1970 - 71	1994
Zimbabwe	1985 - 90	-



MINE INJURY: MORE THAN A MEDICAL PROBLEM

I

Before addressing the subject of assisting victims of anti-personnel mine injuries it is necessary to paint a picture of a country affected by the mine problem.

This country is usually poor. Its social and economic infrastructure has been torn apart by a savage civil war. Educational programmes have ceased and people with professional qualifications have long since left. Military hardware is in the hands of armed gangs, poorly trained soldiers or even children. Among the weapons that remain when the war ends there may be thousands, if not millions, of anti-personnel mines. They can be found planted in vast tracts of land in the remotest part of the country. However, their placement is designed to cause maximum harassment to those who live in or travel through the area. Thus, they are usually laid in roads or tracks, around sources of clean water, near fruit-bearing trees, in houses awaiting the return of refugees and in the fields upon which the community is dependent for its livelihood.

Health care is largely dependent on a variety of foreign aid agencies whose work is also hampered by the presence of mines. One mine, or even the suspicion that there are mines, can close a road for weeks. The cost of bringing in aid may be multiplied by 25 if all supplies have to be transported by air. Some areas may simply be too dangerous for the agencies to visit or work in.

Mines are a source of serious concern for United Nations peace-keeping operations, and the new generation of military surgeons is not trained in the general surgical skills needed to treat mine injuries.

SOMALIA

When refugees returned to Hargeisa in northern Somalia, in 1991, 75% of those who triggered mines were children.

Source: WAF (1)

GEORGIA

80% of mine victims in 1994 and 1995 were civilians.

Source: ICRC in-country study (2)

QUANG TRI PROVINCE, VIET NAM

Three thousand hectares of agricultural land cannot be cultivated because of mines. Yet this land could employ and feed 35,000 people.

Source: Oxfam (3)

THAI-CAMBODIAN BORDER 1990 -1993

62% of wounded patients in the ICRC hospital had been injured by mines.

Source: ICRC surgical database

CAMBODIA

Only 27% of males injured by mines in Cambodia were involved in military activities.

Source: F. King (4)

UN peace-keeping operations - total mine casualties:
203 injured by mines, 60 killed.

Source: UN

Mines in Bosnia:
97 UN peace-keepers have been injured and 12 killed. Among IFOR personnel, 52 have been injured and 7 killed.

Source: UN

Mines in Croatia:
33 UN soldiers have been killed by mines and 9 injured.

Source: UN

AFGHANISTAN

In Afghanistan one adult male in ten has been involved in a mine incident.

Source: British Medical Journal (5)

CAMBODIA

61% of mine victims go into debt to pay their medical expenses.

Source: British Medical Journal (5)

AFGHANISTAN

84% of mine victims go into debt to pay for their treatment.

Source: British Medical Journal (5)

AFGHANISTAN

Adult male Afghans who are injured by a mine are ten times more likely to be unemployed in the long term.

Source: WAF (1)

When someone steps on a mine, that person's medical needs are unlikely to be met; anyone trying to bring help is also immediately at risk from other mines. It may be hours or even days to the nearest medical facility, even a primitive one. If the victim survives the mine injury, what awaits him or her with a severe disability in such a country? Even crutches may be too expensive. Travelling to a limb-fitting centre may be a major undertaking for the whole family. Who is going to pay for the prosthesis if it is not fitted and manufactured free of charge by one of the agencies? Employment is unlikely; begging on the streets may be the surest form of income. Divorce and social ostracism may be added to the insult and indignity of being handicapped in such a country.

MINE INJURIES: AN EPIDEMIC

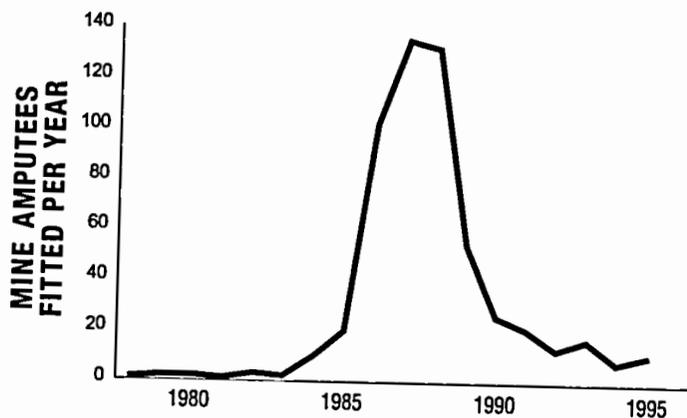
The term "epidemic" has frequently and correctly been used to describe the number of mine injuries all around the world. Although the focus of this document is assistance for victims of an epidemic, managing that epidemic must go beyond treating the individuals affected. Preventive measures must be taken. Thus we can regard assistance for victims of anti-personnel mines as treatment; preventive measures take the form of mine-awareness programmes, mine clearance and, of course, a total ban on the production, stockpiling, transfer and use of mines. All of us familiar with the mine problem recognize that the solution does not lie solely with any one element of treatment or prevention; it is to be found in a comprehensive approach combining assistance with preventive measures. We must not lose sight of this.

AFGHAN-PAKISTANI BORDER

In 1992 refugees returned to Afghanistan. The number of mine-injured seen in the ICRC hospitals in Pakistan doubled from 50 per month to 100 per month. The proportion of women and children with mine injuries rose also from 2% to 6% and from 14% to 25% respectively.

Source: Journal of Accident and Emergency Medicine (7)

**Erasmus Paredes Herrera Limb-fitting
Centre – Managua, Nicaragua
Evolution of casualties due to mine
warfare 1980-1995**



Source: ICRC in-country study (6)

**METUCHIRA DISTRICT, SOFALA,
MOZAMBIQUE**

One inhabitant out of 60 from this district was killed or injured by a mine explosion. "Our results suggest that the impact of land mines is substantially higher than originally thought."

Source: The Lancet (11)

There is a general lack of credible data on countries affected by mines. In places such as hospitals there may be a concentration of mine victims. However, data collected from hospitals concerns survivors of mine injuries; data concerning those killed and the impact on the victim's family must be sought from elsewhere. Most accurate data has come either from the ICRC hospitals or specific study teams who have performed epidemiological surveys in affected countries (2,7-10). Such specific studies are not easily funded (they are not considered as "aid") and gathering data may be a difficult and possibly dangerous task. Information may be intentionally withheld because of its political or military implications. The ICRC has tried to address this paucity of data by means of its own in-country studies and collating data from other credible sources.

