Clinical Management

of Acute Pesticide Intoxication:

Prevention of Suicidal Behaviours

Management of Mental and Brain Disorders

Department of Mental Health and Substance Abuse

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This document is a first edition, presenting the key points to start with in a long-term process towards guidelines on the clinical management of pesticide poisoning. At this stage it is an experts' technical consensus on best practices and setting the scene for more research to fill important gaps in knowledge. It is anticipated that the recommendations in this document will remain valid until 2013 when new research findings should be available to complement and update the current version.

Clinical Management of Acute Pesticide Intoxication: Prevention of Suicidal Behaviours

Background

Intentional self-poisoning with pesticide as a suicidal behaviour came to the attention of the Department of Mental Health and Substance Abuse of the World Health Organization (WHO) in the early years of this decade. The Department then joined with the Department of Violence and Injury Prevention and the International Programme on Chemical Safety of WHO to launch an initiative in 2004 to reduce the global number of deaths from pesticide poisoning entitled The WHO Global Public Health Initiative on the Impact of Pesticides and Health: Preventing Intentional and Unintentional Deaths from Pesticide Poisoning.

The initiative's five aims are to:

i. Review and recommend improved pesticide regulatory policies.

ii. Implement sustainable epidemiological surveillance and monitoring of pesticide poisoning in clinical settings and communities.

iii. Improve the medical management and mental health care of people with pesticide poisoning in health care facilities at different levels.

iv. Provide training at different sectors and levels.

v. Develop or strengthen community programmes that minimize risks of intentional and unintentional pesticide poisoning.

Whenever necessary and requested WHO is ready to provide the relevant technical assistance to its Member States in the development or strengthening activities related to those aims. However, it is of particular concern that in relation to pesticides, international organizations and nongovernmental organizations are not dedicating sufficient attention to intentional self-harm, preferring instead to concentrate on unintentional poisoning (accidental or occupational exposure). There is a need to engage their interest also in intentional self-poisoning with pesticides.

The specific purpose of this document is to address the third aim (see iii. above) - improving medical management and mental health care of people with pesticide poisoning in health care facilities at different levels. More particularly, to describe best practices in the clinical management of acute intoxication with pesticides, accidental and intentional, for different levels of staff in the health care system, i.e. primary health care, district hospitals, and specialized units. Since in many countries pesticides are used in a large proportion of deliberate self-harm, the appropriate management of pesticide intoxication can considerably reduce the number of deaths and improve the recovery in cases of non-fatal intoxication.

However, before entering into the subject matter of this document, it is useful to say a few words about the other aims of this initiative.

Pesticides policy

Any actions addressing the impact of pesticides on health should be in principle framed within sound national suicide prevention strategies and pesticide policies, including their implementation at different levels.

Aim i. above includes, more specifically, global efforts towards banning the most toxic pesticides, according to the Hazardous Chemicals and Wastes Conventions, i.e. the Basel, Rotterdam, and Stockholm Conventions (www.basel.int; www.pic.int; www.pops.int; last accessed on 3 April 2008). It is not only crucial for governments to ratify and implement these conventions; they must also work to ensure their enforcement and effectiveness. The effective regulation at the local level is crucial, since ineffective control would result in banned pesticides being provided by the black market with poor quality control and labelling. In addition, efforts need to be made to reduce human toxicity of pesticides used in agriculture.

Regulation of the pesticides used in Sri Lankan agricultural practice has clearly shown that bans of the most toxic pesticides result in a sustained overall reduction in the number of deaths from intentional pesticide poisoning (Gunnell et al., 2007a). Unfortunately, pesticide poisoning due to intentional ingestion has been excluded from the conventions for unclear reasons (Konradsen et al., 2005). However, banning of the most toxic pesticides has clearly reduced the number of significant unintentional poisoning episodes.

