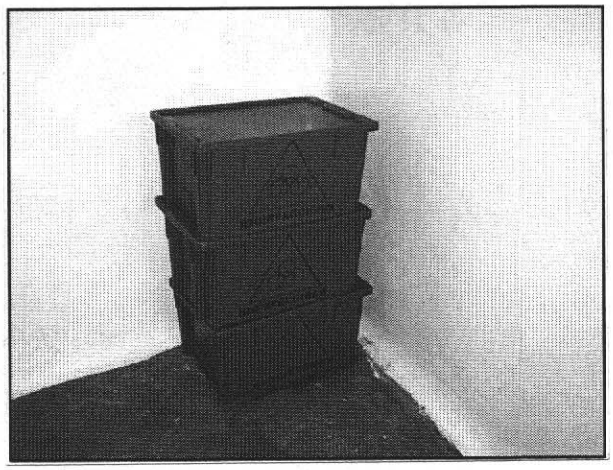
### a.9.1 Container

The type of container in this case is a 30 cm high X 40cm wide X 60 cm long, red color plastic box, with a cap and can be stowed. This box became a standard for MSPAS within the framework of ALA 91/33 program and can be reused (see picture).

Containers for sharp materials were also approved by MSPAS and they can be any plastic container with cap, which is a standard.



Container for Medical Waste

### a.9.2 Collection Frequency

The internal collection frequency per type of waste varies between 29.4% to 42.9% of medical centers (twice/day) and between 21.4% to 36.7% (once per day). It was also found that 11.8% to 22.2% of interviewees collected their waste more than twice per day and the remaining medical centers stated that wastes are collected at the moment they are generated, since they are small medical centers or labs.

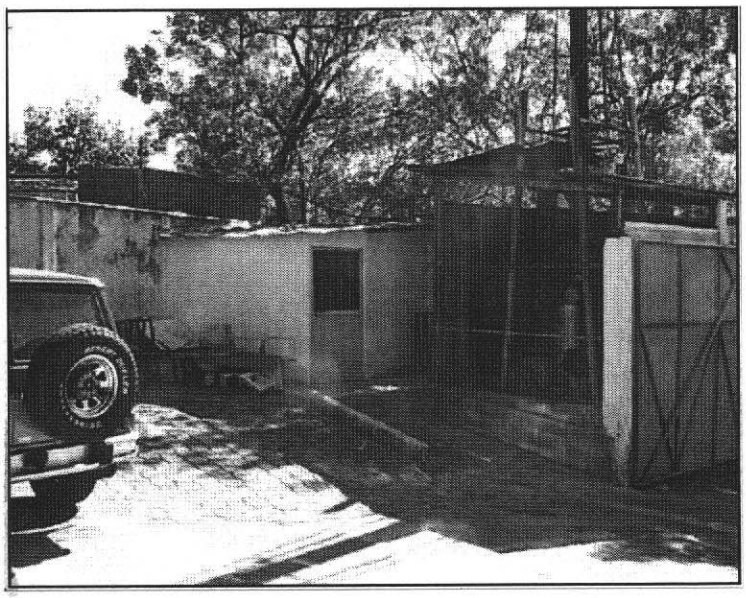
The biggest 5 hospitals collect pathological waste three times or more per day because they are collected at the moment they are generated. This is due to the fact that these hospitals work three shifts in 24 hours, so the obligation is to leave the place clean after each shift has ended.

### a.9.3 Temporal Storage

Regarding the temporal storage of pathological waste, it was found that 14.6 % (6 units) have a cool temperature storing site, 2 belong to MSPAS (Hospital Bloom and Laboratorio Central) and 2 belong to ISSS (Hospital de Especialidades, Hospital Médico Quirúrgico), the other centers are Laboratorio Forense de Medicina Legal and Hospital Centro de Emergencias.

In the medical centers surveyed it was found that 75.6% of them have a central warehouse and 19.5% have more than one warehouse; i.e., gathering points per departments.

Central warehouses are separated from other buildings and 85.4% of the medical units have them in an specific area. The frequency of disinfecting of such place is as follows: 17.1% once per week, 12.2% when it is deemed necessary and 12.2% never: however, 53.7% of interviewees do it three times per week.



Central Storage for Infectious Waste

34.1% of the warehouses in medical units do not have fence or locked; 12.2% of interviewees only use the warehouse for polluted waste; 14.6% lock the warehouse; 14.6% puts a fence around the warehouse but unlocked and 24.5% use auxiliary facilities, or when the amount is small wastes are kept inside their containers in the place where cleaning devices are kept.

