Improving the availability of poisons centre services in Eastern Africa

Highlights from a Feasibility Study for a Subregional Poison Centre in the Eastern Africa Subregion, including a toolkit on setting up a poisons information service.
Project funded through the Quick Start Programme of the Strategic Approach to International Chemicals Management (SAICM) (Project No. X.04.G.ZMB).

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The complete project report can be obtained from the SAICM Secretariat at saicm.chemicals@unep.org or from Joanna Tempowski at tempowskij@who.int.

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## Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>AAPCC</td>
<td>American Association of Poison Control Centers</td>
</tr>
<tr>
<td>COMESA</td>
<td>Common Market for East and Central Africa</td>
</tr>
<tr>
<td>DALYs</td>
<td>Disability adjusted life years</td>
</tr>
<tr>
<td>DaTIS</td>
<td>Drug and Toxicology Information Service, Harare, Zimbabwe</td>
</tr>
<tr>
<td>EAC</td>
<td>East African Community</td>
</tr>
<tr>
<td>EAPCCT</td>
<td>European Association of Poisons Centres and Clinical Toxicologists</td>
</tr>
<tr>
<td>IHR (2005)</td>
<td>International Health Regulations, 2005 revision</td>
</tr>
<tr>
<td>km²</td>
<td>Square kilometre</td>
</tr>
<tr>
<td>NAPCAT</td>
<td>Network of African Poisons Centres and Applied Toxicologists</td>
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<tr>
<td>NGOs</td>
<td>Non-governmental organizations</td>
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<tr>
<td>NPDS</td>
<td>National Poison Data System</td>
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<tr>
<td>NPIC</td>
<td>National Poisons Information Centre Dublin, Ireland</td>
</tr>
<tr>
<td>NZNPC</td>
<td>New Zealand National Poisons Centre</td>
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<tr>
<td>PIMC</td>
<td>Poison Information and Management Centre, Nairobi, Kenya</td>
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<tr>
<td>SADC</td>
<td>Southern African Development Community</td>
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<tr>
<td>SAICM</td>
<td>Strategic Approach to International Chemicals Management</td>
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<td>WHO</td>
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Executive summary

1. Background

This booklet presents a summarised synthesis of a project carried out to explore the feasibility of a subregional poisons centre in Eastern Africa. The project was initiated at the request of the SAICM Africa Core Group to address the lack of poisons centres in the region, and was funded by the SAICM Quick Start Programme. The project ran from January 2012 to December 2013.

The overall objective of the project was to find a means for improving the provision of poisons centre services in Africa.

The countries included in this study were: Burundi, Comoros, Djibouti, Eritrea, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Mozambique, Rwanda, Seychelles, Uganda, United Republic of Tanzania, Zambia and Zimbabwe. Prior to the start of the project, three poisons centres had been identified in the subregion: two in Nairobi, Kenya and one in Harare, Zimbabwe.

2. Introduction

Poisoning presents a significant public health burden in the subregion. In the countries covered by this study it is estimated that unintentional poisoning accounts for 16 500 deaths and 1 128 500 DALYs. This is an underestimate of the true burden of poisoning since these figures do not include self-poisoning and snakebite. It is estimated that intentional self-poisoning with pesticides causes 7800 deaths per year in the African region, and snakebite causes between 1400 and 10 000 deaths in eastern sub-Saharan Africa.

A poisons centre is a centre of expertise about chemicals and toxins and their harmful effects. As a minimum it is a poisons information service that provides emergency information, but some centres also include a toxicology laboratory and/or a clinical treatment unit. The rapid growth of the chemicals industry in Africa increases the need for poisons centre services. Poisons centres have been identified as a required capacity for implementation of the International Health Regulations (2005).

3. Project activities

Information has been synthesised from two major activities: a literature review and an extensive stakeholder consultation.

The literature review sought background information on the 16 countries in the subregion, particularly on the epidemiology of poisoning and on health system characteristics. The review also sought information on poisons centres more generally and on examples of cross-border poisons centre services.
The stakeholder consultation involved an attitudes survey of the 16 countries, two international workshops and national workshops in Kenya, United Republic of Tanzania, Zambia and Zimbabwe. The stakeholders consulted included poisons centre staff, hospital medical directors, representatives from ministries of health, environment, agriculture, labour and industry, regulatory authorities, trade associations, professional associations, SAICM National Focal Points, Rotterdam Convention focal points and NGOs. Additional information and perspective was provided by the project Steering Group.

4. Project outcomes

Literature review

The countries of the subregion span a large geographical, linguistic and cultural range. There is a wide variation in terms of indicators relevant to the establishment and work of poisons centres. Access to telephone services and the internet is limited in most countries in the subregion, though this is improving rapidly in some countries.

The amount spent on health per capita varies considerably and even in the highest spending country expenditure is low compared with OECD countries. Only two countries have the minimum number of healthcare workers judged sufficient by WHO to provide essential interventions.

There are relatively few published data on the epidemiology of poisoning in the subregion. Commonly reported forms of poisoning include pesticide poisoning, kerosene ingestion by children, and poisoning with household products, traditional medicines and natural toxins, including snakebite. Some studies found a relatively high case-fatality rate for poisoning, in particular for accidental poisoning in children. This contrasts with developed countries where accidental poisoning rarely causes deaths in children.

The most common model for a poisons centre is a telephone-based information service in a single country. Only two examples of a formal cross-border poisons centre service were found. In both cases a poisons centre in one country covered the out-of-hours service in another country. To enable this, procedures were agreed for documenting and reporting the enquiries from the other country, and essential databases and country-specific information were shared. Many poisons centres answer ad hoc enquiries from other countries, however, there is no mechanism for follow-up or for reporting back to national health authorities. There has been a growth in internet and other electronic poisons information databases, including the AfriTox® database available in the African region, and TOXINZ® (from New Zealand) available to low-income countries through HINARI.

Studies on cost-effectiveness have shown that, whatever the configuration of the poisons centre, they provide a positive cost-benefit.
Stakeholder consultation: attitudes and options
There was detailed discussion of possible options for improving poisons centre services, including both large-scale and smaller-scale subregional poisons centres, an entirely internet-based service, standalone national centres, and national poisons centres linked together through a coordinating hub. While there was general support for a subregional poisons centre there was a preference for national centres, ideally coordinated through a hub. During the course of the project Ethiopia, Uganda, United Republic of Tanzania and Zambia started developing plans to establish poisons centres.

Establishment of national centres
Establishing a national poisons centre requires political and financial support, technical input, information resources and equipment. It is essential that the poisons centre has the support of the main professional groups of users, i.e. nurses, doctors and pharmacists.

While most well-established poisons centres have diverse sources of funding, including income from commercial services, many of these sources will not initially be available to the new centre. The centre, therefore, needs a guaranteed amount of core funding that covers the main costs.

Adequately trained staff are critical. Health professionals with at least some of the necessary background training are available in most countries, however, to work in a poisons centre they would need specific training. The low number of health professionals in general is a challenge.

The coordinating hub could be based at an existing poisons centre or hub services could be provided by a suitable professional association.

Requirements for a subregional poisons centre
Ideally a subregional poisons centre should serve countries with a shared language. There would need to be a good telecommunications infrastructure linking the countries. Strong political support in the countries concerned would be important, together with an institutional and legal framework agreed by the governments. This should cover issues such as the funding for the service, its scope and its terms of use (e.g. who could use the service, response times, quality standards and procedures for alerting about chemical events). There would also need to be agreement on handling issues of accountability and medical liability. Policies and procedures for handling confidential patient data and commercially sensitive information on products would also be required.

The information needs of a subregional poisons centre include details of pharmaceuticals, products, plants and venomous animals in each of the countries served as well as information on clinical and laboratory services. To provide a robust
24-hour, year-round presence of staff at the poisons centre would require at least 6–8 full-time professional staff.

5. Discussion and conclusions

While the Eastern Africa subregion suffers a number of severe health burdens there is an argument for investing in poisons centre services as a means for improving the prevention and cost-effective management of poisoning, as well as to fulfil other roles in support of public health and the sound management of chemicals.

