



**World Health
Organization**

Medical equipment in Gaza's hospitals.

Internal management, the Israeli blockade and foreign
donations



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a Gerusalemme

July 2009

Preface

In February 2009, shortly after the end of the Israeli military assault on Gaza (Operation Cast Lead), the WHO office for West Bank and Gaza commissioned a consultant bio-medical engineer to carry out a study of the state of medical equipment in Gaza's hospitals. This reflected long-standing concerns about the lack of medical equipment and the poor maintenance and functionality of the equipment that was available. WHO was also aware of the large volumes of donated equipment that had been delivered to Gaza during the war. The aim of the consultancy was to provide an overall assessment of the situation and of the main deficiencies of the system, to identify the main factors that were responsible for the deficiencies and to make recommendations on what could be done about them. This report is a summary of the findings

Introduction

No health care system can function without adequate medical equipment. Yet in Gaza doctors and nurses do not have the medical equipment they need to respond to the health needs of the 1.5 million people living in the Strip. Medical devices are often broken, missing spare parts, or out of date.

Two main factors are responsible for this: the Israeli blockade with its restrictions on the movement of goods and people, and the poor internal organization of maintenance services.

These problems have been compounded by emergency donations of medical equipment which have flooded the Strip since the war in Gaza ended in January 2009. Few donors consulted the Ministry of Health or aid agencies working in the Strip to find out what medical equipment was needed. Few took into account the difficulty of securing spare parts, the high cost of maintenance contracts, and the lack of staff trained in using the devices. While some of the donated equipment has been welcome and useful, a significant proportion is unnecessary or unwanted because it is surplus to actual needs or does not meet MoH standards. According to the MoH, it will be difficult to integrate this equipment into the health care system. The result is that an estimated 500 tons of medical equipment is now sitting idle in warehouses across Gaza.

The current situation brings high economic and human costs. Hospitals cannot run efficiently using equipment that is faulty, unreliable or that has been out of service for long periods. New equipment has a short lifespan because it cannot be properly serviced and maintained. There are serious risks to patients if the equipment needed for their treatment is not available or if their treatment depends on devices that have not been regularly tested or properly maintained.

Without an easing of Israeli restrictions on the Gaza Strip, it is unlikely that there will be a major improvement in the situation. In the meantime, internal reforms in the health system would resolve some of the problems. These should include establishing an inventory of medical equipment, coordinating procurement and stocktaking with the Ministry of Health in the West Bank and a stricter enforcement of protocols for foreign donations.

Internal organisation

Medical equipment in Gaza is looked after by the Ministry of Health's (MoH) Central Maintenance Unit (CMU), a small team of engineers and technicians based in Shifa Hospital in Gaza City. Shifa is Gaza's largest hospital and the CMU has a dual role. It is responsible for the maintenance of medical equipment in Shifa Hospital. It also supervises and supports local maintenance units in nine other hospitals in the Strip.

When Hamas seized control of Gaza in June 2007, public sector unions that were not allied with Hamas went on strike. This included an estimated 1750 doctors, nurses and non-clinical staff from hospitals and health clinics. During the strike from end August to end December 2008, many of their jobs were filled by new people recruited by Hamas.

As a result, the majority of maintenance workers are new to their jobs and few have been trained. In August 2008, two thirds of hospitals in Gaza had no maintenance staff. All Gaza hospitals - except the two in Rafah - now have engineers and technicians in post. But three quarters of technicians surveyed by WHO West Bank and Gaza¹ in May 2009 had been in post for less than one year. Whilst half of the engineers had been trained in medical equipment maintenance, only one in four technicians had had any specific training.

These maintenance workers have a profoundly difficult task. Like other health sector personnel, they are struggling to work in an environment where political upheaval, the Israeli blockade, the recent war, as well as economic restrictions have left public services in tatters. Maintenance staff lack skills, tools and equipment. In addition, deep-rooted problems with how their work is organized and managed are preventing them from carrying out their jobs effectively.



Photo/WHO: Bio-medical maintenance room - Nasser Hospital, Khan Younis.

¹ WHO. *Gaza hospitals: medical devices maintenance*. July 2009.

The recent survey, conducted by WHO West Bank and Gaza, found a wide range of problems with the organization of maintenance services in Gaza. These problems included:

- *the lack of an inventory of medical equipment:* there is little information about the current state of medical equipment: what is held, by whom, and in what condition. To perform their duties effectively, maintenance staff need to have a computerised inventory of medical equipment that includes technical specification, control history, and service record.
- *a centralized procurement system based on rules and processes that are inefficient and obsolete:* the procurement process has been damaged by the political divisions between Gaza and the West Bank the lack of an inventory, and the severe shortage of financial resources, even petty cash for small cost purchases. The existing system needs a radical overhaul to make it quicker and more effective.
- *a misguided and potentially harmful distribution of tasks among departments:* for example, phototherapy devices used by neonatology departments and sterilizers, including autoclaves, are serviced by electricians rather than by the biomedical maintenance unit. In some cases this has led to the use of depleted lamps in the treatment of newborn babies with jaundice. In another example, responsibility for the treatment of water for dialysis equipment is routinely given to mechanics departments which have inadequate knowledge of the quality of water required for artificial kidney devices. This is a particular problem given the poor quality of water in Gaza.
- *a confusion of tasks and responsibilities:* responsibilities are not defined and job descriptions are unclear leading to a waste of effort and resources. In the Central Maintenance Unit in Shifa, there is no clear separation of responsibility for maintenance work in Shifa Hospital and supervision of local maintenance teams working in other hospitals.
- *a lack of tools, workshop space and safety test instruments:* maintenance units are obstructed from doing their jobs because their tools and instruments are incomplete or in poor condition. Most hospitals lack even a basic work bench or room for the use of maintenance workers.