Once the wastes are collected and stored in the central warehouses they are collected by special trucks (65.9% of medical centers); all these centers have a direct access for vehicles and containers are manually loaded.

The remaining medical centers are not provided a special collection service and the municipality renders such; since these are small medical centers, 22% of them carry the wastes from the curb side or are loaded manually to delivering them to the truck when the bell is rung. It should be clarified that these wastes are mixed discharge along with common or domestic waste, and the municipality does not have a special system for them; the compactor type or normal box truck that passes by the zone of the medical center picks up the waste.

So far the questions of internal management have been focused on bio-infectious waste, since they represent the largest portion of hazardous waste and thus with a greater contamination risk. Nevertheless, when asking about some type of storage for hazardous chemicals and expired drugs, 90.2% of interviewees replied that there is no such storage and only four centers (9.8 %) have a place devoted to them.

Regarding radioactive waste, it was found that 17 medical centers use this type of waste and 14.6% have a storage site for them; the 11 centers remaining have no storage structure.

### b. General Waste (Common Waste) Management

#### b.1 Storage

The survey summarizes each management stage beginning with storage; it was found that 82.9% of interviewees mix all wastes together and 17.1% stores them separately, being the newspaper the most frequent item segregated.

Table F-11: Storage Method of General Waste

| Question | Total | |
|---|---|---|
| 1. We mix them all together. | 34 | 82.9% |
| 2. We store them separately. | 7 | 17.1% |
| Total | 41 | 100.0% |

When asked about the reason wastes are not separated, 73.5% of interviewees answered that there is no guideline that states so and the general management of the medical center has to make a decision on it.

Table F-12: Reason of No Separate Storage

| | Total | |
|---|---|---|
| 1. There is no reason to separate them. | 4 | 11.8% |
| 2. It is troublesome to separate them. | 3 | 8.8% |
| 3. The waste collectors separate them. | 2 | 5.9% |
| 4. Others | 25 | 73.5% |
| Total | 34 | 100.0% |

### b.2 Waste Generation Amount

The generation amount does not have data results directly weighted at the site, however, the estimations by the persons in charge are respected.

Table F-13: Estimated Waste Generation Amount

| Category of Hospital | Nos. Hospital | Nos. of bed | Total (kg/week) | Generation ratio (kg/bed/day) |
|---|---|---|---|---|
| I | 8 | 2,421 | 47,872 | 2.825 |
| II | 11 | 687 | 18,592 | 3.866 |
| III | 10 | 156 | 3,229 | 2.957 |
| IV | 7 | - | 1,925 | - |
| Total | 36 | 3,264 | 71,618 | 3.216 |

### b.3 Waste Composition

Table F-14 shows the general waste composition.

Table F-14: Waste Composition

| Type of General Waste | Category of hospital | | | Total | Answer | |
|---|---|---|---|---|---|---|
| | I | II | III | | Nos. | % |
| 1. Kitchen waste | 33.1% | 39.3% | 28.7% | 34.3% | 21 | 95.5% |
| 2. Recyclable papers (newspaper, magazines, etc.) | 11.2% | 12.0% | 15.3% | 12.8% | 22 | 100.0% |
| 3. Waste paper | 5.3% | 8.3% | 15.6% | 9.8% | 19 | 86.4% |
| 4. Textile | 2.8% | 3.0% | 4.0% | 3.3% | 16 | 72.7% |
| 5. Grass and wood | 12.0% | 5.1% | 4.3% | 6.8% | 19 | 86.4% |
| 6. Plastic | 10.2% | 8.6% | 15.0% | 11.1% | 19 | 86.4% |
| 7. Rubber, leather | 4.2% | 1.6% | 2.4% | 2.5% | 13 | 59.1% |
| 8. Metals | 9.5% | 3.0% | 3.1% | 4.8% | 16 | 72.7% |
| 9. Bottles, glasses | 9.2% | 4.6% | 8.6% | 7.1% | 18 | 81.8% |
| 10. Ceramics, soil | 1.5% | 2.9% | 1.4% | 2.0% | 13 | 59.1% |
| 11. Others | 1.0% | 11.6% | 1.6% | 5.5% | 5 | 22.7% |
| Total | 100.0% | 100.0% | 100.0% | 100.0% | | |

### b.4 Waste Treatment

97.6% of medical centers do not give any kind of treatment to wastes and only 2.4 % (1 center) stated that wastes are treated with an insecticide.