This study sought to evaluate the feasibility of a subregional poisons centre and to propose ways for improving the availability of poisons centre services in the subregion. With regard to a subregional centre, the study has shown that there are a number of practical and policy matters that would have to be dealt with. Political support in the countries concerned, as well as support from the professionals who would be using the service are essential.

Based on the limited available experience with such a service, a subregional centre would work best for countries with a shared language, similar levels of medical resources and funding, as well as a good telecommunications infrastructure. While a shared poisons centre service has been shown to work between two countries, a service shared between more countries is an untested concept and its ability to fulfil the required public health and chemical safety roles is uncertain.

During the consultation, stakeholders showed a strong preference for national centres over a subregional centre and supported the concept of national centres networked or linked through a coordinating hub.

There are a number of challenges to establishing poisons centres in the subregion, including lack of trained personnel, under-developed telecommunications and information technology infrastructure and lack of funding. The extent of these challenges varies from country to country. There are also mitigating factors, however. These include a definite interest on the part of governments in setting up poisons centres and the availability of a regionally relevant database on toxic substances, AfriTox®. In addition, the existing poisons centres in the subregion, as well as those in South Africa, are willing to provide technical support and training. Furthermore, this is a time of considerable innovation in telecommunications in Africa, allowing many sectors of the community to access novel services. This could be extended to poisons information services.

Cross-border initiatives in health and other areas within the Tripartite area of the three regional economic communities, COMESA, EAC and SADC, may facilitate shared poisons centre services or the hub concept. Relevant initiatives include agreements on the training and accreditation of health professionals and cooperation on surveillance. The three communities are also collaborating on the development of telecommunications infrastructure.
6. Recommendations

1. The plans for establishing poisons centres already drafted by Ethiopia, Uganda, the United Republic of Tanzania and Zambia should be further developed to ensure they are based on a robust cost model. Technical support, in the form of training and practical guidance, should be sought from the poisons centres in the subregion. WHO and other international organizations should be asked to assist with the development of proposals and should facilitate technical assistance.

2. Governments of countries that would prefer to share poisons centre services should agree on policies and protocols addressing the ethical, quality standard and liability considerations, procedures for sharing information, alerting about events and reporting numerical data on poisoning cases. Robust financial arrangements should be put in place to ensure the sustainability of the cross-border service.

3. The existing centres within the subregion should be further strengthened through increased financial support from their governments. The centres should seek formal recognition as national centres. Poisons centres are encouraged actively to seek additional funding sources provided these do not threaten the operational independence of the centres.

4. Consideration should be given to establishing poisons centre hubs that link together centres in different countries that share linguistic and cultural characteristics. The role of hubs could be provided by any of the existing poisons centres in the region or by the Network of African Poisons Centres and Applied Toxicologists (NAPCAT).

5. NAPCAT should seek additional funding from national authorities, donors and international bodies in order to enable its development as a professional association.

6. Poisons centres operating within the region should consider the use of the WHO-developed tools for harmonized data collection.

7. A comprehensive survey should be carried out to identify the location, activity and availability of expertise on different aspects of toxicology within the subregion.

8. A regular audit of analytical capacity and services in the subregion should be undertaken and a listing maintained of relevant laboratories.

Appendix 1

The appendix provides additional guidance on setting up a poisons centre.
1. Background

This booklet summarises the outcomes of a project funded by the Quick Start Programme of the Strategic Approach to International Chemicals Management (SAICM), entitled “Feasibility Study for a Subregional Poison Centre in the Eastern Africa Subregion”. The project started in January 2012 and ended in December 2013.

The establishment and strengthening of poisons centres is relevant to a number of the objectives of the SAICM Overarching Policy Strategy, namely: risk reduction; knowledge and information; governance; and capacity-building and technical cooperation (1). The continuing need in countries for poisons centres and for increased capacities to deal with poisonings and chemical incidents is recognized in the SAICM Global Plan of Action (1).

At the time of the study, only nine countries in Africa had a poisons centre: Algeria, Egypt, Ghana, Kenya, Morocco, Senegal, South Africa, Tunisia and Zimbabwe (Fig. 1). This contrasts with Europe, the Americas and the Asia-Pacific region where most countries have a centre.

Fig. 1: Section of a global map showing the locations of poisons centres: each red dot is a poisons centre

1 The map on the website is dynamic. The map can be enlarged so that a country is seen in detail. Clicking on a red dot will bring up information about the poisons centre http://www.who.int/gho/phe/chemical_safety/poisons_centres/en/index.html
The first African regional meeting on SAICM in June 2006 identified the establishment and strengthening of poisons centres as a regional priority. The possibility of a subregional poisons centre, that is a centre in one country serving multiple countries, was suggested. This project is the result of a request by the SAICM Africa Core Group, at its fifth meeting in January 2010, that proposals be developed to address the lack of progress in establishing poisons centres.

The overall objective of the project was to find a means for improving the provision of poisons centre services in Africa and, specifically, to:

- document the incidence of poisoning in the Eastern Africa subregion;
- establish the existing provision of poisons centre services in the subregion;
- identify available models of poisons centre service provision and the requirements for their establishment; and
- present options on how to improve the availability of poisons centre services.

The study area for this project comprised the following countries in the UN Eastern Africa subregion: Burundi, Comoros, Djibouti, Eritrea, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Mozambique, Rwanda, Seychelles, Uganda, United Republic of Tanzania, Zambia and Zimbabwe. While the project has focused on one subregion it is anticipated that the outcomes are applicable more universally to the African region and, indeed, to other parts of the world.

**Fig. 2: Countries included in the feasibility study**

![Map of Africa showing countries included in the feasibility study](http://unstats.un.org/unsd/methods/m49/m49regin.htm)
2. Introduction

Poisoning with chemicals, both synthesized and natural, presents a significant public health problem, particularly in developing countries and those in economic transition. It is difficult to obtain accurate figures for the number of poisoning cases since cases are often poorly recorded. According to WHO estimates in 2012 there were 16,500 deaths from unintentional poisoning in the 16 countries covered by this study (2). In addition unintentional poisoning caused the loss of 1,128,500 years of healthy life (disability adjusted life years, DALYs) in these countries (3). These figures underestimate the true impact of poisoning since they do not include intentional self-poisoning or poisoning due to snakebite. It has been estimated, for example, that there are in the order of 7,800 deaths per year in Africa due to deliberate ingestion of pesticides (4) and between 1,400 and 10,000 deaths from snakebite in eastern sub-Saharan Africa (5).

The rapidly growing role of chemicals in the economies of many countries in Africa, coupled with weak regulatory infrastructure, increases the likelihood of adverse health impacts (6). The predicted growth rate for the chemicals industry in Africa and the Middle East is over 5% per year until 2021, outstripping that in North America and Western Europe (7). At the same time there is increased penetration of chemical products into national economies through the globalization of sales and use (7). Capacities for the sound management of chemicals are not, however, developing at a similar rate. Many countries in Africa have limited ability to detect, measure and manage the effect of chemicals on health, owing to a lack of poisons centres, lack of toxicological expertise among health professionals, and lack of laboratory analytical facilities.

Another driver for the establishment of poisons centres is implementation of the International Health Regulations (2005) (IHR (2005)) (8). The IHR (2005) require countries to have in place core capacities for, amongst other things, the surveillance, detection and management of public health events from all causes, including chemicals. In the case of outbreaks caused by chemicals, poisons centres can contribute to these capacities, and having an adequately resourced poisons centre is one of the indicators that the necessary capacities are in place (9).

2.1 What is a poisons centre?

A poisons centre, or poisons control centre, is a centre of technical expertise about chemicals and toxins and their harmful effects. As a minimum it is a poisons information service that provides emergency information, but some centres also include a toxicology laboratory and/or a clinical treatment unit.
The main tasks of a poisons centre are to:
- provide advice about diagnosis and management of poisoning
- develop protocols for the management of poisoning
- maintain databases of products and substances
- collect data on poisoning enquiries to the centre to establish the epidemiology and causes of poisoning
- carry out toxicovigilance / surveillance of new hazards
- engage in poisons prevention activities
- provide training to health professionals on the diagnosis and management of poisoning.

