2. THE ORGANISATION AND PLANNING OF HEALTH SECTOR RESPONSE TO CHEMICAL ACCIDENTS

2.1 Introduction

This chapter considers the contribution of the health sector to general chemical emergency preparedness planning. It does not give detailed advice on drawing up a health sector Major Accident Plan, although the main elements of such a plan are outlined (see Section 2.3.1). This chapter does give advice about the special aspects of major chemical emergencies that the health sector needs to consider and plan for in advance of any accident occurring.

Section 2.2 outlines roles and responsibilities for emergency preparedness planning and emergency response, and draws attention to the need for local awareness and preparedness programmes, the importance of hazard identification and evaluation, and sources of information useful in emergency preparedness planning by the health sector. Section 2.3 goes on to consider chemical emergencies in relation to the elements of a health sector Major Emergency Plan. Section 2.4 goes into more detail on equipment and protection of personnel. Finally, Section 2.5 considers provision for accident investigation and follow-up.

In every major chemical emergency it is necessary to minimize harm to the population at risk, which may call for evacuation. In developed countries evacuation is usually only carried out if there is an immediate hazard such as an explosion, or a longer-term hazard such as contamination of air, soil or water by highly toxic substances. Poorly planned and executed evacuation may cause more harm than providing advice on personal protection and sheltering. Emergency plans should provide clear guidance on evacuation policy under local conditions.

2.2 Organisation of health sector response

2.2.1 Roles and responsibilities

Many countries have recognised the need to plan for disasters of various kinds. In some cases, this responsibility has been given to existing bodies such as the armed forces or civil defence services. In others, special organisations have been set up. Input from the health sector is required for disaster planning in general. All hospitals or other facilities which receive acute or emergency cases should have a Major Accident Plan, and this should be linked to the emergency plans of other concerned bodies, for example the local public authorities and police, fire and rescue services. It should provide for co-operation with other hospitals or health facilities in cases where there are large numbers of casualties.

In several countries, close co-operation between civil and military services has been established for coping with major accidents. Such co-operation can have clear advantages for both services, in terms of optimal use of available emergency resources and access to a larger number of trained medical personnel. Ultimate or overall command should be clearly established, and agreement should be reached regarding the integration of functional leadership of operations and medical responsibilities. Education and training exercises need to be undertaken jointly (see Chapter 4).

Health care professionals should contribute to the emergency preparedness planning process, as well as making it their responsibility to be aware of local emergency medical plans and their roles within them. Where there is no central organisation co-ordinating the roles and responsibilities of independent medical practitioners, the individuals concerned should develop their own emergency plans as necessary.

In this context, health authorities and hospitals need to consider and prepare for the special features and requirements of chemical accidents. These include: the availability of emergency medical information on a 24-hour, seven-day basis; specialised personnel, drugs and equipment; provision for decontamination and prevention of further contamination at all stages; and long-term epidemiological follow-up.

Public officials at the regional/state and national/federal levels need to ensure that these aspects are covered in the preparation of local and regional disaster plans.

Exposure beyond national borders is possible, and should be taken into account when emergency response plans are drawn up. These plans should include a list of information providers, and of sources of emergency response assistance, in neighbouring or potentially affected countries. (For health sector information needs, see Chapter 1).

In many countries, the task of organising and planning the health sector response to chemical accidents is performed by Poisons Information Centres at local, regional/state and national levels (see Section 1.3.2). These specialised information centres should make themselves aware of existing emergency plans and their roles in them. Besides acting as a source of toxicological information and advice, and in some cases undertaking a co-ordinating and/or management role, Poisons Information Centres are an important means of collecting and collating exposure data and clinical case data for assessing the real and potential consequences of a chemical accident.

The role of the Poisons Information Centre needs to be publicised. It should be contactable on a 24-hour basis, and should be staffed by specialists. It is most important that if emergency duty officers are expected to provide technical information, they have a sufficiently clear understanding of the nature of the information they are giving out to enable them to discuss this information with an enquirer.

2.2.2 Awareness and preparedness

In the context of emergency preparedness planning involving major chemical hazards, regional/state and national governments should encourage local awareness and preparedness programmes, for example by encouraging the application of UNEP's Awareness and Preparedness for Emergencies at the Local Level (APELL) process or similar activities. Local authorities, in turn, should be prepared to take part in APELL or a similar programme, including the exchange of all relevant information with local industry and the community. This will enable a co-ordinated emergency response plan to be developed at the local level. Hospitals and other receiving facilities, health care professionals and Poisons Information Centres/chemical response centres should be involved in this process.