Community action for the reduction of risks associated with pesticides

Due a variety of reasons, practical work related to the Pesticides and Health initiative started from the fifth aim (see aim v. mentioned above), on community action to minimize the adverse risks of intentional and unintentional pesticide poisoning, through a safer access to pesticides. Improved storage safety is part of the fifth aim. In May 2006, WHO convened a meeting of experts coming from four regions, that produced the publication entitled *Safer Access to Pesticides: Community Interventions*. Three main types of promising community interventions were identified, i.e. safer storage (household and communal), community education, and psychosocial interventions. A follow-up meeting was held in 2007 in order to discuss proposals for feasibility demonstration projects in China, India and Sri Lanka.

These projects will be operational in 2008 and have been framed as feasibility demonstration projects that will be adequately and objectively evaluated with the involvement of full time researchers; this will provide the research with quality audit, an essential feature if the work is to be recognized as of high quality and then incorporated into public health practice. The projects are supported by the pesticide industry.

Training

The availability of guidelines or accessible descriptions of best practices is essential for the initiation of activities related to training (see aim iv. above), since there are no standardized practices for the management of acute poisoning with pesticides, particularly in low and middle income countries, and on presentation to different levels of health care. Progress of activities related to aim iii. (the main purpose of this document), will allow the development of training programmes.

The identification of centres of excellence in low-income countries where pesticide poisoning is a public health issue is an important step in this direction.

Surveillance

In the absence of systematic data collection related to pesticide poisoning (accidental or intentional), the initiative Pesticide and Health is planning to start sustainable epidemiological surveillance and monitoring systems of pesticide poisoning (see aim ii. above), starting from clinical settings connected to the communities where demonstration projects will be initiated in 2008.

The above-mentioned training centres of excellence could also act as sentinel centres that could support data collection from across the world and make the information obtained available to governments, health agencies and other interested parties. Even low-tech sentinel sites could be very valuable and play a role: work conducted in Sri Lanka has shown that a history of ingestion of a particular pesticide was usually proved correct on subsequent formal analysis of blood samples (Eddleston et al., 2005; Roberts et al., 2005).

Pesticides most frequently used in accidental/deliberate intoxication

Globally, there is a scarcity of information on the magnitude of both intentional and unintentional poisoning, as well as on the relative importance of different pesticides. This information is particularly lacking from most of Africa, and detailed and accurate community-based data on the pesticides responsible for fatal self-harm are not available for most of rural Asia. Sentinel centres, that would need to be identified and supported, could provide this information from across the world.

At any rate, it is known that the pesticides that cause most deaths in rural Asia, and in the world, are WHO Class I and II organophosphorus pesticides - causing an estimated 200,000 deaths (Buckley et al., 2004; Eddleston, 2000; Gunnell et al., 2007b). At any rate, in rural Asia, the variety of pesticides available in communities for intentional or unintentional poisoning is large, reflecting the pesticides used in local agriculture. Studies from Sri Lanka suggest that less than 20% of pesticides used for self-harm

are bought for the purpose; the majority are freely available in the home or nearby garden (Eddleston et al., 2006a).

The vast majority of these deaths are intentional; unintentional oral or dermal exposure to WHO Class I OP pesticides can cause severe poisoning but the doses are usually smaller than with intentional poisoning, resulting in fewer deaths. WHO Class II OPs are generally less toxic in unintentional poisoning. Where Class II OPs are the most commonly used insecticides, unintentional poisoning is generally less likely to cause severe poisoning. Class II OPs are highly toxic in intentional overdose.

Other classes of pesticide that are common causes of significant and/or fatal poisoning include carbamate and organochlorine insecticides, the fumigant aluminium phosphide (a significant problem in north India), and the herbicide paraquat. Less common causes of significant poisoning include the herbicides chlorphenoxy acetic acid derivatives and propanil, some pyrethroid insecticides, avermectins, and amitraz (Eddleston, 2000).