Thus poisons centres fulfil a number of roles in clinical care (management of the poisoned patient), public health and sound chemicals management.

Typically, a poisons centre provides a 24-hour service. Most centres answer enquiries from both health professionals and the general public. The work of two poisons centres in the Eastern Africa subregion provides an illustration of the functions of a poisons centre.
The Drug and Toxicology Information Service (DaTIS) was established in 1979. The centre is staffed by drug and poisons information pharmacists who provide a service 24 hours a day, seven days a week. The out-of-hours service is provided through a roster of on-call pharmacist-toxicologists contacted on a mobile telephone.

The Drug and Toxicology Information Service answers enquiries from healthcare professionals on poisoning diagnosis, management and prevention. It is also involved in developing national treatment guidelines. The centre is involved in the education and training of healthcare students (pharmacists, nursing science and doctors), both undergraduate and postgraduate, as well as paediatricians, physicians and public health practitioners. The staff of the centre teach on a Masters in Public Health course and offer continuing education and other outreach courses and seminars.

The centre produces a drug information bulletin and has an active website. The centre carries out research, in particular in toxico-epidemiology, and analytical and experimental toxicology. The centre has some laboratory facilities but lacks equipment and is currently trying to build up its analytical services.

The Drug and Toxicology Information Service collaborates with a number of other agencies including the Medicines Control Authority of Zimbabwe, the Ministry of Health and Child Care – Directorate of Pharmacy Services, WHO, the Red Cross and CropLife.

The centre receives significant in-kind support from the hospital and the University of Zimbabwe. These include staff costs, office space, telecommunications infrastructure and access to library facilities. There are no salaried staff employed by the Drug and Toxicology Information Service. Some of the centre's work is carried out by pre-registration pharmacists and unpaid interns. The Ministry of Health and Child Care provides a small annual grant.
2.2 The roles of poisons centres in public health and sound chemicals management

As centres of expertise and knowledge about the effects and clinical management of exposure to chemicals, products, medicines, toxic plants, and venomous bites and stings, poisons centres can provide advice and information about whether an exposure is toxic and the best course of action to take to minimise and treat toxic effects in an exposed person.

Poisons centres are, in fact, both providers and collectors of information on hazardous substances and products, and on the effects and outcomes of exposures. They compile data about their enquiries and must also maintain databases and other collections of information on the substances about which they are consulted. The enquiries database is a uniquely centralized collection of information in a country about human exposures to toxic substances, and can be analysed to identify trends in poisoning, the circumstances giving rise to exposure, as well as the health impacts. The greater the penetrance of the poisons centre, meaning the degree to which the population in the poisons centre’s catchment area is aware of and uses the centre, the more comprehensive and useful these data will be.

By collecting data on human exposures to chemicals and toxins poisons centres improve the body of knowledge about toxic effects and treatment. Poisons centres can, therefore, be a focus for training and research. Moreover, poisons centre data can provide evidence to support rational and cost-effective or cost-saving practices in the management of poisoning. An example is the use of poisons centre data by the American Association of Poison Control Centers to develop guidelines on the pre-hospital care of overdose with tricyclic antidepressants (10) and valproate (11).

Poisons centres can also play an important part in chemical incident and disaster preparedness and response activities. They can identify unanticipated hazards, such as carbon monoxide poisoning as a secondary consequence of infrastructure damage during natural disasters (12, 13). In disaster situations they may also handle more general enquiries from the public, for example about water and food contamination, by virtue of the fact that the services are available, accessible and well-known (14).

The centralized nature of poisons centres means that they can be sentinels of chemical release and can provide early warning of disease outbreaks caused by chemicals. This ability is used by a number of countries as part of their health security systems (15). The USA, for example, has a sophisticated data collection system, the National Poison Data System (NPDS), that allows the near real-time collection of enquiry data from 55 poisons centres. This now includes over 55 million case records and is used to monitor trends in poisoning and to act as an early-warning system for chemical release (16, 17).

The annual reports compiled by poisons centres, describing enquiries to the centres, provide information on the poisoning trends in a country (18, 19). The more ‘mature’ the poisons centre, the larger the body of data that the centre will have amassed that can be used for early warning and trend analysis.

An important use for poisons centre data is to identify the toxic risks in a community, including emerging risks (20). This is an activity known as toxicovigilance (21). These data can be used to inform priority setting for the prevention of poisoning as well as to provide evidence of the effectiveness of such measures. In the UK, for example, studies
of the impact of legislative changes to the pack-size of paracetamol in reducing suicides drew on official mortality data, hospital records and poisons centre reports (22,23). Some examples of toxicovigilance by poisons centres are given below.

**CASE STUDY 1:**

The Centre Antipoison et Pharmacovigilance de Maroc, in Rabat, Morocco, has analysed enquiries received about cosmetics and has identified a high incidence of intentional self-poisoning with para-phenylenediamine, a chemical used in artificial henna that can easily be bought from herbalists. The centre has also identified health problems associated with the use of skin lighteners and hair straighteners. These problems reflect the weak regulation of cosmetic products in Morocco (24).

**CASE STUDY 2:**

The two poisons information centres in Cape Town, South Africa have investigated accidental pesticide poisoning in children. They have identified the informal sale of toxic pesticides by street vendors at taxi ranks as a particular root cause. The vendors buy the pesticides in bulk and re-package small volumes into unlabelled or poorly labelled containers to sell cheaply to people for use as a domestic pesticide. These poisonings reflect a weakness in enforcing regulatory control of pesticide sales as well as more generalized ignorance about the hazards of pesticides. The poisons centres have drawn the attention of the authorities to this problem, leading to action by the national Department of Agriculture, Forestry and Fisheries and City of Cape Town officials, who raided the street vendors. Agriculture department officials seized products that were either not registered for domestic use, or were illegally brought into the country. The poisons centres have publicized the issue and the Tygerberg Poison Information Centre is planning to provide poisoning prevention labels and education for the street vendors about the safe use of pesticides (25, C Marks personal communication, May 2013).

It is because of their roles in surveillance, preparedness and response for public-health events involving chemical agents that poisons centres are considered a key component of national capacities for implementation of the IHR (2005). However, an important proviso is that the poisons centre must have adequate resources. The centre should have enough trained staff to provide a competent and reliable service, it needs to be accessible to its user population, and it needs the information resources and information management tools to compile and analyse its data.
2. INTRODUCTION
3. Project activities

The project has involved the synthesis of information drawn from two major activities: a literature review and an extensive stakeholder consultation.

The literature review sought background information on the 16 countries included in this project, particularly on the epidemiology of poisoning and on health system characteristics. The review also sought information on poisons centres more generally and, in particular, on examples of cross-border services.

The stakeholder consultation involved an attitudes survey of the 16 countries, two international workshops and national workshops in Kenya, United Republic of Tanzania, Zambia and Zimbabwe. The stakeholders consulted included: poisons centre staff, hospital medical directors, representatives from ministries of health, environment, agriculture, labour and industry, pesticides registration authorities, pharmaceutical regulatory authorities, trade associations for manufacturers of pesticides, medical, nursing and pharmacist professional associations, SAICM National Focal Points, Rotterdam Convention focal points and non-governmental organizations (NGOs) concerned with medical care, consumer safety and pesticide safety.

Additional information and perspective was provided through regular discussions with the project Steering Group.

The outcomes of these investigations are presented below in summarised form.
4. Outcomes of the study

4.1 Demographic and infrastructural characteristics of the countries in the subregion

The countries of the subregion span a large geographical, linguistic and cultural range. The total population is more than 340 million. Countries vary greatly in size, from 452 km² for the Seychelles to 1.1 million km² for Ethiopia (26). Population densities range from 19 people per km² in Zambia (27) to over 600 people per km² in Mauritius (28). The survey revealed that at least 33 languages are commonly used in the countries and there are, in addition, many other tribal and dialect languages. English, French, Swahili and, in Ethiopia, Amharic are used by health professionals and, to a lesser extent, the public.