2.2.3 Hazard inventories

Hazard inventories are an important means of identifying possible emergency situations. Hazardous situations within a specified geographical area, including hazardous facilities and the existence of hazardous (toxic) chemicals, should be identified. It should be noted that the handling and storage of hazardous chemicals occurs not only at chemical installations, but also at many other workplaces including

off-site storage areas and warehouses. The possibility of chemical accidents during transport should also be considered.

In carrying out hazard inventories, health services should liaise and closely co-operate with other public authorities or organisations that might also be involved in responding to a chemical accident. Assistance in carrying out such inventories should be given by, for example, local authorities and those responsible for environmental protection and preventive medicine, police and fire services, hospitals, emergency control centres, civil defence and military authorities, and industry.

Public authorities involved in community health care provision should contribute to the process of identifying and evaluating local situations that are potentially hazardous. Where other organisations with a formal responsibility for undertaking hazard evaluations do not exist, or in the absence of an effective interface between the local health authority and local industry, it may be necessary for local health care providers to make their own hazard evaluation(s).

Hospitals should actively contact local industries, and these industries should actively give hospitals and related facilities information concerning the presence of hazardous chemicals. These activities can be initiated by local or national government authorities.

2.2.4 Information needed for planning chemical accident response

Information needed by the health sector in order to plan its response to a possible chemical accident is addressed in Chapter 1. However, in addition to the obvious sources of information (Poisons Information Centres, chemical response centres, industry), public health authorities should consider approaching suppliers of antidotes and other drugs, and of resuscitation, protection and decontamination equipment, who can advise on use and availability.

If the health authority is itself conducting a hazard analysis, it should consider approaching:

- customs and transport officials, who may be able to advise on importation, distribution and movement of chemical products;
- meteorologists, for advice on the effects of the weather on chemical dispersion.

2.3 Major Accident Plans and chemical emergencies

2.3.1 Main elements of a health sector Major Accident Plan

A health authority's Major Accident Plan should contain at least the following elements:

- a command and control system and provision for an emergency communication system;
- provision for a hospital "flying squad" to be sent to the scene of the accident;
- hospital-level arrangements:
  - bed clearance;
  - patient reception area;

- patient identification and documentation;
- samples from patients, on which to base follow-up analysis;
- drugs, equipment and protective clothing;
- staff call-up

- information to relatives/the general public, directly and through the mass media, and press relations;

- standing down of emergency services;

- follow-up and evaluation of patients;

- training in the use of the plan, practical testing of the plan, and evaluation of the test results.

Regional/state and national/federal governments need to look at preparedness planning for large-scale emergencies that extend beyond local, or even national, boundaries.

The following paragraphs cover the points in these areas that refer particularly to chemical accidents and their consequences. Follow-up and evaluation of patients is addressed in Section 3.6, and training and education (including procedures for testing emergency preparedness plans) in Chapter 4. Therefore, these matters are omitted here.

2.3.2 Command and control and emergency communications

The primary task of first responders is to assess the scene, and then create order and establish lines of communication, even when this seems to limit initial rescue and containment activities. In the immediate area of an accident, information should be made available on contamination hazards, decontamination procedures, where applicable, and public safety.

Several countries have created co-ordination teams or command groups designated to be located at the perimeter of the accident site. The location of such a team should be well indicated, so that it is clear that this is the emergency information point. The service responsible for organising this point will vary from country to country. In many cases the command and control vehicle will be supplemented by additional vehicles from other services. Once at the site, the command and control centre/vehicle should be prominently located, although away from any danger of exposure to chemicals.

To make decisions on the management of the accident and its victims, the on-site co-ordinator will need to be informed rapidly about:

- the type and amount of chemicals involved in the accident, as well as handling and containment advice;

- the number of potentially contaminated persons, rescue capabilities, and the capacity of local treatment facilities;

- the weather, the condition of the immediate environment, and the likelihood of exposure of rescue workers;

- the number of rescue workers already active at the site, the location of these workers, and ways to communicate with them;

- the availability of additional resources, including a hospital "flying squad" and on-site medical co-ordinator.