Accurate collection of data is the first step in addressing an epidemic. This epidemic is no different.

The *ICRC database of mine incidents* registered more than 9,000 victims in over 40 countries between January 1995 and November 1996. It is impossible to know what proportion of all victims are registered here but it is certain to be a small minority.

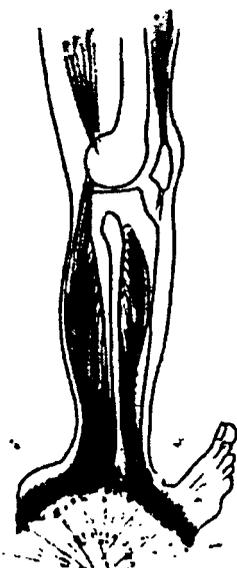
At a governmental conference in Tokyo in March 1997, the ICRC proposed a **mines information system (MIS)** to the international community. The system includes a standardized format for collecting information about mine incidents. This is detailed in section XI of this document.

There are three patterns of injury seen in those victims who survive for long enough to reach hospital. The first relates to stepping on a buried anti-personnel mine; there is usually traumatic amputation of the foot or leg with severe injury of the other leg, genitalia and arms. This first pattern tends to be the most severe. The second pattern is seen when the victim triggers a fragmentation mine. If he or she is not killed immediately there are wounds similar to those from any other fragmentation device; such wounds can affect any part of the body. The third relates to accidental detonation whilst handling a mine; it is seen among mine-clearers, those planting mines or curious children who pick up or play with mines. This pattern inevitably involves severe wounds of the hands and face. Some mines, by design, kill the person who triggers them; this is the case for the bounding mines which explode at waist height. Therefore, the proportion of wounded who die or who suffer amputation depends on the type of mine.

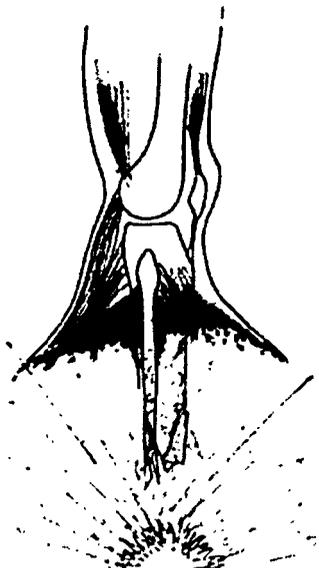
PATTERNS OF INJURY IN 720 PATIENTS IN ICRC HOSPITALS

Pattern 1 -	30%
Pattern 2 -	50%
Pattern 3 -	5%
Unclassifiable -	15%

Source: British Medical Journal (8)



a) Diagram showing how an injury, apparently confined to the foot, is associated with proximal compartmental muscle damage.



b) Diagram of explosive injury with traumatic amputation of the lower leg. The mechanism of proximal compartmental injury with skin and gastrocnemius preservation is shown.



c) Diagram showing how, when the skin has returned to position, the extent of proximal damage is hidden.

The buried anti-personnel mines (inflicting a pattern 1 injury) are those most likely to remain long after a conflict and are the most difficult to detect.

THE PROFILES OF THREE VICTIMS OF ANTI-PERSONNEL MINES

THE ICRC REGISTRY OF MINE INCIDENTS

up to November 1996

9,384 casualties were registered
1,568 were killed
3,999 were civilians
125 were aid workers

The ICRC surgical database which commenced in 1991 has more than 26,000 patients registered from five independently functioning ICRC hospitals. Of these, 27% are mine victims. From these databases, and numerous testimonies from both victims and health workers, profiles of victims can be established which show both their injuries and their needs. Three such profiles are presented here.

MINE INJURED IN ICRC HOSPITALS

Potential "combatants"

males 15-50 years old - 68.7%
Children < 15 years - 19.8%
Women - 7.3%
Males > 50 years - 4.2%

Source: ICRC surgical database

The soldier

A soldier, 20 years of age, was leading a routine patrol of six others through some grassland. His boot caught a trip wire which triggered a fragmentation mine; the mine was hidden in a small bush about 2 metres away from him. Although at least ten fragments of the mine hit him, the biggest wound was in his right thigh with a 10-cm entry and a fracture of his right femur. Another small fragment hit him in the abdomen but he was not aware of this at the time.

The other soldiers were carrying some bandages which they put around his thigh. They made a stretcher out of some long sticks and a hammock and carried him 5 kilometres back to the camp. From there a lorry took him to the nearest government hospital which was a six-hour drive. One of his friends was allowed to accompany him to the hospital. By the time they arrived there he had lost a lot of blood, was dangerously dehydrated and was nearly unconscious.

The hospital itself had little in the way of supplies. There was only the one doctor and three nurses for the 50 patients in the ward. There were no pain-killing drugs. There was no qualified surgeon or anaesthetist at the hospital. The doctor at the hospital put up an intravenous infusion of fluids and gave the soldier an injection of antibiotics. He was put in bed with neither sheets nor a blanket. A dressing and a splint were put on his thigh. After an hour the dressing was soaked in blood and his thigh was very painful. His friend tried to find some pain-killing tablets in the local market, but these were too expensive; he could not afford to buy food for both of them and the medicine.

After 24 hours the wounded soldier became feverish and delirious and his abdomen began to swell. He began to vomit. The doctor said that maybe a fragment of the mine had perforated his intestines and that there was nothing that could be done. Anyway, it was months since they had had any supplies and the only surgeon had left town when the rebels had attacked it a year before. After two more days the soldier slipped into a coma and died. His friend buried him in a shallow grave marked only by a small pile of stones.

EVACUATION OF MINE VICTIMS TO ICRC HOSPITALS

Only 25% arrive within six hours of injury;
15% travel for more than three days to reach the hospital.

Source: ICRC surgical database

The child

A ten-year-old boy arrived at an ICRC first-aid post in a taxi hired by his father. Ten hours earlier, he had stepped on a small buried anti-personnel mine which had shattered the whole of his left foot. The boy told the staff at the first-aid post that he had been out collecting firewood. He had in fact been looking for unexploded mortars and shells to sell in the local market. He knew that there were mines in the area.

In the first-aid post he had a dressing put on the remains of the foot, had an infusion put up and was given both pain killers and antibiotics. He was put in an ambulance and was taken to an ICRC hospital. The journey took five hours. The father was surprised to hear from the ambulance driver that he did not have to pay for the transport and even more surprised to hear that the treatment and the food for both of them in the hospital would be free.