Adult literacy levels in the subregion range from 41% to 91% for men and 29% to 92% for women (29), and this is of importance when considering the use of written materials for disseminating poisons information.

Given that a poisons information service is usually delivered over the telephone, with some centres also providing an internet-based service, the availability of telecommunications infrastructure is an important consideration. Access to mobile telephones is very limited in many countries, with nine out of 16 countries having fewer than 50 subscriptions per 100 inhabitants. Seychelles and Mauritius are the best supplied, with the former being on a par with many developed countries (30). As Fig. 5 below shows, however, access to mobile telephony is increasing rapidly in some countries. Indeed the growth in mobile telephone subscriptions is greatly outstripping that of fixed-line telephones, which remains extremely limited in most countries (30). With regard to the internet, even in the best-served country, Seychelles, just over half of the population uses the internet, by contrast with over 80% in most developed countries (30). Internet usage mirrors fairly closely the proportion of the population living in urban areas.
In common with other parts of the region, countries in the Eastern Africa subregion are having to cope with considerable health challenges. There are continuing high levels of infection with HIV/AIDS, tuberculosis and malaria, also diarrhoeal diseases and, more recently, an increasing prevalence of non-communicable diseases (31). The resources available for healthcare are extremely limited in most countries, with total per capita health expenditure ranging from US$ 17 (Eritrea) to US$ 551 (Seychelles) (32). A critical problem is the lack of trained healthcare staff, with all but two countries (Mauritius and the Seychelles) unable to meet the minimum number of healthcare workers needed to deliver essential interventions, which is estimated as 23 physicians, nurses and midwifery staff per 10 000 population (33,34). Moreover, most healthcare staff work in urban areas while, in most of the countries in the subregion, the majority of the population continues to live in rural areas (31).

4.2 The characteristics and burden of poisoning in the subregion

The true burden of disease due to poisoning in the Eastern Africa subregion, and its importance relative to other causes of disease, is unknown because the available data are incomplete. Nevertheless WHO has estimated death rates due to unintentional poisoning ranging from 0.3 deaths per 100 000 population in Mauritius to 8.1 deaths per 100 000 population in Mozambique (2).

The literature review revealed that for most countries in the Eastern Africa subregion there were very few studies on the epidemiology of poisoning. The exception was
Zimbabwe, where poisons centre staff have published extensively on this subject. The limited data available in the subregion highlighted pesticide poisoning, kerosene ingestion by children, and poisoning with household products, traditional remedies and natural toxins, including snakebite, to be of particular importance in terms of both illness and death. In the oceanic countries (Comoros, Madagascar, Mauritius and Seychelles) poisoning with toxins from marine animals was identified. Poisoning with cyanogenic glycosides contained in bitter cassava continues to be a problem in countries where cassava is an important part of the diet, such as Mozambique and the United Republic of Tanzania (35).

One striking finding was the relatively high case-fatality rate for poisoning from chemicals and drugs noted in some of the studies, even those describing accidental poisoning in children. In two studies of children admitted for poisoning in Zimbabwe, for example, case-fatality rates of 4.9% and 3.1% were noted (36,37). This contrasts with the 0.1% case-fatality rate seen in a similar age group in the USA (38).

4.3 Models of poisons information provision

The literature review identified a number of models for the provision of poisons centre services. The most common model is the centre that functions exclusively as a poison information service. This provides information to health care professionals on the diagnosis, management and prognosis of poisoning, and may also offer information to the general public. The staff of such centres are not, usually, directly involved in the medical management of poisoned patients but only give advice on management.

This model is the easiest to set up and it may be combined with a medicines information service, exemplified by the poisons centres in Kenya and Zimbabwe described above. The service is usually telephone-based and is usually available 24 hours per day, every day of the week. Where staffing permits there is a poisons information specialist in the centre at all times. In other situations the out-of-hours service may be provided by someone on duty from home or from a hospital department. In countries where there are multiple poisons information services, the out-of-hours service may be provided on a rotational basis or one centre may permanently provide the out-of-hours service for one or more other centres (18,39,40).

The staff of the centre may be nurses, pharmacists, physicians, scientists, clinical toxicologists or a mixture of these. These staff need specific training to carry out poisons information work (41). In centres where the front-line staff are not physicians, there may be a system for referring particularly severe cases of poisoning to an on-call clinical toxicologist.

Poisons information centres usually conduct a range of additional activities. The centre in Zimbabwe, for example, also engages in toxicovigilance, research
and the training of healthcare professionals. The Tygerberg Poisons Information Centre in South Africa offers specialist advice on clinical toxicology (poisoning from natural toxins, especially snakebite). The Red Cross Children’s Hospital Poisons Information Centre, also in South Africa, offers specialist poisons information for paediatric cases and produces a database on poisons and clinical management of poisoning, called AfriTox® (see below).

Another model is a poison centre that is associated with a treatment unit for poisoned patients. This unit may be part of the poisons centre itself or poisons centre physicians may have allocated beds in the host hospital, to which poisoned patients can be admitted.

Some poisons centres have an associated analytical toxicology laboratory that analyses samples from poisoned patients. Examples of such centres are the Tygerberg Poisons Information Centre in Cape Town, South Africa, and the Centre Antipoison et Pharmacovigilance de Maroc, in Rabat, Morocco.

There are also a small number of poison centres that can provide poisons information, clinical and laboratory services. Examples are the Therapeutics and Toxicology Centre in Cardiff, UK and the Munich poisons centre in Germany.

4.4 Examples of cross-border poisons information services

The literature review found very few examples of cross-border poisons information services. One example is the National Poisons Information Centre (NPIC) in Dublin, Republic of Ireland, where the out-of-hours service is provided by the UK National Poisons Information Service on a contract basis (18,42). Out-of-hours callers to the NPIC pay the normal telephone charge and the additional cost of routing the call to the UK is paid by the NPIC. The NPIC uses the same toxicology database (TOXBASE®) as the UK service and also documents its enquiries using the same data collection system (called UKPID). This facilitates a consistent approach by the Irish and UK services to poisons information enquiries.

A short-term cross-border arrangement has also been described (43). In 2002 the London Centre of the UK National Poisons Information Service handled the night-time calls of the New Zealand National Poisons Centre (NZNPC) for four months to cover a staffing shortfall. Since there was 12-hour time difference this meant that the night-time calls were handled during the day-time in the UK. The NZNPC provided the London Centre with New Zealand drug formularies, pharmaceutical schedules, medicines guides, access to TOXINZ® (the New Zealand poisons database), and contact details for New Zealand hospitals. In addition, an analysis of recent night-time calls received by the NZNPC was sent to give an idea of typical enquiries. A mutually agreed standard operating procedure was developed for handling New Zealand enquiries and for case referral. The London Centre completed reports for all New Zealand calls and sent these on a daily basis.
to the NZNPC for audit and medico-legal purposes. Callers to the NZPC paid the normal telephone charge and the additional cost of routing the call to the UK was covered by the NZNPC.

A further example in Europe is a long-standing, if unofficial, arrangement for enquiries from health professionals in Luxembourg to be answered by the Belgian poisons centre in Brussels. This arrangement is facilitated by geographical and cultural proximity and a common language. The poison centre’s telephone number is not, however, advertised to the public in Luxembourg. There is no arrangement for reporting back to the Luxembourg health authorities about the poisoning enquiries from the country (Mostin, personal communication, October 2013).

Most poisons centres handle a small number of ad hoc enquiries from other countries, for example, during 2011-2012 the Tygerberg Poisons Information Centre in South Africa answered 93 calls from other countries, accounting for 1% of their total calls (C Marks, personal communication, May 2013). The majority of these calls (47%) were from one neighbouring country, but small numbers of calls were also taken from 11 other African countries. Once again, there is no arrangement for reporting back to the relevant national health authorities about these enquiries.

4.5 Provision of a poisons information service via the internet

Over the last few years a small number of internet-based poisons information databases linked to poisons centres have been developed. To date, there are at least four such databases that are used outside their countries of origin. These are AfriTox® (South Africa), Poisindex® (USA), TOXBASE® (UK) and TOXINZ® (New Zealand), and are described briefly below.