The locally available pesticides will also determine how many poisoned people survive to hospital presentation. In areas where highly toxic fast acting WHO Class I organophosphorus (OP) pesticides are used, the onset of poisoning can be so fast that many people die before they can be taken to hospital. By contrast, where slower acting pesticides are used, more patients will survive to reach hospital and medical care (Eddleston et al., 2008a). The case fatality for different pesticides also varies markedly, from around 70% for both aluminium phosphide and paraquat, to close to 0% for many of the newer lower toxicity pesticides (Dawson and Buckley, 2007; Eddleston, 2000). Therefore, hospital statistics, whether from primary or secondary hospitals, must be interpreted in light of this difference.

More than half of global deaths from pesticide poisoning occur in China (Buckley et al., 2004; Phillips et al., 2002), where currently, the WHO Class I OP pesticides are the major problem, but where five Class I OPs (methamidophos, methylparathion, parathion, monocrotophos, phoxim) have been recently banned. This was expected to reduce the number of poisoning deaths in China, and has since been associated with a possible 10-15% fall in overall suicide rates in women. In China, some deaths occur from pesticides that are considered to be generally safe in poisoning.

More recently developed pesticides are generally safer than the older pesticides still used widely in low- and middle income countries. While the main international pesticide industry would be keen to sell the newer pesticides, it is likely that the generics and black market industry that is particularly active in low- and middle income countries would not change their sales.

For different reasons, raising attention to intentional and accidental pesticide poisoning has been more difficult than the importance given to occupational exposure. However, both national authorities, agencies and

organizations, and international organizations should consider these three forms of poisoning together, at all opportunities. As the global use of WHO Class I OPs reduces over the coming years, due to the enforcement of international bans, the relative importance any kind of poisoning (including any health hazards) due to other classes of pesticides will increase. By combining all forms of poisoning, it should be possible to keep better monitoring and surveillance, broadening advocacy, at the same token.

The management of pesticide poisoned patients at various levels of health care

In putting together the following elements of guidance for health care workers at different levels of the health care system, the experts who participated in the meeting considered previously released guidelines, some of which were produced by WHO, literature reviews, publications, and their extensive experience and expert knowledge in this area.

Basic elements

Respiratory failure is the primary cause of death following the ingestion of pesticides, either due to specific anti-cholinesterase effects of OP and carbamate poisoning, or - for all pesticides - the non-specific complications of aspiration (Eddleston et al., 2006b). Also, much aspiration results from poor initial care of the patient and/or unsafe gastric decontamination. Therefore, the two basic elements of the clinical management of acute intoxication with pesticides are airway management and antidote administration. The ABC of supportive care - Airway, Breathing, and Circulation - is crucial. It is not possible to over-emphasize the need to apply the basic treatment correctly, to tailor treatment to the patient, to evaluate the need for gastric decontamination, and to give antidotes early.

In emergency medical treatment the initial management is pivotal, yet, in spite of a great variation in initial management, with no standardization, the basic principles of initial resuscitation and assessment are often applied only after gastric decontamination for which there is currently no evidence of benefit (American Academy of Clinical Toxicology and European Association of Poison Centres and Clinical Toxicologists, 2004a, b; Yi et al., 2008). Information on safe airway management and intubation should be part of the basic training of any health worker and included in any document on management of emergencies published by health agencies and authorities.

Gastric lavage

The importance of iatrogenic deaths as shown by the number of deaths occurring after ingestion of low toxicity pesticides needs to be emphasized (Eddleston et al., 2007). The role of inappropriate gastric decontamination in these deaths is important. There is a need to tailor treatment to the poison and the patient; for example, if a person has ingested a low toxicity pesticide

and does not show clinical features of poisoning, it may be best to only observe and support the patient rather than carrying out gastric decontamination and giving antidotes.