When they arrived at the hospital, a surgeon examined the foot and explained via an interpreter that the leg would have to be amputated below the knee. The father explained that this was his only son and that he could not possibly be of use to the family if he had only one leg. The surgeon and the hospital staff who spoke the local language explained that it would be very dangerous to wait and that the boy would be able to walk again with an artificial limb. The father refused to give permission for the amputation. The boy was confused and frightened and began to cry again.

The following morning the boy had a fever and a bad smell was coming from the dressing on his foot. The father decided to find an old uncle who lived about four hours away by bus and to ask his advice. That evening the father and his uncle arrived at the hospital. They had another discussion about the amputation with the staff in the hospital. The following morning, the surgeon told them that he could do nothing more without their permission to amputate the leg and that there was no point in the boy staying in hospital. The anaesthetist assured the father that the boy would be asleep throughout the operation. One of the locally employed nurses rolled up his trouser leg and showed that he too had stepped on a mine six years previously and that he was able to work with his artificial leg. The father then agreed to the operation. Two hours later the boy was back on the ward; he had had a below-knee amputation under a general anaesthetic and there was a blood transfusion running. His new stump was resting on two pillows in a big dressing and he was allowed to eat later that day. The following day, a physiotherapist started to move the knee joint gently above the amputation. Four days later he was taken back to the operating theatre to have the skin flaps of the amputation stitched together which required another general anaesthetic. Five days after this,

In a group of 201 patients with pattern-1 injury 210 lower limbs were lost.

Source: British Medical Journal (8)

the dressing was taken off for the surgeon to have a look at the stump. The boy saw for the first time how his leg ended in a stitched stump. This was a great shock to him and he began to cry once again. His father also cried.

Over the next two weeks he had a lot of physiotherapy and learnt to walk on crutches. There were many other amputees in the hospital; some had both legs missing. The boy's father donated blood to the hospital blood bank.

After a month the boy was transferred to the ICRC limb-fitting centre where he received an artificial leg made out of a plastic material. He could walk quite well with this though it was more difficult over uneven ground. Three weeks later he was able to go home with his father.

Five months later he broke the limb when he was playing football with his friends. He and his father headed for the ICRC limb-fitting centre again and he was given a new leg. A year later, walking grew painful and he saw that he had developed an ulcer on his stump. Once again he returned to the limb-fitting centre and was told that maybe he would need an operation to remove a piece of bone that was still growing in the stump. The surgeon at the hospital examined him and the operation was done two days later. The stump was now a different shape and so he had to have yet another artificial limb fitted - his third in the 18 months since the mine blast.

25% of people with pattern-3 mine injury have associated eye injury.

Source: British Medical Journal (8)

The rice farmer

A 32-year-old mother of three children was working in a rice field. A dark green object in the mud caught her eye. She picked it up, not knowing that it was a mine; it was the kind that explodes either on pressure or when tilted. When the mine exploded it blew off her right hand; her face and eyes received multiple small wounds from the vaporized mine casing. Some other people working in the rice field ran to her aid and tied a strip of material tightly around her forearm just below the elbow. She was unable to see and was led out of the rice field. Someone went to tell her husband.

Eight hours later she arrived at a local dispensary, which she had reached riding on the back of her husband's motorbike. The nurse in the dispensary put some disinfectant on her face and a dressing on the remains of her hand. There was no available bed at the dispensary and she and her husband slept under a tree, it being too dangerous to travel at night because of bandits. The following day they made their way to a hospital. A doctor there looked at her arm and told her that the whole forearm was dead because of the improvised tourniquet and that she would have to have an amputation through the elbow joint. This treatment would be expensive and there were many other patients waiting for

operations. Fortunately her husband had brought some money with him and was able to borrow more in the market. She had her arm amputated the following day. Her eyes were now red and painful and she was unable to open them. The doctor wrote a prescription for some eye drops which the husband was able to buy on the market. The next day her husband had to leave to look after the children. Four days later the nurse told her that the amputation of her arm was infected and the stitches put in at the first operation were cutting out of the swollen skin. The infection and inflammation settled slowly over the following days. She remained in the hospital for three weeks, sharing food with some of the other patients. Her eyes remained inflamed but she recovered some sight in one; the other slowly became totally white. She eventually returned to her village in the car of an aid-agency worker. Her husband told her that she would have to go and live with her mother as he was unable to feed her and the children if only he was working. Her mother informed her that she would have to beg to bring some money in.

SPECIFIC MEDICAL NEEDS

The treatment of wounded people in ICRC hospitals has become a specialty in its own right. There is no onward evacuation of patients; they stay in the hospital until they are discharged. There are rarely specialist facilities available. The surgeons work with a basic level of technology as a matter of policy and are expected to work according to a number of well-recognized basic principles of wound surgery. The ICRC hospitals do not provide a "gold standard"; they provide a standard that is the absolute minimum for both effectiveness and safety (12,13).

The effects of anti-personnel mines are a relatively new subject in the medical literature. Until recently these injuries were considered to be the same as any other caused by conventional weapons. However, mines inflict a much more severe injury owing to the specific design of the weapon; the result is specific medical needs. Injured by buried anti-personnel mines, the victim often suffers lifelong disability, but this disability can be kept to a minimum with correct treatment.

First aid

First aid involves getting the wounded person out of the minefield without risking other lives, and stopping the bleeding. Most bleeding can be stopped by a firm dressing. However, a traumatic amputation may require some sort of tourniquet which must be applied as low as possible. Many limbs are lost or have to be amputated higher than otherwise necessary because tourniquets are applied too high on a limb and left on for more than six hours. Fractures can be splinted with a piece of wood if nothing else is available.

The earlier the wounded person reaches a competent medical facility the better. Mine victims, especially those who have lost a large volume of blood, will need an intravenous infusion. A blood transfusion is rarely needed as a first aid measure (14).

Early administration of antibiotics can help to prevent the onset of serious infection such as gangrene. It is generally held that six hours is the time beyond which a contaminated wound becomes infected and thus life-threatening. In addition to the antibiotics, measures must be taken to prevent tetanus.

Most of the ICRC hospitals have been and are served by first-aid posts where local employees and soldiers receive basic first-aid training.

Preoperative care

When the patient reaches a hospital there are certain routines which must be followed. The patient must be registered. The details of how, where and when they were injured should, if possible, be recorded. This information is useful for mine-clearance teams. It may however, represent military information and therefore may not be readily given by the patient.