AfriTox®
This database has been developed by the Red Cross Children’s Hospital in Cape Town, South Africa. It provides poisons information with a focus on African (especially South African) products and natural toxins. This database has been distributed on CD-ROM to hospitals throughout South Africa and also to hospitals and poisons centres in a number of other African countries, for example to the Zimbabwe poisons centre (Roberts, personal communication, June 2012). As of 2013 the database has been available online.

Poisindex®
This is a commercial poisons information database that is widely used in the USA and in many other countries. Poisindex® lists thousands of consumer, commercial and pharmaceutical products as well as toxic plants and animals linked to over 1500 poison-specific medical management monographs. In the USA all poisons centres access Poisindex® as their primary source of data. Poisindex® product

3 http://www.health.uct.ac.za/fhs/services/pic/afritox
coding is used to generate the American Association of Poison Control Centers’ annual and other reports (17). This system is available on-line as well as for use on a local computer system. As a fully commercial system it is relatively expensive, though preferential rates may be available for low-income countries.

**TOXBASE®**

This is a closed-access database available free-of-charge to registered UK National Health Service staff and under contract to those in the Republic of Ireland. TOXBASE® is intended to be the primary source of information for health professionals in the UK, with the telephone information services advising on serious, complex or unusual cases (45,46). Commercial companies, overseas poison centres and hospitals can use the system on payment of an annual fee (47). TOXBASE® can be used as a surveillance tool through the monitoring of consultations about specific agents. It also has a facility for collecting additional case data on exposures to new products, though provision of such information by the person accessing the database is voluntary.

**TOXINZ®**

TOXINZ® has two levels of access: TOXINZ® Primary (created for family doctors, paramedics and those interested in medical toxicology) and TOXINZ® Full (tailored for use in hospital emergency, intensive care and pharmacy environments). As in the UK, this database supplements the telephone information service provided by the New Zealand National Poisons Centre. Access to the database is by subscription and it is available to overseas poisons information centres. TOXINZ® is available free-of-charge or at low cost through HINARI® to poisons centres in developing countries.

### 4.6 The cost-effectiveness of poisons centres

The literature review found a number of studies evaluating the cost-effectiveness of poisons centres, all of which were conducted in developed countries. Most studies used interviews with callers to the poisons centre to find out what they would have done in the hypothetical situation of not having access to the poisons centre (48-55). These found that people calling about low-toxicity exposures would have contacted or visited family physicians or hospitals, which would have cost more than contacting the poisons centre. The studies concluded that the utilization of poisons centres by the general public led to net savings in healthcare costs.

The above conclusions were supported by two studies that examined the actual impact on usage of medical services when poisons centre services were temporarily suspended (56,57). These showed an increase in healthcare costs, mainly because of increased self-referrals to medical services. In one study this increase amounted to more than three times the State funding for the poisons centre (56).

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5 http://www.toxinz.com/
6 http://www.who.int/hinari/en/
A study involving rural communities correlated calls to poisons centres with hospital admissions for poisoning (58). The results suggested that telephone calls from the public to a poisons centre reduced admissions to hospital at a rate of over 40:1, which in the US context equated to a saving to the health system of more than US$ 7000 per call.

In 2012, the American Association of Poison Control Centers commissioned a report on the cost effectiveness of US poisons centres. This showed a near 1:14 benefit for each dollar spent, amounting to an estimated saving of US$ 1.8 billion per year (59). This analysis took into account savings due to avoided medical utilization, reduced hospital length-of-stay, in-person outreach, and reduced days of work lost. It did not include other benefits such as the provision of surveillance data to federal agencies, toxicology training of health care professionals, and involvement in local, state, and federal emergency preparedness and response.

4.7 Stakeholder consultation: attitudes to a subregional poisons centre

During the stakeholder consultation there was almost universal support for the need to expand and enhance poisons centre services in the subregion. More than 80% of stakeholders agreed with the statement “Do you, after completing the survey, believe that a subregional poisons centre service is feasible?” with 8.5% disagreeing. When the concept was explored in more depth, however, it was clear that the preference was for the establishment of national centres. This was particularly true in the four countries where there were national workshops, of which two already have a centre (Kenya and Zimbabwe) and two are planning to develop poisons centres (United Republic of Tanzania and Zambia).

Stakeholders identified some advantages to a subregional poisons centre in terms of possible cost savings, advocacy, stronger cross-border cooperation, and early identification of emerging toxicological hazards. These perceived advantages were countered by uncertainties about sustained funding for the centre from multiple countries, with the possibility that a country might be cut off from the service if it did not pay its share. Other concerns included possible difficulties in the transfer of confidential patient, product and event-related information across national borders, and a lack of flexibility meaning that specific national needs might not be met by a multi-country funded service. An additional concern was that having a subregional poisons centre in one country might hinder the development of toxicological capacities in the client countries since the focus of expertise would be in the country providing the service. On the other hand some people felt that this centre could provide training to professionals in other countries. Some other potential difficulties centred around possible differences in medical standards and resources between the countries served by the subregional service. This could give rise to medico-legal problems if, for example, the poisons centre recommended an investigation or treatment that was not considered accepted practice in another country.
The above discussion was focused on a telephone-based cross-border poisons information service. The possibility of using an internet-based system was also considered. While stakeholders thought that this was an acceptable way of providing poisons information, it was seen more as an adjunct to a voice-based service than as the sole service. Certainly it was felt that this was not a good medium for providing a service to the public for reasons of limited internet connectivity and low levels of literacy.

4.8 Options for improving poisons centre services in the subregion

Stakeholders were asked to consider six options for providing poisons centre services, which are listed below.

Option 1: Create a ‘super-centre’ to serve the needs of the Eastern Africa subregion, providing the full range of services. This could be an expansion of an existing centre or the development of a new centre.

Option 2: Create a small number of poisons centres each serving multiple countries in the subregion, grouped by language. Where possible these should build on existing centres, including those elsewhere in Africa. These centres would provide the same services as the ‘super-centre’ but to a smaller group of countries.

Option 3: The poisons information service is provided by means of an internet-based toxicology database to which users must subscribe and that logs each contact. This could be maintained by a commercial entity, or a poisons centre in Africa or elsewhere.

Option 4: Each country should be encouraged to create and maintain its own poisons centre service, which would provide a full range of services.

Option 4 (variant): Each country should be encouraged to create and maintain its own poisons centre service, which would provide a full range of services. These centres would be networked and coordinated through a network hub.

Option 5: The status quo is maintained, that is no new poisons centres are created (this option was included for the sake of completeness).

Additional information about the services that would be provided under each option is at Annex 1.

Option 4 (variant) arose from discussions at the national workshop in the United Republic of Tanzania and is illustrated in Fig. 6 below.
4. OUTCOMES OF THE STUDY

Sub regional: Cooperation of National Units

![Diagram of sub regional cooperation]

Derived from Dr Enock Masanja, University of Dar Es Salaam

**Fig. 6: Schematic illustration of the poisons centre hub concept**

The poisons centre network hub could either be a physical or a virtual entity. A physical hub could, for example, be based at an existing poisons centre. A virtual hub could be a professional association with rotating officers but dedicated resources for the hub activities.

The purpose of the hub would be to provide the services listed below.

- Coordination of training of poisons centre staff, for example through the development of an agreed training curriculum and training materials, and arranging training visits.
- Standard-setting for poisons centre services.
- Promotion of standardisation between centres for example in treatment advice, documentation of enquiries etc.
- Mentoring of poisons centres and staff in the network.
- Sign-posting, that is directing members to other resources / sources of assistance etc.
- Advocacy on behalf of the network at national and international fora.
- Assistance in handling difficult enquiries.