Communications can be established from and to the scene of the accident by a variety of methods, for example telephone, telefax (facsimile), radio, pager, or any combination of these. It is essential that both the quality and the reliability of the means of communication be of a high standard. From experience in previous accidents, it appears that most information is requested using radio communication. Sufficient frequencies and an adequate number of radios should therefore be available. During preparations for responding to an accident, the compatibility of radio frequencies should be checked and adaptations should be carried out as necessary. If possible, the frequencies used by the different services should be separated so that a specific frequency or radio operator will not be overloaded.

The possibility of getting help from amateur radio operators should be considered where appropriate, for example when antidotes are needed in a hurry and cannot easily be obtained through other channels.

Medical staff need to be able to communicate directly with Poisons Information Centres/chemical response centres, in order to optimize the available information and allow hospitals and other receiving facilities to prepare for the patients they will be handling. If at all possible, this important information, when obtained directly, should be conveyed to the command and control centre so that a clear overview of the situation can be maintained by those in overall charge.

Conditions at the site of the accident may well be chaotic. Accurate communication of chemical or trade names of any product involved is essential. It is common practice for those in charge at accident sites to request information on chemicals from local emergency control centres. To ensure accurate communications, it is highly desirable to have an information check list specifically designed for completion by the person in charge at the accident site. The check list can guide or prompt the obtaining of relevant details. These details are recorded in a manner that facilitates interaction with a technical expert.

Emergency operators should use a special form on which the most important questions to be asked are prepared/outlined, and which will serve as a memory aid. Guidelines or instructions should have been given them regarding:

- further callers who may or may not be referring to the same accident;
- the telephone numbers of ranking officers in charge of the various emergency services;
- the telephone numbers of hospitals, other treatment facilities, specialised information centres, and important industrial sites in the area;
- back-up telephone numbers and alternative communications arrangements for use in emergencies.

2.3.3 Hospital flying squad

Health sector staff who go out to the scene of a major accident expect, and are expected, to start the diagnosis and initial treatment of victims if this has not already have been begun by first responders, especially the rescue services. However, the prioritization of victims (triage) is an important aspect of the health care professionals' on-site role. Triage is dealt with more fully in Chapter 3.

Health staff also have an important part to play in determining the accident area and in making decisions on the provision of decontamination facilities and evacuation of the accident area. These needs should be borne in mind when the composition of the flying squad for chemical emergencies is being decided.

The extent of the accident area needs to be determined, in order to make it possible to take decisions on the care of victims and the safety of the public and the environment. If a chemical accident takes place in a factory, the occupational health service needs to have plans at least for a general approach to accident response, taking into account existing facilities which could be used to manage exposed accident victims, including their decontamination, examination and treatment. When accidents occur in public buildings, for example indoor swimming pools, such treatment facilities are less likely to exist. However, health authorities can prepare plans for this type of emergency situation. Transport accidents can take place anywhere and are seldom prepared for in local authority disaster plans.

Preliminary information from the site should include: the type of accident; characteristics of the site (factory, public building, school, etc.; rural or industrial area); the danger of further accidents (fires, explosions, crashes); and the presence or release of toxic chemicals. Based on this information and its interpretation, for example by a Poisons Information Centre/chemical response centre, the on-site co-ordinator will need to decide on the actions to be taken immediately, including those intended to avoid or limit exposure of people and the environment. Ultimately, this may involve complete evacuation of the accident area. Medical input to these decisions is a necessity and this is best done on-site.

The on-site co-ordinator also has to determine whether there is a contaminated area that should be entered only by personnel wearing full protective clothing. Where possible, this determination should be made in co-operation with the medical co-ordinator and/or an industrial hygienist.

The on-site co-ordinator will also need to determine whether there is a possibility of contamination of rescue workers, by continued exposure or by contact with victims. It is also important to decide at an early stage whether there is a need for decontamination facilities at the site or at the hospital or other receiving facility. The medical co-ordinator will be needed to advise on these points.

There should be a system for registering workers in the accident area, and of the means of maintaining contact with them. There should be regular monitoring of the workers' situation, in addition to updating of the general information available to them.

2.3.4 Hospital-level arrangements

The elements identified under this heading at 2.3.1 above are of course common to general health sector Major Accident Plans for responding to all types of emergency. However, the following points should be particularly considered in relation to chemical emergencies.