Especially if injured by a buried anti-personnel mine, the patient will need to be washed if his or her condition permits. Blood tests should be taken both to estimate the patient's haemoglobin value and to establish the blood group. Before going to the operating theatre, the patient should be assessed by the surgeon and the anaesthetist.

Surgery

The surgical management of mine-injured patients can be a challenge to even the most competent surgeon. Wounds such as these are not seen in civilian practice and they do not correspond to any of the modern surgical specialties. The surgeon should have a solid background in general surgery. Specialist skills are useful only in a small minority of cases. All wounds should be managed according to well-established basic principles of surgery (12,13). These are excision of dead and contaminated tissue, leaving the wound open under a secure dressing and closing the wound with sutures after four or five days (delayed primary closure). Large wounds may require skin grafts. A wound with a fracture is managed in the same manner and the fracture should be immobilized by either plaster of Paris, skeletal traction or external fixation (15). A surgical amputation either of an entire limb that is beyond repair or at a point above a traumatic amputation should be carried out according to the same principles and closed after a delay. There are some amputation techniques which are particularly appropriate for mine injuries. These are known as myoplastic amputations and the ICRC has produced teaching material to pass on this experience to both military and civilian surgeons (13,16,17).

Anaesthesia

In keeping with the surgical philosophy of using an appropriately basic level of technology, 60% of the anaesthetics given to mine-injured use ketamine. This is a

safe and effective anaesthetic agent which can be given by either intravenous or intramuscular injection. Its principle disadvantage is that it can cause vivid hallucinations in the post-operative period. Only a small proportion of patients require a general anaesthetic with muscle relaxation and protection of the upper airways with endotracheal intubation. Spinal anaesthesia is particularly suitable for later operations such as delayed closure for wounds of the lower limbs. In many ICRC hospitals, nurses have been trained to administer anaesthesia safely.

Nursing care

The nurses are responsible for the admission and in-hospital care of all patients. They are also responsible for the efficient running of the hospital. The head nurse is the key position in the hospital.

After any operation the patient must have at least 24 hours of close nursing supervision. Without this, surgery is dangerous. In the ICRC hospitals most of the nursing care is performed by locally recruited personnel. Those without previous training can be taught the basics of bed-side nursing in a structured course which has been designed specifically for the work in ICRC hospitals.

The senior nurses who have worked in the ICRC hospitals have prepared a book entitled "Hospitals for war-wounded" to help other agencies, organizations or even Ministries of Health to set up and run a hospital for wounded. It should be published by the end of 1997.

Physiotherapy

The physiotherapy requirements of mine victims are unique. In the initial phase, the injured limb must be kept moving by passive movement and isometric exercises but not to the extent that the wounds are interfered with. The patient too must be kept from languishing in bed and must be mobilized on crutches as soon as possible.

As soon as the wounds are closed, active physiotherapy should be instituted aiming to maintain a full range of movements and muscle strength especially in the remainder of a limb above the amputation. A stiff knee for example may make the wearing of an artificial limb impossible.

The patient must also learn how to bandage the stump correctly to help form the conical shape that best fits the socket of an artificial limb.

The end functional result is a product of the quality of surgical care, physiotherapy and the patient's own self-motivation.

Personnel

The book "Hospitals for war-wounded" gives clear guidance about the number of different staff positions that are needed. These are considered a minimum to achieve competent treatment with a heavy workload while combining patient safety and efficient running of the hospital. The formula is tried and tested.

For a 50-bed surgical hospital for war-wounded, the following personnel are needed: head nurse, hospital administrator, teaching nurse, one or two surgical teams each consisting of surgeon, anaesthetist and operating room nurse, physiotherapist, surgical ward nurses, pharmacist, laboratory and X-ray technicians; ancillary staff include cleaners, cooks, security guards, porters and drivers. The total number of staff should be 80 to 90 people. The proportion of locally recruited employees to expatriates varies from country to country.

Hospital equipment and medical supplies

Hospitals are supplied according to three policy principles:

- everything should be ordered from and supplied according to a standardized list;
- the quantities should be calculated in terms of consumption per 100 wounded people admitted;
- every item can be placed on a scale ranging from "essential" to "important" to "nice to have" to "luxury"; this gives a comparison with accepted norms of western medical practice. An appropriate level of basic technology corresponds with a point between "important" and "nice to have."

The standard lists of material and medications can be obtained from the ICRC Health Operations Division.

Ensuring competent treatment for mine victims in a place with limited health-care resources may indirectly help the treatment of others. The severe nature of the injury and the time spent in hospital by mine victims diverts the already limited resource from the needs of others. The additional needs required may not be recognized by authorities or aid agencies because, compared with battle casualties, mine victims arrive at a hospital in small numbers over a long period of time.

HOSPITAL RESOURCES

Average figures for hospital stay and number of operations per patient according to wounding agent:

	Days in hospital	Number of operations
Bullet	18.1	1.9
Fragments	13.7	2.1
Buried mine	32.3	4.0

Source: Medicine and Global Survival (18)

EXAMPLES OF NEEDS IN A HOSPITAL PER 100 WOUNDED

- Disposable syringes, 2-ml - 1,200 units
- Ringer lactate infusions - 500 litres
- Penicillin injection, 5 megaunits - 600 bottles
- Surgical blades - 920 units

Such calculations have been made for all items.

Source: ICRC Health Operations Division standard lists

BLOOD TRANSFUSION

Volume needs per 100 wounded patients according to wounding agent:

- Bullets - 50 units
- Fragments - 50 units
- Buried mines - 320 units

Source: ICRC surgical database

TRAINING MATERIAL

BOOKS

Surgery for victims of war

Dufour et al. (19)

War wounds of limbs

Coupland (13)

War wounds: basic management

Gray (12)

Amputation for war wounds

Coupland (17)

Hospitals for war wounded

Hayward et al. (in press)

VIDEOS

Anti-personnel mine injuries: surgical management

The management of war-wounded patients: the Red Cross way

Blood for transfusion

Blood is essential for the treatment of severe mine injuries. Those undergoing surgical amputation require the most blood. However, little blood is used for resuscitation; most is used in the days following admission for correction of anaemia (14).