Stakeholders were asked to score the six options identified for improving poisons centres services, with the highest score being given to the most preferred option. The overall preference was for countries to set up their own poisons centres but to network these through a hub centre (Table 1). This could be regarded as a hybrid of a national and subregional centre.
Table 1: Ranking of options for improving poisons centre services in the subregion: the higher the score the stronger the preference

<table>
<thead>
<tr>
<th>OPTION</th>
<th>AVERAGE SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Each country should be encouraged to create and maintain its own poisons centre service. These centres would be networked and coordinated through a network hub.</td>
<td>4.9</td>
</tr>
<tr>
<td>Each country should be encouraged to create and maintain its own poisons centre service.</td>
<td>4.4</td>
</tr>
<tr>
<td>Create a small number of poisons centres that serve multiple countries in the subregion, grouped by language. Where possible these should build on existing centres, and not necessarily just those with Eastern Africa.</td>
<td>3.4</td>
</tr>
<tr>
<td>Create a 'super-centre' to serve the needs of Eastern Africa…. This could be an expansion of an existing centre or the development of a new centre.</td>
<td>2.3</td>
</tr>
<tr>
<td>The poisons information service is provided by means of an internet-based toxicology database to which users must subscribe and that logs each contact. This could be maintained by a commercial entity or a poisons centre in Africa or elsewhere.</td>
<td>1.9</td>
</tr>
<tr>
<td>The status quo is maintained, i.e. no new poisons centres are created and things carry on as before.</td>
<td>0.6</td>
</tr>
</tbody>
</table>

4.9 How can national poisons centres be established?

Establishing a national poisons centre requires political and financial support, technical input and material resources. If the primary aim is to create an information service the requirements are relatively limited and are set out in Appendix 1.

Political support is needed from the relevant ministries, particularly health, agriculture and environment, which should also be prepared to provide funding. In addition, the poisons centre must have the support of the main professional groups of users, that is nurses, doctors and pharmacists.

Sustained financial support is also essential, whether as funds or as in-kind services from a host institution. The typical cost items, both start-up and recurring are described in Appendix 1. While most well-established poisons centres ultimately have diverse sources of funding, including income from services to commercial companies, many of these sources will not be available initially to a new centre that has yet to prove itself. The centre therefore needs a guaranteed amount of core funding that covers its main costs.

Obtaining sustained political and financial support for a poisons centre requires advocacy and good arguments, moreover, the poisons centre needs to start to demonstrate its value at an early stage. At the same time, however, funders and supporters need to have realistic expectations of what can be achieved over a
specified timeframe and with the resources available. As described in Appendix 1, the number of enquiries to a poisons centre typically builds slowly over time while its user-base becomes familiar with the centre and the assistance that it can provide.

Another key need is for trained staff to set up and run the poisons centre. There are probably cadres of staff with at least some of the necessary background knowledge in most, if not all, countries; however, the generally low numbers of medical, nursing and pharmacy staff may make it difficult to divert staff to work in setting up or running a poisons information service. The existence of laboratory services and emergency medical services could provide the base from which a poisons centre could be built. In the United Republic of Tanzania, for example, there are plans to develop a poisons information service based in the Government Chemist Laboratory Agency. This has an existing cadre of scientific staff and, with the proximity of this agency to a major teaching hospital and the National Institute for Medical Research, this gives the country a strong platform for development. Similar models may be possible for other countries in the subregion.

During the course of the project four countries (Uganda, Ethiopia, United Republic of Tanzania and Zambia) started work on plans to establish poisons centres. In the case of the United Republic of Tanzania these plans are very well advanced and the centre is expected to start functioning in 2015. The Poisons Information and Management Centre at the Kenyatta National Hospital in Kenya is seeking to improve its status and become the official national centre.

The cost of set-up will present a challenge in an environment of very limited resources. The project report provides evidence that investment in poisons centre services is more than offset by savings in overall expenditure on health, whether by the government, health insurance providers or out-of-pocket expenditure. Moreover, a poisons centre should be seen as contributing to the common good in terms of its roles in public health and sound chemicals management.

4.9.1 Establishing a hub

The poisons centre network hub, as discussed during the stakeholder consultations, could either be a physical or a virtual entity.

The tasks of the hub are described above. To fulfil these the hub would need resources, including staff time, access to telecommunications and an internet connection, and an active and managed website.

A physical hub would have dedicated office space and staff (at least one), a budget, a workplan, a postal and email address and a telephone number. Hubs based around linguistic groups could be anywhere in the region.
The concept of a hub coordinating poisons centres in multiple countries is novel, and, to some extent, untested although there are existing bodies that perform some hub-like functions. At a national level the American Association of Poison Control Centers (AAPCC) fulfils most of the functions described above, for example it is particularly involved in training and standard-setting, harmonization of data collection and maintenance of a national database of enquiries (the National Poison Data System (NPDS)), and advocacy. The AAPCC has a physical headquarters and permanent staff as well as elected officers. Its sources of funding include membership fees from organizations and individuals, occasional grants, and the sale of reports from the NPDS.

At an international level, the European Association of Poisons Centres and Clinical Toxicologists (EAPCCT) fulfils some of the hub functions despite being an association of individuals rather than poisons centres. The EAPCCT, for example, provides advocacy, some standard-setting, and assistance in the management of difficult cases through a discussion forum. Although the EAPCCT is registered as a not-for-profit organization in a single country, Belgium, it has no physical address. It has no funded permanent staff, though it contracts secretarial and web-maintenance services on an as-needed basis, and all other work is carried out by a board of unpaid elected members. Most of the funding for the EAPCCT comes from membership subscriptions, occasional grants and from the annual scientific congresses (A Campbell, personal communication, January 2014).

There is therefore some precedence for the Network of African Poisons Centres and Applied Toxicologists to perform hub functions, given adequate resources.

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7 http://www.aapcc.org/about/
9 http://www.napcat.net/
NETWORK OF AFRICAN POISONS CENTRES AND APPLIED TOXICOLOGISTS (NAPCAT)

NAPCAT is a newly formed group of individuals involved in the practice of clinical or applied toxicology, whether in poisons centres, academia or more generally on chemical safety issues, who have come together to promote the development of clinical and applied toxicology in Africa. NAPCAT aims to promote the development of poisons control centre activities throughout Africa by:

- encouraging the acquisition and dissemination of poisons information suited for the African region, and the collection of high quality data on poisoning cases and toxicological incidents in Africa;
- promoting communication and sharing of information between African poisons control centres and treatment centres in Africa;
- facilitating the training of poisons centre staff and the development of clinical and applied toxicology in the African region;
- advocating chemical safety issues to governments, industry and other related stake holders; and
- fostering international collaboration between African poisons centres and related professional and academic bodies, associations and poisons centre networks in other countries.

THE NAPCAT WEBSITE ADDRESS IS: WWW.NAPCAT.NET
4.10 Requirements for a subregional poisons centre

While the stakeholder consultations showed a preference for national centres, the possibility of a subregional centre was left open. There were, however, a number of requirements identified during project discussions that should be in place for a subregional poisons centre to be possible.

Firstly the centre should be set up to serve countries with a shared language, in order to maximise the accessibility of the information service. In addition, there would need to be a good telecommunications infrastructure linking the countries to the poisons centre.

A subregional centre could belong to one country and offer services to other countries on a contractual basis, or it could be an international centre hosted by one country and run by an international steering group. For the second option, and to some extent the first option also, there would need to be strong political support and an institutional and legal framework agreed by the ministries of health, environment, finance, trade and justice of all the countries concerned. This would cover issues such as the funding for the service, the scope of the service and its terms of use (for instance who could use the service, response times, quality standards, procedures for alerting about chemical events and so on). There would also need to be agreement on how issues of accountability and medical liability would be handled, for example in case of a patient with an unexpectedly bad outcome and, ideally, there should be harmonised legislation between the countries on such issues. In addition there would need to be agreement on the handling of confidential information, for example patient data and commercially sensitive information on products.

At a technical level, a subregional poisons centre would need to have collections of information about pharmaceuticals, products, plants, venomous animals and so on in each of the countries that the centre served, including local names for these. In addition the centre would need to have information on clinical and laboratory services in the other countries and, if available, contact details for specialist toxicologists in the countries served. There would need to be an adequate number of trained staff to handle the call load and to carry out other work, such as maintaining databases on agents and local services. For a 24-hour, year-round presence of staff at the poisons centre this would require at least 6–8 full-time professional staff to allow for leave, training, illness etc. (21).
4. Outcomes of the Study
5. Conclusions

There is no doubt that there are serious problems with poisoning in the subregion with many thousands of deaths and hundreds of thousands of years lost to disability. The fact that there are high case fatality rates for poisoning (up to 4.9%) that compare unfavourably with rates in OECD countries (with rates of <1%) suggest that there are big health wins available with the expansion of poisons centre services and clinical toxicology training. Eventually, with the roll-out of Universal Health Coverage (60), it could be hoped that overall mortality rates will decline; however poisons centre development may accelerate this in particular areas.

