

SURGERY IN EAST AFRICA: TECHNOLOGY AND TRAINING

Communications

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Perhaps our most disturbing deficiency is not our lack of knowledge but our inability to use the knowledge we have (Bryant 1969).

Introduction

The situation quoted above may be a key to an understanding of the health predicament in developing countries. We do not apply the knowledge we have because in many instances we cannot reach the people who require it. The term communications covers many different concepts, but my brief today is to consider the urgent business of getting to the patient and some ways of overcoming the problems of distance and isolation.

Medical radio network

Where efficient telephones are not available, the radio is a useful substitute. Many parts of the developing world are not going to be on the telephone within the foreseeable future, so radio should be considered.

The single-side-band high-frequency radio today costs around KShs 28,000/- to buy and install with the necessary aerial: twenty years ago they cost KShs 5,000/-. The license fee is currently KShs 760/- per year. Such a radio can be mains or battery operated and emits about 100 watts.

Trials near Lamu show that the batteries can be kept well-charged with solar panels or by a vehicle, if one is available. Windmills, static bicycles and other devices have been used effectively to generate power for radios.

Radio can be used for communication between a hospital and an out-station. A good example of this is Lodwar Hospital from which the district medical officer can call six outlying stations daily. A schedule is arranged



at 07.50 hours and in ten minutes he knows a great deal about what is going on medically in his district. Radio discipline is important, by which I mean that times for communications must be strictly kept: no one can communicate with you if your set is switched off. The international radio language and alphabet must be used and messages should be brief and carefully thought out.

Individual patient problems can be discussed over the radio, and requests for drugs, staff matters, laboratory results and a host of other medical organisational subjects can be dealt with. It takes a little time to use a radio efficiently. Some people never learn or are too self-conscious to try; others pick it up very quickly. There are booklets available which explain in simple language the mysteries of radio communication (AMREF 1977). At a different level the district hospital can call the provincial or central hospital if required.

When light aircraft are used to strengthen

a rural network of communications the radio is absolutely vital. Messages concerning arrival times, the weather, and the condition of an airstrip can be rapidly passed over the radio and emergency needs can be relayed, for example, a request for vaccines during an epidemic.

Radio communication has another unquantifiable value and that concerns maintenance of the morale of medical personnel living in the bush. This has been mentioned to me so often that I believe it to be of the utmost importance. Contact with the outside world becomes vital when you are isolated: radio can be one of the main factors in reducing such isolation.

Light aircraft

Aeroplanes are a valuable adjunct to medicine if efficiently used. The first principle to accept is that aeroplanes are a means and not an end. This sounds somewhat childish but in considering the delivery of health care, it is what you put in an aeroplane, the staff and supplies, which really matter.

First, it must be appreciated that an efficient radio network prevents a number of unnecessary trips by aeroplane. Communication over the radio may solve the particular problem and make a journey unnecessary. Radio also reduces the mileage which would otherwise be undertaken by doctors or other medical staff living in remote areas. One example will suffice. A doctor at a peripheral station may feel that he must go and discuss an urgent medical matter with his district medical officer (DMO). He gets into his Land-Rover and drives many miles, only to find that the DMO is in Nairobi. Radio contact can prevent such useless journeys.

The light aeroplane, like the radio, causes a great deal of misunderstanding in the public mind. The old adage recounted of a nervous passenger who said to the pilot that she would like to fly, 'nice and low and nice and slow', the most dangerous way to fly, is merely one comic example among many which still exist in the minds of the public.

SAFETY AND COST

Many people feel that aeroplanes are expensive

and dangerous. It would take too long to entirely expunge these feelings from the minds of those who nurture them but it can be said that flying is three times safer per million passenger miles than travelling by road.

A recent analysis of a local flying medical service in East Africa showed that the surgical operations it performs in the bush cost KShs 660/- each; a sum which includes all expenses including the surgeon's, anaesthetist's and nurses' salaries, the full cost of running the aircraft and the pilot's salary, a proportion of relevant administrative overheads and the fixed cost of flying which involves insurance, maintenance, spare parts, and engine overhauls. This figure also takes into account the astronomical price of aviation fuel which stands at KShs6/31 per litre. I defy anyone to say that this is expensive.

Table I gives the unit transport costs, number of seats, the operational costs, per hour, per mile and per seat mile, in US dollars for two commonly-used aeroplanes and a Land-Rover. The total cost is the sum of the vehicle travel cost, and the cost of staff time during travel. I will take as an example the Nairobi-Lodwar-Nairobi surgical safari which we do fairly constantly (Table II). The distance travelled is 625 miles in a Cessna 206 and if you go in a Land-Rover it is 875 miles. The vehicle cost per mile in a Cessna 206 is 0.97 of a dollar, and in a Land-Rover it is 1.10 dollars. Thus the vehicle travel cost is 606 dollars in a Cessna 206 and 962 dollars in a Land-Rover.