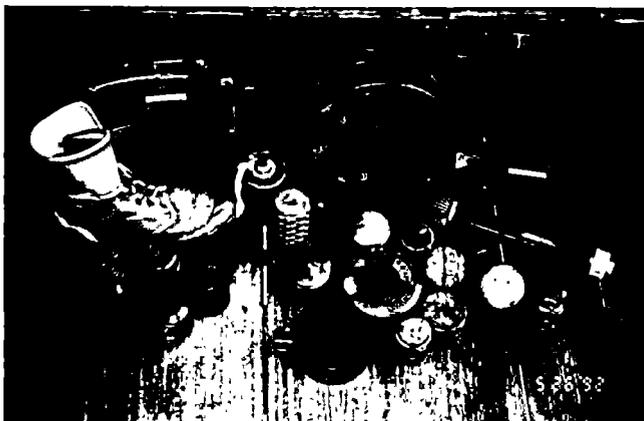
All blood transfused must be grouped, cross-matched against the patient's own blood and tested for syphilis, malaria, hepatitis and HIV. Blood should not be transfused if these tests cannot be done reliably.

In ICRC hospitals the blood bank is supplied through donations from friends or relatives of the patients or from the local population. Blood donation sessions are used as an opportunity to promote the Red Cross principles and international humanitarian law.

Training material

The ICRC has produced specific video and teaching material about the surgical treatment of mine victims. Much of this has been adopted as standard teaching material for many of the world's military medical corps. A surgical seminar is held every year in Geneva for interested surgeons from National Red Cross or Red Crescent Societies and others with a military or civilian background. The ICRC has organized surgical seminars in many countries including Peru, Iraq, Myanmar, Cambodia, Pakistan and Bosnia.

SURGERY



ICRC/R. Coupland

1. Cambodia, 1992. A selection of mines found in a Cambodian village in 1992.



ICRC/R. Coupland

2. Thailand, 1991. A typical pattern 1 mine injury. String has been tied around the leg as a make-shift tourniquet.



ICRC/R. Coupland

3. Thailand, 1991. The same patient after successful surgical amputation.

ICRC/R. Coupland



4. Thailand, 1993. A severe pattern
1 mine injury.

ICRC/R. Coupland



5. Pakistan, 1990. This child picked
something up!

ICRC/R. Coupland



6. Thailand, 1991. A patient five
days after bilateral above knee
amputation after a severe mine
injury; he is having a ketamine
anaesthetic prior to delayed closure
of the stumps.

LIMB-FITTING

ICRC/A. Brooks



7. Taking an accurate plaster cast of the stump is essential.

ICRC/P. Grabhorn



8. Cambodia, 1995. When heated, thermoformable polypropylene fits the plaster cast of the stump closely.

ICRC/P. Duhait



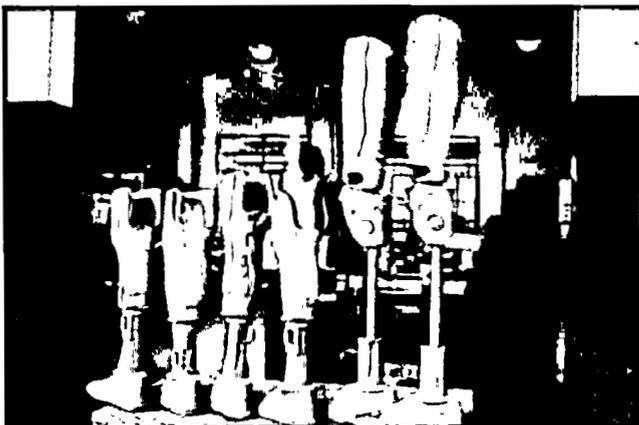
9. Cambodia, 1996. The other components of the artificial limbs such as knee joints are also made from polypropylene from a single mould.

ICRC/M. Deneu



10. Ethiopia, 1995. Fitting a child with an artificial limb for an above-knee amputation is difficult and time-consuming.

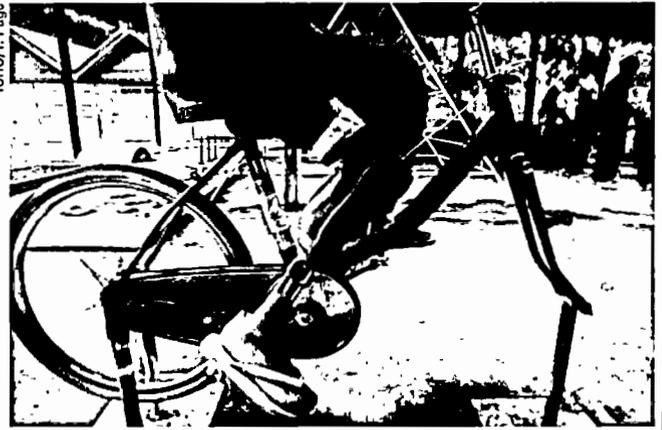
ICRC/C. Lo



11. Cambodia, 1996. Artificial limbs for both above- and below-knee amputations.



12. The amputees must learn to walk over all surfaces.



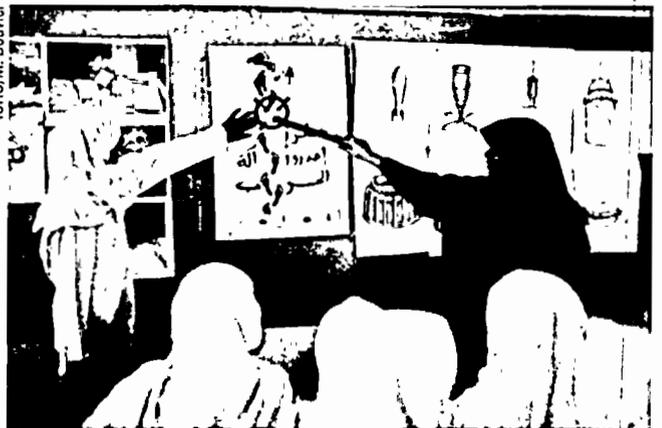
13. Cambodia, 1996. A well-fitted prosthesis permits a return to everyday living.



14. Social re-integration is an important part of the rehabilitation of a mine amputee.



15. For many mine victims, crutches are all they can afford.



16. Yemen, 1995. Mine awareness: education of local women.

SPECIFIC NEEDS FOR REHABILITATION OF MINE VICTIMS

VII

After the surgical treatment, and when all the wounds are healed and the swelling of the amputation stump has settled, the patient is ready to be fitted with an artificial limb (a prosthesis). This is normally four or five weeks after completion of the surgical treatment. The fitting of an artificial limb is an essential part of the rehabilitation of a mine-injured amputee. In biological terms, it replaces that part of the organism responsible for locomotion; it must be accepted by the person *and* fulfil the same function as the lost part. It obviates the need for crutches and thus frees the amputee's hands for the tasks of everyday living. It is the first step in regaining some of the dignity lost. There will be a life-long need for an artificial limb.