Poisons centres offer good value for money: the literature review shows that poisons centres, whatever the model used to set up and deliver them, have positive cost-benefits at both the health system and personal level.

There are already three poisons centres in two countries of the Eastern Africa subregion, and a fourth was identified through the project (in Madagascar), and this gives a focus from which to expand. There are also poisons centres in a neighbouring country, South Africa, which shares many of the toxicological problems of Eastern Africa.

The purpose of this study was to evaluate the feasibility of a subregional poisons centre and to propose ways for improving the availability of poisons centre services in the subregion. The study has shown that there are a number of practical matters that would have to be dealt with in order to establish a subregional centre, in particular concerning the sharing of confidential information, issues of medical liability, mechanisms for reporting events and poisoning data from each country, and agreement on the basis for cost-sharing. There would need to be political support in the countries concerned, as well as support from the professionals and public who would be using the service. The very limited experience of this kind of cross-border service suggests that a subregional centre would work best for countries with a shared language, similar levels of medical resources and funding, and a good telecommunications infrastructure. While a shared poisons centre service might work between two countries, a service shared between more countries is an untested concept and its ability to fulfil the required public health and chemical safety roles is uncertain. Moreover, it would be complex to operate and administer.

During the consultation, stakeholders were clear about the need for and utility of poisons centre services, and believed that expanding these services in Eastern Africa was important. At the same time there was a desire and, in many cases a preference, for national centres. Even where respondents supported the formation of a subregional centre, there was a clear preference for a national centre to be formed before this or
in parallel. The overwhelming preference was for national centres networked or linked through a hub.

In a number of respects establishing national poisons centres rather than a subregional centre is more straightforward and, arguably, more desirable. It is more straightforward in the sense that the centre needs only to answer to one national government, be compatible with one health system, collate data on its own country’s products and natural toxins, and to devote time and resources to promoting itself to users within its own country. It has the benefit that national authorities would have immediate ownership and access to data on chemical exposures in their own countries, and on the products and chemicals available in the country. Furthermore, it would promote the development of national capacities in clinical toxicology. Networking poisons centres through a hub provides advantages in terms of sharing training resources, harmonising data collection, providing mutual support, and, potentially, facilitating the development of cross-border surveillance and early warning of events of international concern.

There are already some cross-border working arrangements at a practical and policy level that could facilitate either a subregional centre or a hub arrangement. An example is the poisons information database AfriTox®, developed in South Africa, which is used as a reference source by the poisons centres in Zimbabwe and Kenya and also by a number of hospitals in other African countries. There are also more formal cross-border initiatives, in health and other areas, within the Tripartite area of the three regional economic communities: the Common Market for East and Central Africa (COMESA), the East African Community (EAC) and the Southern African Development Community (SADC). These include agreements relating to the training and accreditation of health professionals, cooperation on surveillance, coordination in the implementation of chemical safety conventions, and collaboration on infrastructure development including in telecommunications (61-65).
6. Project recommendations

The project group developed eight recommendations arising from the feasibility study. These are:

**Recommendation 1:** The plans for establishing poisons centres already drafted by Ethiopia, Uganda, the United Republic of Tanzania and Zambia should be further developed by the responsible authorities to ensure that they are based on a robust and sustainable cost model that takes account of existing services and the funding mechanisms for the health system into which the poisons centre service will be integrated. These plans can then be used as the basis for requesting support from national governments and development partners for the establishment of the centres. In addition, technical support, in the form of training and practical guidance, should be sought from the poisons centres in the subregion, in Kenya and Zimbabwe (but see also recommendation 3) as well as the poisons centres in Cape Town, South Africa. WHO and other international organizations should be asked to assist with the development of proposals and should facilitate technical assistance.

**Recommendation 2:** Governments of countries that would prefer to share poisons centre services rather than establish national centres should agree on a framework that includes policies and protocols addressing the ethical, quality standard and liability considerations of a cross-border service, as well as procedures for sharing information, alerting about events and reporting numerical data on poisoning cases. Robust financial arrangements should be put in place to ensure the sustainability of the cross-border service.

**Recommendation 3:** The existing centres within the subregion should be further strengthened through increased financial support from their governments. The poisons centres should seek formal recognition as national centres. Centres are encouraged actively to seek additional funding sources provided these do not threaten the operational independence of the centres. Technical and in-kind support could be sought from other African and non-African poisons centres and this could be facilitated by WHO.

**Recommendation 4:** Consideration should be given to establishing poisons centre hubs that link together centres in different countries that share linguistic and cultural characteristics. The hub could serve the following functions: coordination, training, standard-setting, mentoring, signposting (that is acting as a centre that can advise on where services or advice can be obtained) and advice to members of the
network (on poisoning cases or on organisational matters) as well as advocacy and negotiations with state, regional and international bodies on behalf of the network.

The role of hubs could be provided by any of the existing poisons centres in the African region. Alternatively hub functions could be provided by the Network of African Poisons Centres and Applied Toxicologists (NAPCAT).

**Recommendation 5:** In order to strengthen the provision of poisons centre services within the subregion, and more widely in Africa, poisons centres should be encouraged to network. Since there is an existing network, NAPCAT, it is recommended that this network should be strengthened through increased financial support so that it can further develop its intended roles in promoting professional development, standard-setting and advocacy for poisons centres in the region. While some funds for the network come from membership dues, NAPCAT should seek additional funding from national authorities, development partners and international bodies. With adequate resources NAPCAT could provide hub functions for a group of poisons centres.

**Recommendation 6:** To assist in the early development of standardised data collection and data exchange as well as consistent reporting of data about poisoning and toxicology within the subregion, it is recommended that all centres operating within the region consider the use of the WHO tools for harmonized data collection\(^{10}\).

**Recommendation 7:** A comprehensive survey should be carried out to identify the location, activity and availability of expertise on different aspects of toxicology within the subregion. This information should be kept in a database. Information about experts within a country should be made available to the appropriate national health authorities and institutions. The survey and construction of the database could be carried out by NAPCAT if it was provided with sufficient resources to perform this task.

**Recommendation 8:** An audit of analytical capacity and services should be undertaken and a list created of laboratories and the analyses they can carry out.

\(^{10}\) [http://www.who.int/ipcs/poisons/harmonization/en/]
### Annex 1:
Options for providing poisons centre services in the Eastern Africa subregion

<table>
<thead>
<tr>
<th>OPTION 1</th>
<th>OPTION 2</th>
<th>OPTION 3</th>
<th>OPTION 4</th>
<th>OPTION 4 (VARIANT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create a ‘super-centre’ to serve the needs of Eastern Africa, providing the services listed below. This could be an expansion of an existing centre or the development of a new centre.</td>
<td>Create a small number of poisons centres each serving multiple countries in the subregion, grouped by language. Where possible these should build on existing centres, and not necessarily just those within Eastern Africa.</td>
<td>The poisons information service is provided by means of an internet-based toxicology database to which users must subscribe and that logs each contact. This could be maintained by a commercial entity, or a poisons centre in Africa or elsewhere.</td>
<td>Each country should be encouraged to create and maintain its own poisons centre service, which would provide a full range of services.</td>
<td>Each country should be encouraged to create and maintain its own poisons centre service, which would provide a full range of services. These centres would be networked and coordinated through a network hub.</td>
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**SERVICES** | **SERVICES** | **SERVICES** | **SERVICES** | **SERVICES** |
### OPTION 1
1. Telephone advice service to all countries in the subregion.
2. Training for medical, nursing and other professional staff on diagnosis and management of poisoning.
3. Co-ordinate provision of, and information about, clinical and laboratory services in each country served.
4. Maintain a database of products and agents, describing key ingredients and toxicity.
5. Maintain a data collection system for enquiries to the service, whether received by telephone or electronic means, and carry out regular analyses of data to detect trends and emerging problems.
6. Fulfil an alert and surveillance role for chemical events in line with IHR (2005) requirements.
7. Create and maintain an online database for access by the public and professionals that will give information on toxic agents specific for the region, or work with an existing system to ensure it is adapted to regional needs.
8. Link with policy makers for enacting appropriate policy and legal instruments.