There is much discussion about the use of gastric lavage or forced emesis compared to activated charcoal in pesticide poisoned patients. Recent studies indicate that single or multiple doses of activated charcoal are safe in pesticide poisoned patients, including patients receiving appropriate amounts of atropine (Eddleston et al., 2008b). By contrast, both forced emesis and gastric lavage have potential serious complications if performed in non-consenting patients or unconscious patients without airway protection (Eddleston et al., 2007). However, in light of the absence of direct data showing the benefits of charcoal over other forms of gastric decontamination, it is difficult to make a strong recommendation.

Overall, if a patient presented within one hour to a health care facility, the administration of activated charcoal should be considered if the patient is conscious and gives consent. The patient should not be forced to accept the charcoal. Forced emesis is not recommended. Oral fluids should not be given.

Antidotes

Atropine is the most important antidote for pesticide poisoning, being effective in OP and carbamate poisoning (Eddleston et al., 2008; Freeman and Epstein, 1955). However, the dosing recommendations given in different sources vary markedly and there is much variation in how it is given in practice (Eddleston et al., 2004).

The effectiveness of the second antidote for OP poisoning, an oxime such as pralidoxime, also varies markedly according to the OP and the ingested dose. Current recommendations are to give oximes to all OP poisoned patients requiring atropine (Johnson et al., 2000); however, many patients do not seem to benefit (Eddleston et al., 2005). More data are required. Suxamethonium be avoided when intubating OP pesticide poisoned patients. There is great need for consistent evidence-based recommendations and more importance to be placed on sustainable access to antidotes in the rural hospitals that see most patients. Current research aims to identify new affordable and effective antidotes.

Monitoring

As to the immediate monitoring of the patient, the Glasgow Coma Score (GCS) on admission appears to be the best predicator of outcome - patients with GCS 15/15 have a <5% risk of death while patients with GCS <10/15 have a 60% risk of death. GCS is a clear marker of outcome in OP pesticide poisoning in particular (Davies et al., 2008).

Where to treat

In view of the relatively high risk of death after pesticide poisoning, all patients should be sent as quickly as possible to the nearest health care facility. At that point the skills and resources available to the health care worker will determine whether the patient should be transferred urgently onwards to a better resourced hospital or kept under observation in the first health care facility.

Many patients will present to peripheral elements of the health services, such as small rural hospitals, where staff and resources are inadequate to manage the patient. Such hospitals should safely transfer all patients who present to them. Patients should only be kept at these peripheral health units, if they do not show clinical features of poisoning AND the staff are able to manage any patient who begins to show clinical features (see below). If these skills and resources are available, patients who do not develop clinical features can be safely discharged home without the cost of transfer to or observation in a distant referral hospital.

For a pesticide poisoned patient to be safe in a health care facility, a minimum set of skills and resources must be available:

- skills and knowledge about how to resuscitate patients and assess for clinical features of pesticide poisoning;
- skills and knowledge to manage the airway, in particular to intubate and support breathing until a ventilator can be attached;
- atropine and means for its intravenous (IV) administration if signs of cholinergic poisoning develop;
- diazepam and means for its IV administration if the patient develops seizures.

If any of these skills and resources are not available in the health care facility, then the patient should be transferred to one that does.

The availability of these skills and resources will allow asymptomatic patients to be safely observed in the peripheral unit until they develop clinical features of poisoning. At this point, since respiratory failure is the primary cause of preventable death in pesticide poisoning, symptomatic patients should be observed in a facility able to offer respiratory support, 24-hour observation (in an Intensive Care Unit) if required, and a large supply of

antidotes. This might be the first hospital to which the patient presented; however, it will most often be a secondary referral hospital to which the patient should be transferred safely as soon as possible.

All facilities keeping poisoned patients for observation should be able to further assess ongoing suicide risk and mental illness in a poisoned patient. Often, a decision to provide supportive care only, without medical intervention is appropriate.