A large-scale chemical emergency may produce large numbers of patients with burns and/or respiratory damage. It may be desirable to alert regional or national burns units and arrange for patients to be transferred there directly from the scene of the accident. Similarly, it may be appropriate to make the same arrangements with intensive care units in other hospitals for patients needing ventilation. If a decision is taken to treat victims in general acute beds, then practicable plans must also exist for adequate staffing and equipment of these beds.

The hospital laboratories and pharmacy will need to be alerted to the possibility of a large influx of requests for analyses and pharmaceuticals.

The reception area needed for large numbers of casualties will usually be larger than that of the average hospital accident and emergency department. It also needs to be equipped with showers for decontaminating victims.

The clerical process of identifying and documenting patients is the same as in any major emergency. However, it needs to be co-ordinated, not only with initial treatment but also with the taking of initial samples from all patients, partly for treatment but also partly as a basis for epidemiological follow-up -- a requirement associated with chemical emergencies which does not apply in many types of disaster. This implies both the availability of technicians and equipment and co-operation with registration staff to ensure than no one is missed.

Drugs, equipment and protective clothing are an important item for emergency preparedness planning in relation to chemical accidents. Antidotes and other drugs need to be available, if not immediately within the hospital, then at least obtainable within a short time.

The possibility of large numbers of patients needing help with breathing has already been mentioned. This implies the availability or obtainability of mechanical ventilators. An inventory of available ventilators should be carried out, bearing in mind that manual ventilation is possible but requires a considerable number of personnel.

Flying squad staff will need appropriate protective clothing and this may also need to be provided for medical and nursing staff receiving still-contaminated patients (see 2.4 below for more details)

All Major Accident Plans should provide for calling in extra staff and for maintaining an up-to-date register of names and telephone numbers. Where chemical emergencies are concerned, these should cover medical practitioners with experience in toxicology and intensive care and nursing staff with experience of using mechanical ventilators.

2.3.5 Information to the public and relations with the media

The provision of information to the public in the event of a chemical accident needs to be considered well in advance of such an accident actually occurring. It will be necessary to warn the potentially affected public that an accident has occurred, or is likely to occur, and to provide information on what should be done to minimize possible adverse effects. It is important to ensure that the system for communicating with the public is clear, and that it includes designation of those responsible for providing information directly or through the media. Health sector Major Accident Plans should provide for input into this system, particularly concerning public health precautions and the number and condition of victims.

Information given in the immediate area to first responders must be considered as likely to become available to the public. However, information provided by the caller making the first report of the accident, or information passed on to first responders, is often inaccurate or incomplete. As far as possible, only information known to be factual should be disseminated.

The media have enormous responsibility for how the public will react to a major chemical emergency. This is turn means that those responsible for managing the emergency, including health care professionals, are responsible for ensuring that the media are given correct information. This process will be easier if contact has already been made with representatives of the media, and if an understanding has already been developed on how to proceed if a chemical accident occurs.

Personnel operating in the field should not be expected to handle media relations. They should be instructed to refer media representatives to those designated to pass on information. Ideally, a press officer should be readily available and briefed to answer questions within the limits of the information known to be factual. The press officer must be able to obtain health advice to the public and details on the number and condition of victims from the health care professionals for onward transmission.

2.3.6 Standing down of emergency medical services

In general, decisions about standing down of services should be taken in conjunction with the overall site co-ordinator and never in isolation. For the emergency medical services, this will in effect mean that the flying squad should never leave the site until the site co-ordinator is satisfied that it has completed its job (as outlined in 2.3.3 above) and that its members will from then on be better occupied back at base.

Flying squad members should be prepared to contribute to a subsequent general debriefing on the workings of the overall emergency plan and lessons to be learned for the future.

2.4 Emergency equipment, medicines and antidotes, and protection of rescue workers and medical personnel

2.4.1 Emergency equipment

The types of emergency equipment needed to meet specific types of emergencies should be determined and this equipment obtained. All emergency equipment should be in working order, highly reliable, effective, and available when an emergency occurs.

The most effective storage areas for emergency equipment should also be determined. The value of storing such equipment near the sites of possible emergencies should be assessed, with consideration given to ease of accessibility and protection from unauthorised use, while periodic checks on its adequate functioning need to be carried out.