### b.5 Waste Container

The most widely used containers are large plastic bags (87.8%) dustbins (4.9%) and other non-conventional containers (7.3%).

### b.6 Collection

Regarding the entity that collects waste, 61.0% answered the municipalities and 14.6% hires a private transporting company; 12.2% mentioned another entity, which in this case is the service provided by ISSS to its 5 hospital centers. It is satisfactory to know that all the centers are provided some type of service.

Collection trucks enter 51.2% of hospital facilities, 17.1% are provided door-to-door service, 17.1% curb side collection, 7.3 % bell collection and 7.3% station collection (container).

Regarding collection frequency it was found that 46.3% is less than 3 times/week, 12.2% is from 4 to 5 times/week and 34.2% more than 5times/week; only 7.3% are provided an irregular service.

The collection time is fixed for 61% of the interviewees and irregular for 31.7% of them; only 7.3% of interviewees stated that they do not know whether it was fixed or irregular.

### b.7 Final Disposal

Final disposal of common waste is quite good, since 87.8% have access to MIDES sanitary landfill; 12.2% is ignorant of where final disposal is done. However, such hospitals are located in municipalities within MIDES project; therefore, it can be said that 100% of wastes finally reach the sanitary landfill.

An exception is the Divina Providencia hospital, which is clearly a charity center whose function is to take care of cancer patients in their final stage. The hospital does not have emergency services, nor external consultation, cafeteria or restaurant, reason why its generation is minimal and wastes are buried within their property.

### F.4.4 Financial Aspect

This section is devoted to financial aspects, specifically the current cost per service and the ability to pay by medical centers.

Hospital costs were recorded up to December 1999 when the service consisted of collection and final disposal in a security cell of the sanitary landfill. These costs were of ¢177.32 colones/ton (U$20.00), and the collection was around ¢2,500 colones/ton (U$284.00).

From January 2000 the service includes thermal disinfecting method at the sanitary landfill, with a increase of the treatment and final disposal to U$ 226.00/ton (including 13% VAT) equivalent to ¢1.97colones/kg plus ¢3.56colones/kg of collection.

Regarding common waste, the public hospitals in San Salvador are not collected the cleansing fee, whereas other municipalities do charge this fee to public hospitals.

ISSS uses its own collection system for common waste, but their costs are unknown. The other medical centers are charged the fee in the electric bill, which goes according to the electricity consumption and with a cost per sanitary landfill of $18 dollars/ton, just like the rest of the population.

Question 63 was aimed at acknowledging the willingness to pay, and the hospitals that have both services (around 70%) stated that they cannot pay an additional raise, whereas those that are not provided the bio-infectious waste treatment show more willingness to pay.

Regarding the recycling of common waste, only 9 centers (22 %) separate some components, and 100% of these centers sell newspaper and just one sells glass and another one sells metal. All these centers are visited by people or enterprises that purchase such recyclable material.

In this section the monthly cost of water and electricity payment was asked, as well as their consumption: 12.2 % of the interviewees is ignorant of the amount paid for water service, 24.4% pays less than 1,000 colones, 39.0% pays from ¢1,001 to ¢10,000 colones, 10% between ¢10,001 and ¢15,000 and the remaining 14.6% pays more than ¢15,000 colones/month.

Table F-15 presents the data of water and electricity service payments and the cost per $m^3$ and kw/hr, according to the consumption billed in the previous month to the visit (December or November 1999 in some cases).