A lower limb prosthesis is made of three basic components: the socket which must fit the stump of each individual patient; the pylon or alignment system which replaces the length of the lost limb and incorporates a knee joint if the amputation has been made through the thigh; and the foot, which must be robust yet pliable.

Key words to apply to the ICRC's limb-fitting centres are "appropriate technology". Modern technology may not be workable in a country affected by mines. Before 1989, the policy of the ICRC was to make maximum use of locally available materials for the production of artificial limbs. The disadvantages of this were recognized and now, as a result of technological developments in the ICRC workshops, all the components of an artificial limb are made of polypropylene, a thermoformable plastic. The advantage of this system is that it gives the amputee a light and individually-fitted artificial limb. It is cheap and can readily be replaced or repaired. This material is easy to transport and work with. Importantly, it can be recycled and so there is no waste.

The ICRC puts great emphasis on the training of local technicians in the use of this technology and many mine amputees find employment in the ICRC limb-fitting centres. Such training ensures that the programme can continue after the ICRC withdraws. In recent years, partner organizations have been found to take over these programmes, the majority of them with some continued support from the ICRC. Most commonly, this is a governmental body in the country concerned. Some have been handed over to competent private foundations or to National Red Cross or Red Crescent Societies.

The focus of rehabilitation has continued to be on the physical aspects of disability. Physical rehabilitation goes some way to supporting young amputees psychologically. However, the

Since 1979, the 45 ICRC rehabilitation projects in 22 countries have manufactured more than 100,000 artificial limbs for 70,000 amputees. In addition, 140,000 pairs of crutches and 7,000 wheelchairs have been made.

Source: ICRC Health Operations Division (20)

MYANMAR

From 1986 to 1995 the ICRC ran a limb-fitting centre in Yangon that produced 10,795 artificial limbs. It continues today with three partners: the Myanmar Red Cross, the Ministry of Health and the Ministry of Defence.

need to furnish additional psychological assistance and help with finding a place in society has largely been neglected. Little data exists on what happens to mine amputees later in life. In some countries, amputees form gangs and turn on the society that has rejected them; in others, there is an unofficial family- or clan-based form of support for handicapped people.

THE COST OF TREATMENT AND PHYSICAL REHABILITATION

VIII

The costs vary from country to country. Factors leading to higher costs include the need to import all materials, the need to use expatriate workers and the need to transport personnel and materials by air. All expenses are higher in the initial phase.

Surgical costs

The cost per patient per day in an ICRC hospital is around US\$120. This includes transport costs but not the salaries of expatriate staff. A mine amputee stays in hospital on average 30 days. Therefore, the cost of treating a mine injured patient in the basic facilities provided by the ICRC is between \$3,000 and \$4,000.

The costs of providing artificial limbs

Each artificial limb costs between US\$100 and US\$150. There may be a greater variation when a partner organization is involved.

For a young active person the artificial limb may need replacing every two years. Thus the lifetime needs may amount to thousands of dollars. The cost to the ICRC of fitting one person, including lodging during the fitting and manufacture, salaries of the workers, logistics, machines, equipment, etc., is around US\$1,000, which includes the cost of the expatriate personnel. The equipment for the manufacture of the polypropylene components, including an injection moulding machine, costs US\$25,000.

COLOMBIA

The ICRC organized a technical assistance programme for the CIREC foundation workshop in Bogota, Colombia from 1992 to 1994. Following the introduction of polypropylene technology, it was possible to reduce the price of a transtibial prosthesis (for below-knee amputation), including the necessary treatment, from US\$473 to US\$212.

Source: ICRC Health Operations Division

VIET NAM

From 1989 to 1995, the ICRC supported the Ho Chi Minh City rehabilitation centre and introduced its own technology. During this period, more than 11,000 amputees were provided with polypropylene artificial limbs. Since the ICRC's withdrawal, the centre has produced prostheses for nearly 5,000 amputees with a manufacturing cost of between US\$38 to US\$64 per prosthesis. Included in the production were artificial limbs for nearly 3,000 destitute amputees; these were paid for by the ICRC's Special Fund for the Disabled.

Source: ICRC Health Operations Division

IX THE CONSTRAINTS AND EXAMPLES OF HOW THEY APPLY

KABUL, AFGHANISTAN

In 1992, the ICRC rehabilitation centre was closed after being hit by rockets.

KABUL, AFGHANISTAN

In 1992, all hospital staff were withdrawn from the ICRC hospital in Karte Seh after heavy fighting made the working conditions too dangerous. The hospital received 600 wounded people in six days.

NOVYE ATAGI, CHECHNYA

The new ICRC hospital near Grozny treated 300 war-wounded, 15% of whom were mine victims before six health workers were killed in the hospital in December 1996 and all ICRC personnel were withdrawn from Chechnya.

ANGOLA

ICRC limb-fitting centres produced 12,420 artificial limbs between 1972 and 1993. The centre in Huambo was closed for reasons of security and because it had been looted by armed gangs.

Why is it that not every person who falls victim to a mine receives adequate treatment? There are several factors or constraints to consider. These may have an effect individually or in combination.

Access

People are injured by mines over large geographical areas. The wounded person may be far from any town and the incident may never be reported to either authorities or aid agencies. Without large and obvious needs constituting a "critical mass", agencies are sometimes reluctant to commit themselves. Thus, mine injuries remain a large-scale, scattered and yet largely unattended problem. A related problem is that an agency might have difficulty finding the wounded person. In other words, geography may not allow the victim to encounter the agency that can provide the transport or the medical care that he or she needs.

Lack of protection

In some countries wounded people do not go to hospitals, for fear of their lives. Rebels and those among the population associated with them may not want to travel to government- or "enemy"-held areas where the hospitals are. Any treatment they receive may be via an agency which has limited access to the area. This may be the case for the majority of mine victims throughout the world.

Security

This is one of the major constraints (21). Many of the areas in which mine injuries occur are simply too dangerous for outside agencies to work in. The ICRC has over recent years been working in increasingly dangerous situations. Hospitals, warehouses and accommodation have been looted by armed gangs. Aircraft have been shot at. Vehicles have been stolen at gunpoint or blown up by anti-tank mines placed on ordinary roads. ICRC personnel have been threatened, beaten and killed. At this moment, following last year's tragedies in Burundi, on 4 June, and in Chechnya, on 17 December, the ICRC is asking itself one very fundamental question: What is an acceptable risk?