As part of emergency preparedness planning, it should be ensured that adequate medical facilities are available, including transportation facilities. In an emergency, this may mean the rapid transformation of facilities normally used for other purposes. Another important aspect of emergency preparedness planning concerns the equipment to be carried by emergency response personnel, most often in specially designated emergency response vehicles.

Decontamination equipment for on-site and hospital use and, as appropriate, protective equipment for medical personnel are discussed in Chapter 4.

2.4.2 Medicines and antidotes

Where suitable antidotes exist for persons injured by chemicals produced by industry, industry should be required to ensure the availability locally of the antidotes if obtaining them is a problem for the health authorities. Essential emergency medicines, kept up-to-date, should be available at or near installations handling toxic chemicals. Emergency treatment facilities, medical centres or hospitals in proximity to such installations -- or, if necessary, Poisons Information Centres in the region -- should also

stock appropriate emergency medicines and antidotes to deal with the consequences of a major chemical accident (see **Table 2.1**).

Public health and education authorities should ensure the basic training of all medical and paramedical professionals, as appropriate, in the use of emergency medicines and antidotes.

2.4.3 Personal protective equipment

In the case of accidents such as explosions or fires, for example, personal protective equipment may have to be used to afford full protection to personnel responding to them. In all situations, the clothing should be leak-proof and made of chemical-resistant material(s) which combine the greatest degree of comfort with the maximum level of protection. Two categories of protective clothing exist:

- chemical protective clothing (CPC); and
- respiratory protective equipment (RPE).

CPC includes garments, gloves, boots, coveralls with head gear, and fully encapsulating suits. These outfits are available in three categories: light duty (for exposure to dilute acids and alkalies), medium duty (adequate for most chemicals), and heavy duty (for exposure to extremely hazardous and corrosive chemicals).

There is also a range of RPE to be used in toxic or oxygen-deficient atmospheres. They can be divided into two new types: Emergency Escape Units, which can be used for short periods to allow escape from toxic atmospheres; and Self-Contained Breathing Apparatus, which gives a longer period of protection to individuals either entering or escaping from dangerous or toxic situations.

Contaminated protective clothing should always be washed, or hosed down, before the user or rescue worker takes it off. This will ensure a longer service life, and prevent contamination from occurring the next time the protective equipment is used.

All protective equipment should be:

- stored in a manner that prevents it from being damaged by an accident;
- easily accessible; and
- regularly inspected and maintained, with replacement as necessary.

Appropriate selection of protective clothing is critical, and therefore should be undertaken by qualified personnel such as an industrial hygienist or safety officer. Where this is not possible, advice should be sought from the fire service, Poisons Information Centre or chemical response centre. Personnel designated to use the protective equipment should be well-trained in how to use the equipment correctly. This training should be reinforced by being included in regular disaster simulation exercises.

Table 2.1 Antidotes and other drugs that may be needed in the event of a chemical accident

The choice and availability of antidotes may vary from country to country.

Substance:	Indication:
Amyl nitrite (for inhalation) **1**	Cyanides, nitriles
Atropine (for injection) **1**	Organophosphates, carbamates
Budesonide (for inhalation) * **1, 2**	Irritant gases
Betamethasone (for injection) (tablets) * **1, 2**	Irritant gases
Calcium gluconate (topical) **1**	Hydrofluoric acid
Calcium salts (for injection) **	Hydrofluoric acid
Cobalt edetate	Cyanides (nitriles)
Copper solution * **1**	Phosphorus white (yellow)
Dimercaprol	Arsenic, mercury
Dimercaptopropane sulfonate (DMPS) (for injection) (tablets)	Arsenic, mercury
Dimercaptosuccinic acid (DMSA) (for injection) (tablets)	Arsenic, mercury
Hydroxocobalamin (for injection) **1**	Cyanides, nitriles
4-Dimethylaminophenol (4-DMAP)	Cyanides
Methylthionine (methylene blue) (for injection) *	Nitrites, nitrobenzene (and other methomoglobin forming agents)
Obidoxime (for injection) * **1**	Organophosphates
Oxygen **1**	Carbon monoxide, cyanides, hydrogen sulphide, irritant gases, nitriles