Photo/WHO: Maintenance tools - Beit Hanun Hospital.

The nature of these problems point to the need for an extensive overhaul of maintenance services. One of the difficulties in doing this is persuading people under siege, who for years have lurched from crisis to crisis, to think in terms of rehabilitation and system-building. Maintenance engineers, who deal each day with the frustrating effects of the Israeli blockade, need to be convinced of the value of reorganising their work in different ways.

The blockade: movement of goods

The Israeli blockade has had serious adverse effects on the state of medical equipment in Gaza. Since the initial closure of Gaza to the outside world in 2000, the Israeli government has imposed increasingly severe restrictions on the movement of people and goods in and out of the Strip, particularly since June 2007. Medical supplies such as pharmaceuticals and disposables have normally been allowed in because of their humanitarian purpose. But some medical equipment, consumables and spare parts have been subject to delay or refusal and the restrictions have also affected the equipment maintenance supply chain and system.

Certain types of medical equipment are especially difficult to bring into Gaza. Among the items that are restricted by Israel are image diagnostic devices. The Israeli government has refused or delayed entry to this kind of device because it

is considered to be dual-use technology. For example, it is very difficult to import x-ray equipment due to the presence of sophisticated electronics, components that the Israeli Authorities argue can be used for weapons development. It took more than six months to get a fluoroscope for Shifa Hospital into Gaza.

Batteries are also subject to restriction because of security concerns. This poses special problems for maintenance staff. Hospitals have to pay particular attention



Photo/WHO: Dialysis machine maintenance - Shifa Hospital, Gaza City.

to the control of water and power, because of the poor quality of water and the irregular supply of electricity in Gaza. To protect sensitive medical equipment from blackouts and fluctuations in power, hospitals in Gaza use Uninterruptible Power Supply (UPS) systems as backups. UPS batteries are quickly depleted by the frequency of the peaks and drops in power distribution. At present, there are hundreds of UPS that are out of use because of dead batteries. In Shifa Hospital, for example, a large and expensive UPS used by the dialysis department to keep artificial kidneys running during power cuts, has been out of use for more than one year.

Medical equipment test instruments also suffer from the closure of the Strip. Test instruments should be regularly recalibrated by the manufacturer or by specialized companies. The difficulty of exporting test instruments for this purpose decreases the efficiency and safety of medical devices, putting the health of patients at risk. The Gaza branch of Jerusalem St. John Ophthalmic Hospital has a retinal laser unit for eye surgery which is out of use and has been so for more than two months, whilst awaiting export to Germany for recalibration.

The closure of the Gaza Strip also involves tight control of other goods that are needed by hospitals. There is a chronic shortage of raw materials for construction. Without cement and other building materials, a hospital cannot rehabilitate an x-ray room, maintain wards, refurbish toilets, and so on. Shifa Hospital's new surgical wing has been waiting to be finished since 2006 because of the shortage of construction materials. Nor has other equipment that is essential for health service delivery, such as hospital kitchen equipment, been approved for entry.

Particular problems created by the blockade involve the import and export of spare parts. Under the rule of exchange, most manufacturers provide spare parts at lower cost for high technology and expensive medical equipment. Under normal circumstances, return of the defective part would mean a considerable saving for the customer of around 40% of the price of the substituted spare part. As the defective spare part cannot be sent out of Gaza, this exchange cannot be done. The difficulty of returning parts also discourages the maintenance of medical equipment. Faced with uncertainty about which part is not working and unable to verify the situation with the manufacturer, the maintenance engineer may simply classify the device as out of order. Many medical devices experience long down times and have short life spans for these reasons.

One of the consequences of this situation is that maintenance contracts in Gaza cost between 25 and 40 per cent more than in other countries. Manufacturers charge more for service contracts because they cannot predict the costs of equipment follow up. The difficulty of applying the policy of exchange makes the cost of the spare part full rather than discounted. One manufacturer estimates having more than 50,000 USD of spare parts in his warehouse which cannot be exported from Gaza. His stock includes x-ray tubes which cannot be recharged and control panels for expensive and sophisticated devices.