Table F-15: Water and Electricity Service Payments

| N° | Health establishment | Monthly water cost | Monthly electricity cost | Cost per m³ | Cost per kw/hr |
|---|---|---|---|---|---|
| 1 | Hospital Rosales | 51,555.00 | 143,724.91 | 1.88 | 0.96 |
| 2 | Hospital Maternidad | 10,428.00 | 114,310.00 | 1.53 | 0.84 |
| 7 | Hospital San Rafael | 18,712.10 | 40,350.00 | 1.94 | 0.95 |
| 8 | Hospital San Bartolo | 6,854.00 | 25,988.68 | 1.83 | 0.79 |
| 9 | Hospital Militar | 13,897.00 | 197,960.83 | 4.76 | 0.87 |
| 11 | Unidad de Salud Concepción | 451.00 | 3,416.97 | 1.83 | 1.09 |
| 12 | Unidad de S. San Antonio Abad | 551.00 | 2,982.49 | 1.83 | 1.05 |
| 21 | Consultorio Zacamil del ISSS | 4,000.00 | 30,300.00 | 2.86 | 0.93 |
| 24 | Hospital de Diagnostico | 4,537.00 | 74,905.94 | 4.76 | 0.87 |
| 25 | Hospital Ginecológico | 18,280.00 | 51,011.00 | 4.94 | 0.90 |
| 29 | Hospital Central | 60.00 | 24,491.75 | 0.14 | 0.79 |
| 33 | H. C. Ginecológica Dres. Farela | 759 | 6959 | 4.29 | 1.43 |
| 35 | Cruz Roja | 2,800 | 36,800 | 2.86 | 0.88 |
| 38 | Hospital Instituto de Ojos | 834.00 | 6,249.06 | 4.34 | 1.39 |

In order to obtain the cost of m³ collected, those interviewees that are ignorant of the cost of the service and who calculated such data without seeing the bill were excluded.

For electricity, again 9.8% is ignorant of the cost of it due to the centralized administration outside the medical institution.

It was found that 29.2% of the institutions pay less than ¢10,000, 17.1% between ¢10,000 to ¢ 25,000, 12.2% between ¢25,000 to ¢50,000, 12.2% between ¢50,000 to ¢75,000 and the remaining 19.5% pays more than 75,000colones/month.

## F.4.5 Cooperation for Waste Management

This section is intended to knowing the willingness of medical institutions to collaborate with the solution of the medical and common solid waste management problem.

Results are quite good: 80.5% is willing to cooperate for a good waste management; 4.9% are not convinced of such; 2.4% ignores such and 9.8% has a different perspective of the problem.

The degree of cooperation would be concentrated as follows: 21% in awareness programs, 19% in informational programs, 10% in generation reduction programs and 18% in treating bio-infectious and other hazardous wastes.

In a minor scale is recycling (9%), research (8%), efforts to avoid mixing wastes and discharge them in a clean manner (7%), reuse (4%) and other actions (4%).

When asked if medical institutions should cooperate with the country and the municipality in waste management, the answer was "**YES**" in 97.6% of interviewees.

Regarding the costs in waste management, 29.3% considers they are increasing considerably, whereas 46.3% considers they are just increasing.

17.1% states that costs are stable and 2.4 % are institutions that do not separate wastes nor pay for a special hospital waste management, since such institutions have different criteria and the medical solid waste management is not obligatory.

68.3% of interviewees prioritize waste management; 26.9% place it as a normal priority and the remaining 2.4% place it as low priority.

The last question of the survey refers to the support required by medical units: 32.1% required financial support and 42.9 % mentioned technical support. Other type of support represents 14.3 % and those that require no support 7.1 % and 3.6 % answered other aspects.

## F.5 Findings

The results of the diagnosis point out some critical aspects that will have to be taken into account at the moment of outlining actions to improve the current system. However, the conditions found so far force the conduction of a technical analysis in two levels:

- the first level is formed by medical centers furnished with a collection, treatment and final disposal service;
- the second level is formed by the medical centers unfurnished with this service and therefore discharge wastes to the municipality collection service.

Critical points identified in medical waste management in AMSS are identified next from a technical point of view.

### a. Medical Centers with Medical Waste Management System

There are deficiencies in the labeling of wastes; it is not standardized and does not allow the identification of the generation source within the facilities.

Central warehouses do not have required settings such as drainage, hydraulic installations and restricted access only takes place in 50% of establishments.

There are no appropriate facilities to disinfect the containers utilized for the storage and haulage of wastes.

The use of nuclear medicine and the generation of radioactive waste concentrates in three hospital centers: Rosales from MSPAS, Medico Quirúrgico and Oncológico from ISSS.

However, the survey found 13 additional medical centers that report radioactive waste, what they mean came essentially from the X–ray system. Actually, this does not generate radioactive waste, but the exposure risk is present if radiological protection lacks or checkup by the corresponding teams.

From the three hospital centers that deal with nuclear medicine, the best equipped facility for this is the Oncology hospital; therefore, a greater support on these activities in the remaining centers should be provided.

### b. Medical Centers that Do Not Have a Hospital Solid Waste Management System

The majority of these hospitals report that they separate polluted from common waste; however, this separation is not reliable since no color code, tagging or standardized containers are used. They do not have written instructions or the willingness from the general management to implement them.