Polyethylene glycol 400 (topical) **1**	Phenol
Potassium permanganate + sodium bicarbonate (topical) * **1**	Phosphorus, white (yellow)
Pralidoxime (for injection) * **1**	Organophosphates
Salbutamol (for inhalation) * **1**	Irritant gases
Sodium nitrite **1**	Cyanides, nitriles
Sodium thiosulphate (for injection) **1**	Cyanides, nitriles
Terbutaline sulphate (for inhalation) * **1**	Irritant gases
Tetracaine hydrochloride (eye drops) * **1**	Eye irrigation
Toluidine blue (for injection) *	Nitrites, dinitrobenzene (and other methemoglobin-forming agents)
Xanthine derivatives	Irritant gases

* *Can be replaced by an equivalent substance or preparation.*

** *Excluding calcium chloride.*

1 *Use may be required at the accident site.*

2 *These indications for the use of corticosteroids remain controversial.*

2.4.4 Protection of rescue workers and medical personnel

In responding to chemical accidents, there may be a danger that rescue personnel will be exposed to toxic chemicals. For this reason, protective equipment needs to be available for use. Personnel from rescue (fire) services are familiar with different types of protective equipment and should use it as required (for example, to work in a contaminated area or to rescue victims), as stated in 2.4.3.

Medical personnel should, in principle, never enter a contaminated area. They should only work at casualty assembly points, to which the injured are brought after decontamination. Only exceptionally should medical personnel need to enter the accident area, for example to carry out triage or give life-saving treatment. They may need to assist in decontamination procedures, but in that case they should be properly equipped, for example with a gas mask in case there is a change in wind direction that would expose them to a toxic chemical. Rubber gloves, a protective coat (and hood), and rubber boots should also be available.

As a rule, medical personnel should be guided by rescue personnel who have been trained to work in this environment. When indicated, they should wear protective equipment all the time they are working under adverse or toxic conditions. They may also need protective equipment at hospitals or other treatment facilities, especially during decontamination of victims.

2.5 Accident follow-up and evaluation

The purpose of an accident investigation is to establish all the facts relating to an accident and the response to it, to draw conclusions from these, and to make recommendations to prevent similar accidents. The right approach to accident investigation should be to establish the cause rather than apportioning blame.

Accident investigations and their findings are a crucial/critical part of every occupational health and safety programme. Responsible organisations should have a policy requiring accidents, dangerous accidents or "near-misses" to be investigated, analysed and reported on. The difference between a minor injury and a serious accident is often only a matter of chance.

2.5.1 Accident investigators

The safety and health care professional or inspector should verify the findings of the supervisor and make an independent investigation of every significant accident. He or she should make a written report to the proper official or to the health and safety committee. Specialised training and analytical experience can enable this individual to search for all the facts and submit a detailed, unbiased report.

The health and safety committee in many companies is concerned with a range of activities. Accident investigation is an important function. Ordinary investigations would normally be handled in a routine manner, but in important cases the chairman of the company may call an emergency meeting of the committee with instructions to conduct a special investigation. In some companies, a special committee may be set up to investigate and report on all serious accidents.

2.5.2 Accident investigation techniques

In order to obtain as accurate evidence as possible, the accident investigation should be undertaken immediately after the accident. Wherever possible, the accident should be discussed at an early stage with the injured person(s) to obtain their version/account of events. If the injured individual(s) is (are) sent home, to a treatment centre, or to hospital, the follow-up may have to be postponed until they are well enough to be visited.

Witnesses should be interviewed as soon as possible after the accident. In taking their evidence, care should be exercised in differentiating between what are verifiable/measurable facts and what may later be shown to be hearsay or opinion. Witnesses should be interviewed individually, although if they wish they may be accompanied by a legal representative or legal counsel. The object of the investigation (to establish the cause of the accident and not to apportion blame) should be clearly explained.

2.5.3 Information and data collection

The purpose of the accident investigation is to discover information concerning the accident and how it occurred, and the nature of any injuries sustained, and to record the relevant facts. The records, both individually and collectively, should provide insights into the areas, conditions and circumstances to which accident prevention and response efforts could most profitably be directed.

2.5.4 Data analysis

Simply to obtain information and report on the accident will not prevent its recurrence. Circumstances or conditions should be corrected. It is often only after carrying out a thorough analysis of several accident investigations that inadequate policies, procedures or failure in management systems become apparent. The study of a single case, on the other hand, may not point out as clearly the necessary corrective actions that need to be taken.