Political and administrative constraints

Assistance to wounded people in one area may go against the desires of the parties to the conflict. The presence of aid agencies may be politically inconvenient. Flight plans

may not be approved. Visas may not be granted. Uncooperative authorities have many tricks with which to hinder aid work.

Poverty

Health care is not provided free of charge in many countries. In mine-affected countries there may be adequate health-care systems for those who can afford it. Mine victims may have to rely on aid agencies or go without treatment completely.

Lack of educated people and social structure

In a mine-affected country, both recovery from the conflict and the assimilation of foreign aid are facilitated by the presence of a social structure and educated people. The cost and difficulty of delivering a service multiplies if the resource that must be imported includes trained personnel. There is little point in supplying a hospital if there are no people qualified to use these supplies correctly.

Lack of funds

It is clear that assistance to mine victims is an extremely expensive form of aid when measured as money expended per person. All agencies are chronically short of funds to continue existing programmes, let alone to set up new programmes. However, lack of funds alone has not stopped the ICRC from establishing a hospital or limb-fitting centre if real needs exist. There has been another factor.

"Donor pressure"

The availability of funds may be conditional upon their use for a certain category of victim or in a particular geographical area. Thus, humanitarian priorities may be overridden by financial considerations and this can be to the detriment of other victims.

Inter-agency rivalry and lack of coordination

Lack of coordination and rivalry between organizations is, sadly, another reality, especially in new situations. It arises from different ideologies and lack of time for inter-agency discussion about who should do what, where and how. For example, one agency may claim it is working in and supplying a certain hospital, though this programme may be inadequately funded or the agency may have difficulty recruiting qualified professionals. The agency's claims may make other

organizations reluctant to involve themselves with the hospital. The result is an aid "vacuum". The various agencies engaged in the fitting of artificial limbs may use different, incompatible and even inappropriate technology. The technology may be determined by the wishes of the donor. Thus, amputees in a certain area may not receive adequate rehabilitation. Those agencies involved in training may give different, conflicting and confusing advice; this applies in particular to programmes perceived as carrying a low financial commitment such as first aid and mine awareness. The donation of medical supplies may be particularly inappropriate. Some medical items are simply dangerous, such as metallic implants for fracture surgery; in a hospital without trained surgeons, sterility or even X-rays, these implants can only make the situation worse for the victims.

THE DECISION-MAKING PROCESS - WHAT ASSISTANCE, WHERE AND HOW?

X

The process of making decisions about assistance to victims of war always requires an accurate and objective assessment of the needs and an estimate of the resources necessary and the constraints that will apply. **Priorities must be established.** Victims of anti-personnel mines are one category of wounded; wounded are one category of all people needing assistance.

Assessing needs

No assistance should be planned without an accurate and professional assessment. Each situation must be gauged in terms of the needs *and* constraints. There is no universal solution.

Planning the assistance operation

Once the needs and the possible constraints have been assessed, the next stage is to decide on the priorities. It may be necessary to focus on a certain category of needs or a certain geographical area. If, for example, there are many mine victims arriving at a hospital, the priority is their immediate treatment - surgical action has high priority. If in a certain geographical area there are known to be many amputees resulting from a conflict that has ceased, establishing a limb-fitting centre has priority; surgical action may be inappropriate.

The next question relates to what is needed in terms of personnel and material. Once this has been decided, the funds must be found. Money might come from an emergency appeal if the needs have a high media profile. This might not be the case for a chronic and post-conflict situation, typical of the mine problem. In any case, the availability of funds or the urgency with which they are raised must not affect the priorities established.

A common misconception is that medical action for victims of war is always initiated as an emergency operation. Surgical programmes for mine victims and rehabilitation programmes may be set up after the fighting has finished; quality should not suffer from haste.

It is in this decision-making process that the ICRC has perhaps the greatest experience. There is no easy formula: a balance has to be struck between the needs, the resources available to meet those needs and the constraints on meeting them. Striking this balance requires experienced judgement - an intangible commodity that is extremely difficult to pass on

"Health programmes are often empirically conceived and based on the idea that they are indispensable in a given context and no analytical effort is made to ascertain whether they are necessary, coherent, and amenable to integration with other programmes. The method I propose calls for a rigorous analysis of what the operation is supposed to do, which is essential for a correct preliminary conception and evaluation of outcome."

- Dr Pierre Perrin in
"War and public health"(22)

AFGHANISTAN

In 1989 the ICRC set up a hospital in government-held Kabul. After discussions with both parties, wounded anti-government forces were successfully and safely brought across the front line for treatment in the hospital and returned when treatment was complete.

SRI LANKA

After heavy fighting in northern Sri Lanka in 1989, neither side wanted to send their wounded to the hospital in Jaffna. The ICRC declared the hospital neutral, supplied it and gave both sides guarantees of its neutrality. The facility functioned as a competent hospital treating wounded from both sides of the conflict for six years without the presence of expatriate personnel.

to others. Yet it is essential to the decision-making process. Next to concrete medical action, the ICRC's experience in such decision-making is perhaps the most valuable thing it has to offer other agencies, governmental and non-governmental.

Negotiation: an essential component of the operation

Many of the constraints listed above, especially those relating to politics, access and security, can be minimized by talking to the authorities and various warring parties. Reminding them of their obligations under the Geneva Conventions is the first step in obtaining the necessary access and security guarantees. This remains one of the most important elements of any assistance operation. The ICRC has enormous experience in this kind of negotiation, which goes back to the origins of the organization.