To this, however, you must add the surgical staff costs (Table III). The surgeon works at least 40 hours a week, and from this you can work out his hourly charge. When the cost of the anaesthetist and nurse is added, the total hourly staff cost is 44 dollars.

You must remember that the total travel time by air is 4.5 hours and that it is 24 hours by Land-Rover. These are actual figures (Table IV), produced by our own vehicles and aircraft. When you add up everything, your total transport costs are 804 dollars in a Cessna 206 and 2,018, dollars in a Land-Rover. It costs two and a half times as much to go by road.

TABLE I Unit transport costs

	Single-engine aircraft Cessna 206	Twin-engine aircraft Cessna 404	Ground transport Land-Rover
Number of seats	4	12	5
Operational cost per hour (includes depreciation)	\$135.00	\$488.00	\$40.00
Operational cost per mile	\$.97	\$ 2.30	\$ 1.10
Operational cost per seat mile (fully loaded)	\$.24	\$.19	\$.22

TABLE II Transport cost of surgical safari (Nairobi-Lodwar-Nairobi)

	Cessna 206	Land-Rover
Distance travelled	625 miles	875 miles
Vehicle cost per mile (includes depreciation)	\$.97	\$ 1.10
Vehicle travel cost	\$606.00	\$962.00

TABLE III Transport cost of surgical safari (Nairobi Lodwar-Nairobi)

	Surgical staff costs per hour
Surgeon	\$19.20
Anaesthetist	\$19.20
Theatre Nurse	\$ 5.60
Total staff costs per hour	\$44.00

TABLE IV Transport cost of surgical safari (Nairobi-Lodwar-Nairobi)

	Cessna 206	Land-Rover
Distance travelled	625 miles	875 miles
Vehicle cost per mile (includes depreciation)	\$.97	\$ 1.10
Vehicle travel cost	\$ 606.00	\$ 962.00
Travel time	4.5 hours	24 hours
Surgical staff cost per hour	\$ 44.00	\$ 44.00
Cost of staff time during travel	\$ 198.00	\$1,056.00
Total transport cost	\$804.00	\$2,018.00

I am sure there are people here that have travelled to Lodwar in a Land-Rover. The mileage is longer by road than by air and the surgical specialist, sitting in the Land-Rover getting covered with dust, will be unable to practice his skills during the whole of the outward and return journeys. He will be exhausted when he arrives and therefore less able to undertake the surgical work. Including his recovery time, table V contrasts the time spent away from home to perform two and a half days surgery. The safari will take three days by air but six days by road transport. If you do not believe me, I suggest that you try the trip.

TABLE V Time cost of surgical safari (Nairobi-Lodwar-Nairobi)

	Cessna 206	Land-Rover
Travel time (including recovery time)	4.5 hours	3.5 days
Operating theatre time	2.5 days	2.5 days
Total time for safari	3.0 days	6.0 days

Only the obtuse will deny the validity of these arguments. There is only one counter argument and that is that you should not go at all: neither by aeroplane nor by car. I will leave you to make up your minds on that philosophical conundrum.

OTHER FACTORS

Perhaps the most pertinent disadvantage of flying is that transport is needed at the other end. This can largely be overcome by building

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the airstrip close to the medical facility and by using the radio to arrange for a vehicle to meet the aircraft.

There are numerous variables of light aircraft and experience will show which is best for medical purposes. No aeroplane has all the desirable characteristics. Economy has to be one of the first considerations and this means that size has to be limited. Easy access through large doors is important, particularly for loading and unloading patients or freight. Speed is a relatively minor factor, ten minutes one way or another on a two-hour flight are not significant, but it is important that aircraft in East Africa should be able to land and take off on relatively short airstrips at elevations well above sea level.

Local knowledge is probably the most important asset a pilot can possess. I am assuming that the technical side of flying has been mastered because without that ability he will not persuade many people to fly with him. Flying is largely a matter of temperament; like surgery.

There is another consideration which must influence medical flying. An aeroplane costs money even if it is sitting on the ground. If a surgeon has to be at a particular hospital for two or three days, the pilot either has to wait for that time or go away on another mission. This is not always easy to arrange. Efficient use of pilots has to be reckoned with in the same way as the efficient use of surgeons or doctors. This is the one potent argument for doctors being able to do their own flying although it can be argued that after a long operating list a surgeon should not be asked to fly himself home.

The tasks which an aircraft can assist in accomplishing in the medical field are:

- 1 regular visits by specialists,
- 2 regular inspection tours of their outlying facilities, by district or provincial medical officers or mission doctors,
- 3 movement of staff, supplies, drugs, vaccines and mail,
- 4 supervision by senior medical staff of remote rural medical projects,
- 5 emergency evacuation of seriously ill or

injured patients.