Resources

Two resources are currently available for educating clinicians about the treatment of pesticide poisoning:

- "Sound management of pesticides and diagnosis and treatment of pesticide poisoning" - a WHO/UNEP resource tool intended to assist national programmes and those involved in the management of pesticides, and with diagnosis and treatment of pesticide poisoning, in formulating training courses, adapted to specific needs of different target groups. (http://www.who.int/whopes/recommendations/en/, last accessed 3 April 2008)

- WikiTox - a free online resource for teaching materials on toxicology, funded by the South Asian Clinical Toxicology Research Collaboration (SACTRC). (http://curriculum.toxicology.wikispaces.net/, last accessed 3 April 2008).

Best practices in the clinical management of pesticide poisoned patients at various levels of health care, that include also the recommendations of the two resources mentioned above, are summarized in Annex A. It is desirable that these be tested out.

Incorporation of information into practice

The process of changing clinical practice is a complex one. It is not a simple task to change individual clinicians' practice in response to guidelines, even with an accompanying training and supervision programme. The adoption and implementation of newly introduced treatment guidelines need to be carefully and critically assessed from its beginning.

Probably the most effective route for change refers to the education of medical and other health students, who will then move out to clinical practice, some of them in rural areas as medical or health officers after graduation. In its absence, or as a complement to it, in-service training offers another good opportunity of introducing new practices. One positive recent example comes from the training of non-medical health care workers to provide treatment with anti-retroviral medication for HIV-infected people (World Health Organization, 2005). Ongoing studies are showing good results and that it is also possible

for non-health care workers to provide treatment where health care workers are in short supply.

Any change in clinical practice touching issues of relevance to public health needs the support from both the Ministry of Health and from health care workers on the ground. It can also be boosted by extensive support from relevant international organizations, such as WHO, FAO and UNICEF. There is a particular need to understand the local drivers for change, requiring a situational analysis for each location.

Another example of a possible avenue for the introduction of positive changes in the clinical management of acute pesticide poisoning would be its inclusion in WHO guidelines for Integrated Management of Adolescent and Adult Illness (IMAI) (World Health Organization, 2004). This is a well structured set of principles and guidelines for what its name indicates; it is already available for first-level facility health workers and lay providers in low-resource settings, and is now being finalized for the second-level health care facilities.

In IMAI there is a section on the management of poisoning, in general, and the incorporation of pesticide poisoning into these guidelines, which are translated into several languages, would likely increase the profile of this problem. A proposal of how pesticide poisoning could be integrated into the IMAI approach, as well as producing a clinical pathway for assessing pesticide poisoned patients can be found in Annex B.

Finally, Tugwell and colleagues (Tugwell et al., 2006) presented one model of affecting and monitoring change that involved a cascade of steps to assess and prioritize barriers and to choose effective knowledge translation interventions. In particular, it presented the six audiences through which change can occur (the six Ps - *P*ublic, *P*atient, *P*ractitioner, *P*olicy maker, *P*ress, and *P*rivate sector). This model could also be a useful guide to assist in the introduction of new approaches to the clinical management of pesticide poisoning.

The way ahead

As indicated previously, there is a great need of additional and better quality information related both to the extent and nature of pesticide poisoning, and its clinical and public health management.

This document, presenting an experts' technical consensus on best practices (see Annex A), hopes to make one step further in a long-term process towards guidelines on the clinical management of pesticide poisoning that require a comprehensive evidence base. Important gaps in knowledge will need to be tackled in a research oriented framework.

In the area of **community care**, research questions to tackle in the future are as follows:

1. The role of mechanically induced emesis soon after ingestion (in particular the balance of effects of early emesis vs. risks of aspiration, delay, vagal stimulation, sympathetic drive); and
2. The level of resistance to a recommendation not to give fluid to drink as well as the lack of a recommendation to give forced emesis.