The blockade: movement of people

The effect of the above is to reduce the quality and increase the cost of medical equipment in Gaza. Additional restrictions on the movement of people in and out of Gaza have compounded the situation. Since 2000, maintenance staff and clinical workers have not been able to leave the Strip for training in the use of medical devices. The closure also seriously disrupts the work of suppliers. Suppliers play a critical role in ordering, installing, recalibrating and servicing complicated and high tech equipment. In many cases, manufacturers and their official dealers hold the

keys to the software that controls the devices. Well trained personnel are required to execute these tasks. The main suppliers of medical equipment are based in the West Bank with branches in Gaza which employ trained technical staff. However, dealers based in Gaza have not been able to exit the Strip to update their skills and technical knowledge, and manufacturers without a presence in the Strip cannot enter Gaza to provide after sales services. Since hospitals are dependent on new technologies, a technological and educational hiatus has been created that may take years to bridge.

The role of foreign donations

There is now an additional factor that is obstructing good practice in the maintenance of medical equipment in Gaza: foreign donations. In January and February 2009, Gaza received 4,600 tons of donated medical supplies from foreign governments, religious charities and aid agencies. An estimated 500 tons of this total amount, generously donated in response to the Israeli military action in Gaza, consisted of medical equipment. The equipment is largely focused on emergency medicine, including large numbers of surgical beds, anaesthesia machines, ventilators, and ambulances.

The role of foreign donations deserves special scrutiny for the reason that most donations were not solicited and many are not suitable for the health services in Gaza. Indeed, it could be argued that they have added extra burdens and costs to a system already suffering from an overload of problems. At the same time as large numbers of inappropriate and expensive donations have come into Gaza, the area lacks a single working MRI scanner. The scanner has been out of service for more than four months as no donor was available to pay for a replacement spare part.

The coordination of donations is complicated by the fact that some foreign governments will not deal directly with the de facto authorities in Gaza, and by the lack of communication between the Ministries of Health in the West Bank and in Gaza. However, just as important is the failure of many donors to coordinate their donations with the MoH in Ramallah, as well as the failure of many to follow international guidelines and the MoH's own protocols for the donation of medical equipment.

Not all donations have been uncoordinated. There are noticeable differences between the organization of medical donations that came through Israel and the West Bank and those that came from Egypt via the Rafah crossing. Donations through Israel and the West Bank were coordinated with the MoH who consulted a list of items drawn up by Gaza hospitals. The technical unit of the MoH was consulted for advice, and information was provided about the equipment's technical specification and warranty.



Photo/WHO: Medical equipment donations in storage.

Goods entering from Egypt were not coordinated in this way and involve a number of logistical and technical problems. Among these are:

- the donations do not match need: for example, there have been excessive donations in emergency medicine, and few or none in medical diagnostics.
- the donations are often unusable for technical reasons: in some cases accessories and instruction manuals are missing; there are several brand names and models that may not be compatible or may not match the technology in place.
- staff are untrained in how to use the donated equipment.
- the donated equipment has no warranty and/or the manufacturer does not have a representative in Gaza to deal with repairs and maintenance.
- there are concerns about the quality of some donations. Manufacturers are unknown or are known to represent the low quality end of the market.
- the donations cannot be used because they depend on consumables, spare parts and test instruments which are unavailable due to blockade.

As a result of this situation, there are now thousands of medical devices of different types, models and brands stored in MoH warehouses throughout Gaza. Each one needs checking for completion, technical specification and quality in order for decisions to be made about their appropriate distribution.

Solutions

This paper has described a range of internal and external problems with medical equipment in Gaza. There is a need for a medium-term plan, supported by well-coordinated actions by the MoH, stakeholders and donors. This plan should consist of a number of activities, including:

- *establishing an inventory and database:* which records and classifies the medical equipment already in use. The inventory would be used to draw up a list of medical equipment that is urgently needed. A database of medical equipment is already in use in the West Bank, supervised by the MoH biomedical equipment unit. The Gaza inventory should use the same dataset and software to facilitate coordination between the two regions. WHO would be well-placed to supervise the development of the inventory.
- *revising technical specifications:* establishing a consultative body to revise technical specifications and prepare a homogenous set of specifications for the main equipment used in hospitals.
- *reviewing the rules for procurement:* implementing new rules to increase the efficiency of the procurement process. Stakeholder support for the process is needed together with adequate financial resources.
- *reorganizing hospital maintenance:* reallocating maintenance responsibilities, setting work plans for groups of medical devices, separating the Central Maintenance Unit and Shifa maintenance unit into two entities.
- *supporting and training maintenance staff:* introducing a suitable induction period for new staff; planning training and retraining of engineers, technicians and nurses in accordance with their duties for groups of equipment.
- *supporting maintenance activities:* by supplying adequate tools, furniture, IT equipment and spare parts.
- *easing the movement of people:* easing the Israeli restrictions in order to allow health workers out of Gaza for training in the use of medical equipment;
- *easing the movement of goods:* easing the Israeli restrictions to allow medical equipment, spare parts, consumables and test instruments to move in and out of Gaza more freely;
- *managing foreign donations:* reorganizing the storage of medical devices by type, model and manufacturer; checking each donated item for completeness, compatibility, and quality; establishing and strictly applying a formal process for managing donations.