Evaluating the project

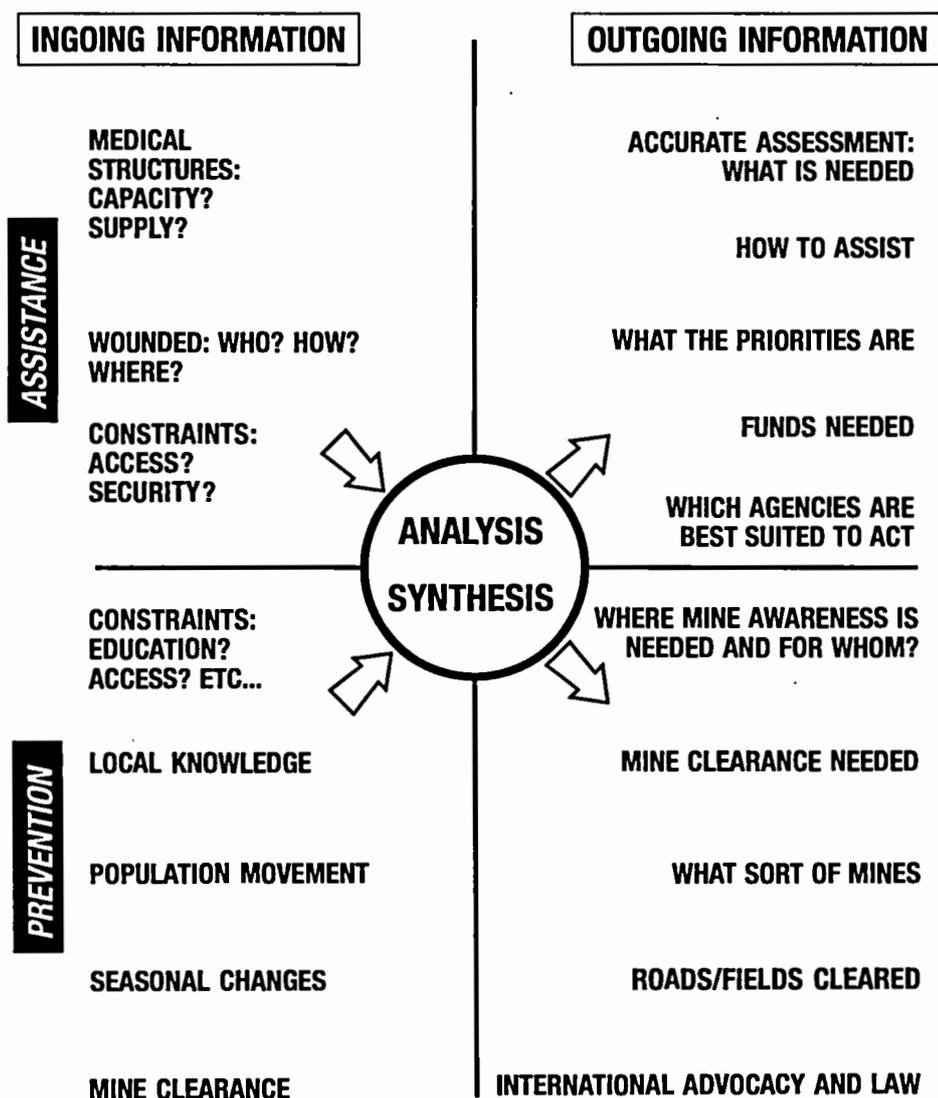
Objectives must be set at the outset and progress assessed in terms of whether these objectives have been achieved. Examples of such goals could be to establish a functioning hospital with a certain number of beds within a certain period of time; another might be to attain a certain output of artificial limbs per month after a year of the operation. By regularly evaluating the project, it is possible to detect trends in the needs themselves and in the constraints on meeting those needs. Changes can thus be made, or the programme ended altogether, in a timely manner.

THE MINES INFORMATION SYSTEM

Clearly, the key to improving assistance for the victims of anti-personnel mines is the structured flow and analysis of information about the entire mine problem in any given situation.

In each area affected by mines there should be a system - **mines information system (MIS)** - by means of which pertinent information is collected and analysed systematically. The information gathered would relate to every aspect of assistance *and* prevention. This is presented in the diagram below.

MINES INFORMATION SYSTEM: EXAMPLES OF INFORMATION FLOW



An important tool in collecting information is a standardized form regarding mine incidents. It can be filled in either electronically or on paper in the field. This information is then centralized and publicized by the Mines Unit at ICRC headquarters, Geneva. The form is intended to be used by all agencies; it can be obtained from the ICRC.

Some examples of how an MIS would function are as follows:

- Data is gathered from health facilities regarding the number, location and nature of mine injuries. This information is then passed on to agencies in charge of both mine awareness and mine clearance;
- The MIS makes a professional assessment of how well supplied the hospitals are and how well trained their staff is. Taking into account the practical constraints, this information is passed on to agencies having sufficient expertise to strengthen these health-care facilities or to establish new ones;
- Mine-awareness teams in the community calculate the number of individuals and families affected by mines. Once the needs are identified, programmes to provide rehabilitation and social integration are started. The same information is passed on for use in the general press and for advocacy purposes;
- All agencies involved in the mine problem in any one location are in a better position to decide on mine-clearance priorities if equipped with information systematically gathered by the MIS.

The ICRC cannot and should not shoulder this task alone. In each situation there must be **contributions from four sources: local authorities/governments, the relevant United Nations agencies, the NGO community and the ICRC.**

The ICRC has gained considerable experience and expertise in treating and rehabilitating individuals injured by mines. This has been achieved by applying the means required to meet the needs in each situation while taking into full account the specific constraints. The donor community must focus as much on these constraints as on the technicalities of the assistance itself. These constraints must be circumvented in the short term but fully addressed in the longer term.

Only a small proportion of the immediate needs are met by the ICRC and other agencies because:

- there is a serious lack of funding for the projects already under way;
- the specific constraints encountered in any given country affected by the mine problem may be insurmountable;
- there is no comprehensive and coordinated long-term approach to assistance aimed at dealing with the mine problem.

There are three reasonable and immediate goals for improving assistance to mine victims:

- all mine victims should have access to surgical care and rehabilitation that meets the standard established by the surgical hospitals and rehabilitation centres of the ICRC;
- the psychological and social needs of those injured and disabled by mines should be addressed;
- the impact that the presence of mines has on the economy and development should be measured.

However, it is not enough to strive to meet these assistance goals alone if we wish to bring more and higher-quality assistance to mine victims *in the long term*. Any concrete action in mine-affected countries must include both assistance and prevention; this is possible only through the systematic collection and analysis of information by all agencies concerned, the process on which the proposal of the mines information system is based.

Lastly, any solution to the mine problem will inevitably involve a coordinated approach bringing together inter-governmental cooperation, emergency aid, development, education and considerable funds.

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For more information about mines and the ICRC campaign,
consult the ICRC Web site at

<http://www.icrc.org>

or contact the

Mines Campaign Unit

International Committee of the Red Cross
19, avenue de la Paix, CH-1202 Geneva

Tel: ++41 22 730 2305 - Fax: ++41 22 730 2250 - e-mail: landmines.gva@icrc.org

Assistance for Victims of Anti Personnel Mines Needs Constraints and Strategy

Coupland Robin M.

International Committee of the Red Cross

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