REGULAR VISITS BY SPECIALISTS

This activity is now being markedly increased in East Africa. Out-reach visits are undertaken from Nairobi, Moshi, Mwanza and Dar es Salaam. Efficient organisation is a vital ingredient and it is important to do what you say you are going to do. It is appreciated that on rare occasions due to illness of staff or exceptional weather conditions the schedule cannot be maintained but every effort should be made to minimise these failures.

The specialists should have time to do extensive rounds and devote much of their time to teaching. Surgeons may be inundated with patients for operation, but each hospital visited will be different and the best use of time must be decided by the specialist and the medical officer whom he is visiting.

An attempt must be made not to rush visits although this is easier said than done due to other commitments the specialist may have at his base, aircraft scheduled to fly elsewhere and many other factors. Clearly if there were enough specialists at peripheral hospitals these visits would be largely unnecessary. This happy day has not yet arrived and for the time being much help can be given.

REGULAR INSPECTIONS BY THE DISTRICT MEDICAL OFFICER

There are many districts in Kenya which are difficult to travel around because of their size, the type of terrain or the lack of roads. Taking the district medical officer or mission doctor around his parish by air can be well justified and it is being done in the North-East Province of Kenya, in Turkana, Marsabit (Fig 1), Lamu, Loliondo and elsewhere. Rural dispensaries can be visited, supplies taken, and morale boosted, and the DMO gains first-hand knowledge of the situation in his area.

MOVEMENT OF STAFF, SUPPLIES AND MAIL

This is of secondary importance but the aeroplane can speed up delivery of essential drugs or vaccines. Every effort should be made to take the necessary freight when a doctor's visit is planned. Freight alone may be justified,



FIG 1 AMREF Flying Doctor, Anne Spoerry, takes a specimen from a patient at Sololo Airstrip in Marsabit District, Kenya. The vehicle will return the patient to hospital as the aircraft continues on the rounds of the District before returning to Nairobi. Later, the results of the specimen test will be radioed back to Sololo Hospital.

for instance in epidemics, when a vaccine is urgently required. Sometimes dropping off food or other supplies may have to be considered in exceptional conditions such as floods.

SUPERVISION OF REMOTE RURAL PROJECTS

Again there is a case for using air transport to undertake supervisory work of remote medical projects. The factors already considered must be assessed so that a reasonable judgment can be made as to whether air or land travel is best under the particular conditions which prevail.

EMERGENCY EVACUATIONS OF SERIOUSLY ILL OR INJURED PATIENTS

I have left this function to the last because it is the most debatable use for aircraft. It must be freely admitted that the evacuation of one patient by air is an expensive undertaking and therefore it should not be undertaken unless there is no other way of coping with the particular problem. Anyone who has been involved in this work knows that 10% of the calls for emergency evacuation are frivolous and do not justify the effort or expense. Patients can be unscrupulous and serious symptoms imagined when really the aircraft is going to be used because the patient wants to see his girl friend in Nairobi. I am not exaggerating: these things happen. If you refuse to go you are a hard-hearted villain; if you do go you are a sucker. Obviously such frivolous calls can be minimised by insisting on knowing as much as possible about the patient, preferably from a doctor,

although this is often out of the question.

If a doctor goes out by air to see 50 patients at a hospital, the expense of his trip per patient can be justified, but the use of aircraft for one patient needs careful scrutiny. However, those who argue that emergency evacuation by air is unjustified in all circumstances must be careful not to become ill or injured in a remote part of the country, their view is liable to undergo a rapid change. If you have a fractured spine or femur, as a result of a road accident in the bush, try being bumped along a corrugated road before you condemn emergency evacuations. Theory and practice do not coincide here.

Referral

There is one last issue concerning communications which is called referral: sending a patient from the periphery to the centre. How many patients who are referred actually go to the centre? I would hazard a guess that it is not much over 10%. There are many excellent reasons for this type of communication to fail:

- 1 the patient is frightened of leaving his home area,
- 2 he cannot speak the language at the centre to which he is referred, for example Nairobi,
- 3 she cannot leave her family because there are children to look after,
- 4 transport is non-existent or difficult,
- 5 on arrival at the centre there are no beds and the patient is told to return in three months,
- 6 the patient has great difficulty in finding

accommodation at the centre where he may not have any friends or contacts, 7 he cannot be visited in hospital because his relatives are a long way away in his home area.

This form of communication often does not work. The doctor at the periphery may have eased his conscience, but the patient's condition

may not have been improved.

References

- 1 AMREF (1977) *Medical radio communications operational manual* Nairobi, African Medical and Research Foundation.
- 2 Bryant J (1969) *Health and the developing world* Cornell University Press.

THE CESSNA CORSAIR



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