Regarding **first level health care facilities**, there are the following research questions:

1. What is the value of a bolus of atropine (1-5 mg) given IM or IV before transfer?
2. What is the availability of the necessary skill sets in different level hospitals in developing countries?
3. What is the knowledge or skill gap? and
4. What will be the impact of this management strategy?

Regarding **second level health care facilities**, the research questions are as follows:

1. Is there a need for a higher level of specialized care for pesticide poisoned patients?
2. What is the cost-effectiveness of different antidotes at different levels of health care (dependent on the time to treatment and locally common OP pesticides)? and
3. What could be the optimal training strategy for the provision of supportive emergency care, including airway management, in rural healthcare settings?

Further tasks are the evaluation of the current status of pesticide management in rural Asia (including the assessment of current practices both in the community and among primary health care workers), the level of ongoing monitoring, techniques for teaching first and second level health care workers, and how to get local actors interested in the problem.

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Annex A

An experts' technical consensus on best practices in the clinical management of pesticide poisoned patients at various levels of health care

COMMUNITY LEVEL

Person found with history and/or clinical features of pesticide poisoning

1. Immediately transfer the person to a health care facility.

2. Take along the bottle, as long as obtaining it does not delay transfer.

3. Do not give any fluid to drink.

FIRST-LEVEL HEALTH CARE FACILITY

Person presents with a history and/or clinical features of pesticide poisoning

1. Does the health care worker have the skills to assess and monitor the patient?

YES

NO ⇨ Transfer to a better resourced hospital.
Consider giving 1-2 mg IM bolus of atropine.

2. Assess the patient.

3. Does the health care worker have the skills and resources to intubate/manage the airway?

YES

NO ⇨ Transfer to a better resourced hospital.
Assess need for atropine +/- diazepam.
Consider giving 1-2 mg IM bolus of atropine.

4. Manage the airway as required.

INTUBATED

NOT INTUBATED ⇨ SEE BELOW: **NOT INTUBATED**

5. Does the health care worker have the skills and resources to give atropine?

YES

NO ⇨ Transfer intubated patient to a better resourced hospital.
Consider giving 1-2 mg IM bolus of atropine.

6. Does the patient need atropine?

YES

NO ⇨ Transfer intubated patient to a better resourced hospital, if needed (see point 11. below).

7. Give atropine.

8. Does the health care worker have the skills and resources to give diazepam?

YES

NO ⇨ Transfer intubated patient to a better resourced hospital.
Give atropine by infusion during the transfer.

9. Does the patient need diazepam?

YES

NO ⇨ Transfer intubated patient to a better resourced hospital, if needed (see point 11. below).
Give atropine by infusion during the transfer.

10. Give diazepam.

11. Transfer intubated patient to a better resourced hospital, if the facilities of a secondary hospital (see p. 23) are not present on site.
Give atropine by infusion during the transfer.

If the patient remains well, with 1) no change in consciousness, 2) no change in vitals, 3) no cholinergic features, keep the patient, assess for suicidal ideation, and discharge home after 24 hours and when safe from a mental health perspective.

NOT INTUBATED: CONTINUED FROM ABOVE: **4. Manage the airway as required**:

⇨ NOT INTUBATED

5. Does the health care worker have the skills and resources to give atropine?

⇩ YES ⇩

⇩ NO ⇨ Transfer to a better resourced hospital.
Consider giving 1-2 mg IM bolus of atropine.

6. Does the patient need atropine?

⇩ NO ⇩

⇩ YES ⇨ Give atropine and assess need for diazepam.
Transfer to a better resourced hospital, if needed (see point 10. below).
Give atropine by infusion during the transfer.

7. Does the health care worker have the skills and resources to give diazepam?

⇩ YES ⇩

⇩ NO ⇨ Transfer to a better resourced hospital.
Consider giving 1-2 mg IM bolus of atropine.

8. Does the patient need diazepam?

⇩ NO ⇩

⇩ YES ⇨ Give diazepam.
Transfer to a better resourced hospital, if needed (see point 10. below).

9. Keep patient and observe.

10. Observe patient for: Vitals
Consciousness
Cholinergic features

If these change, assess need for atropine and diazepam.
Transfer to a better resourced hospital.

If the patient remains well, with 1) no change in consciousness, 2) no change in vitals, 3) no cholinergic features, keep the patient, assess for suicidal ideation, and discharge home after 24 hours and when safe from a mental health perspective.

SECOND-LEVEL HEALTH CARE FACILITY

Requirements for a second-level health care facility treating pesticide poisoned patients

1. Ventilator.

2. Staff to provide 24-hour a day observation.

3. Adequate supply of antidotes for all referred patients.

4. Knowledge, skills, and therapies for treating patients poisoned with OP and other pesticides (for example, propanil, thallium, copper sulphate, arsenic).

Note that patients may present initially to a hospital that has these facilities.

Annex B

A proposal of how pesticide poisoning could be integrated into the IMAI approach

IMAI guideline, page 7:

"You will need to do the assessment for any of these symptoms if volunteered or observed:

- Fever (28-30)"

ADD HERE:

- *Poisoning (xx-xx) or envenoming (xx-xx)*

****

IMAI guideline, page 13, first box:

"If convulsing, also:
- Give diazepam IV or rectally.
- Continue diazepam en route as needed."

ADD HERE:

- *If poisoning is suspected, phenobarbital is the second line antiepileptic (not phenytoin due to the latter's effects on sodium channels).*

****

IMAI guideline, page 14:

"FEVER from LIFE-THREATENING CAUSE"

ADD HERE 1.:

LIFE-THREATENING PESTICIDE POISONING
Patient has:
- History or evidence of pesticide exposure
- Small pupils
- Profuse sweating
- Difficulty breathing

ADD HERE 2.:

LIFE-THREATENING ENVENOMING
Patient has:
- History or evidence of envenoming
- Locally relevant features of envenoming (e.g. haemorrhage, dyspnoea, severe local swelling)

WITH AN ARROW TO AN ADDITIONAL BOX, PAGE 15, ADD FOR 1.:

- *Insert IV drip with 0.9% sodium chloride infusion fluid.*
- *Give atropine 1.2-3 mg intravenously.*
- *Listen to lungs, take pulse, and measure blood pressure.*
- *Aim for clear lungs, pulse >80 bpm, systolic BP >80 mmHg.*
- *Recheck at five minutes; if no improvement, give double the initial dose of atropine.*
- *Continue to give doubling doses of atropine every 5-10 minutes until the patient is stable (all three aims listed above are fulfilled).*
- *Give supportive care.*

WITH AN ARROW TO AN ADDITIONAL BOX, PAGE 15, ADD FOR 2.:

- *Insert IV drip with 0.9% sodium chloride infusion fluid.*
- *Give antivenom as per local guidelines.*
- *Give supportive care.*

****

IMAI guideline, page 52:

SIGNS:

- *Small pupils*
- *Profuse sweating*
- *(+/- difficulty with breathing)*

CLASSIFY AS:
LIKELY ORGANOPHOSPHORUS OR CARBAMATE PESTICIDE POISONING

TREATMENTS:

- *Resuscitate as per pages 10-15.*
- *Intubate and give mechanical ventilation as required.*
- *Give atropine as required (p 15) until lungs are clear, pulse >80 bpm, systolic BP >80 mmHg.*
- *Give loading dose of pralidoxime chloride IV (1-2 g over 20 min in 200 ml of 0.9% sodium chloride infusion fluid) followed by 500 mg/hr until atropine is no longer required.*
- *Observe carefully for changes in atropine requirements and ventilation.*

Note: If patients have a history of pesticide poisoning but not features suggestive of organophosphorus or carbamate pesticide poisoning, the majority can be managed by careful observation. Locally specific knowledge is required about these other pesticides.