### OPTION 2
1. Telephone advice service to all countries in the subregion.
2. Training for medical, nursing and other professional staff on diagnosis and management of poisoning.
3. Co-ordinate provision of, and information about, clinical and laboratory services in each country served.
4. Maintain a database of products and agents, describing key ingredients and toxicity.
5. Maintain a data collection system for enquiries to the service, whether received by telephone or electronic means, and carry out regular analyses of data to detect trends and emerging problems.
6. Fulfil an alert and surveillance role for chemical events in line with IHR (2005) requirements.
7. Create and maintain an online database for access by the public and professionals that will give information on toxic agents specific for the region, or work with an existing system to ensure it is adapted to regional needs.
8. Link with policy makers for enacting appropriate policy and legal instruments.

### OPTION 3
1. Information on the clinical features and management of poisoning for a range of agents.
2. Information on the availability of clinical and laboratory services in countries in the subregion.
3. Online teaching modules for self-education about poisoning.
4. Mechanism for collecting and analysing information from users about their identity and the agents that they have looked up.
5. Mechanism for collecting basic information about the poisoning case that has prompted the user to consult the database.

### OPTION 4
1. Telephone advice service to medical professionals and, possibly to members of the public, within the country.
2. Training for medical and nursing and other professional staff on diagnosis and management of poisoning.
3. Either provide clinical and/or laboratory services or co-ordinate provision of, and information about, these services within the country.
4. Maintain a database of products and agents, describing key ingredients and toxicity.
5. Maintain a data collection system for enquiries to the service, whether received by telephone or electronic means, and carry out regular analyses of data to detect trends and emerging problems and use this data for prevention, counselling, outreach (e.g. farmers).
6. Fulfil an alert and surveillance role for chemical events in line with IHR (2005) requirements.
7. Create and maintain an online database for access by the public and professionals that will give information on toxic agents specific for the country, or work with an existing system to ensure it is adapted to regional needs.
8. Link with policy makers for enacting of appropriate policy and legal instruments.

### OPTION 4 (VARIANT)
1. Telephone advice service to medical professionals and, possibly to members of the public, within the country.
2. Training for medical and nursing and other professional staff on diagnosis and management of poisoning.
3. Either provide clinical and/or laboratory services or co-ordinate provision of, and information about, these services within the country.
4. Maintain a database of products and agents, describing key ingredients and toxicity.
5. Maintain a data collection system for enquiries to the service, whether received by telephone or electronic means, and carry out regular analyses of data to detect trends and emerging problems and use this data for prevention, counselling, outreach (e.g. farmers).
6. Fulfil an alert and surveillance role for chemical events in line with IHR (2005) requirements.
7. Create and maintain an online database for access by the public and professionals that will give information on toxic agents specific for the country, or work with an existing system to ensure it is adapted to regional needs.
8. Link with policy makers for enacting of appropriate policy and legal instruments.
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Appendix 1

Toolkit and cost model to assist in setting up a poisons information service

1. Introduction

This toolkit provides guidance on the issues to consider when setting up a poisons centre, the components of such a service, and an example of a cost model for a poisons centre.

The toolkit specifically addresses poisons information service functions and does not discuss other possible functions, such as laboratory or inpatient treatment facilities. These functions may form part of a wider centre, but require substantial material and infrastructural support from other bodies.

Some internationally agreed guidance is available to assist in planning and running a poisons information service, in the form of the WHO book *Guidelines for Poisons Control* (1) and a quality checklist developed by the European Association of Poisons Centres and Clinical Toxicologists (EAPCCT) (2). The checklist is further described below.

Before the detailed practical issues there are a few issues of principle to address.

2. Getting started

Often centres are started by one person with a vision or drive to improve the care of poisoned patients and the training of medical, pharmacy, nursing and other staff on clinical toxicology. Sometimes there is a laboratory focus or a focus on one aspect of poisoning (for example natural toxins).

In principle it is possible to set up a poisons information service with very little resource: just someone with expertise, some information resources and a telephone. However, to become a regional or national centre requires the service to be recognised. This recognition may be in a formal sense, for example by a national authority, or it may grow from professional support.

The issue of level of service should be considered at the start. Although offering a 24-hour, year-round service is the ideal, this may not be possible or indeed desirable initially because of the staff resource required, but it should be something to build up to.

Typically, the enquiry load to a centre builds quite slowly as awareness about the centre increases and as its reputation grows. As an example, Fig. 1 shows the gradual increase in enquiries to the Guy’s Hospital Poisons Information Service in London, UK, over the first 33 years of operation (*A Dines, personal communication, April 2010*).
3. Enquiry load and level of service

Estimating the number of enquiries a centre might receive is difficult and will be influenced by many factors. These include: whether the service will be available only to health professionals or also to the general public; awareness of the availability of the service among its (potential) users; and the quality and reputation of the service.

As Fig. 1 shows, a centre may only receive a few enquiries per week for the initial few years. It would be disproportionate to staff the centre for a 24-hour and 7-day a week service with dedicated, office-based staff for this workload. Employing some form of robust on-call system using mobile telephones to cover the out-of-hours service may be appropriate initially until the workload justifies a 24-hour presence at the poisons centre.

Any enquiries received to the on-call system must be adequately documented within the centre as this will form an important measure of the centre’s activity.

4. Funding, resources and sustainability

If the poisons centre is set up initially based on a small number of staff then the costs are apparently very low. The costs would just cover the time (which might be from multitasking or even from free time) of the few people involved, some telephone calls and infrastructural services such as electricity and water. The call charges of the user will be a cost falling elsewhere (but this is an issue that will need to be considered in the wider health system—see below).
It is important to recognise that the centre cannot function with no resources, and even if the resources are not, apparently, charged for they should be recognized and counted. If some of the people working in the poisons centre also have medical or pharmacy duties, then it should be clear how the time in the poisons centre is being made available and it should be accounted for. If, for example, a hospital or other institution allows staff time to work in the poisons centre and answer enquiries, there is a risk that, without explicit funding, these hours could be cut or lost due to other demands placed on the host institution.

Obtaining support from the host institution or funding from a government agency will be very valuable at the outset, even if the funding received does not meet the full costs. There are many models of funding around the world for poison centres, ranging from direct government funding to commercial sponsorship or fee generation and in practice many centres have a mosaic of funding. While a poisons centre may receive funding from diverse sources it is important that these do not in any way undermine the independence of the centre. It is likely that the poisons centre will need to add resources as it expands, and having a number of channels of funding will assist with sustainability.

5. Succession

If a poisons centre does start with one or two people, there is a need to consider how the centre can be sustained if key people leave or are transferred. Some centres are involved in medical, nursing or pharmacy education, and this can develop a cadre of potential new poisons centre staff as well as build support in the wider community.

6. Minimum operational standards and conditions

The EAPCCT self-assessment checklist provides a guide to the minimum operational standards to consider when setting up and running a poisons information service. The checklist itself can be obtained from the Association11 but its main components are listed below.

1. Operations
2. Direction and Management
3. Staff, their educational background and training
4. Location
5. Sources of information
6. Documentation
7. Funding
8. Publications and reports
9. Quality control

11 www.eapcct.org
It is recommended that all of these issues are considered when planning a poisons centre. Some guidance on these points is included in section 7 below.

7. Operational and other considerations

The information below presents brief guidance on most of the above issues and highlights some of the cost components that would need to be considered when developing the poisons centre budget. In addition, suggestions are given for information resources that could assist in initial set up.

7.1 Operations

Although 24-hour, 7-day a week operation should be the target and may be possible immediately, there are centres that operate either within office hours or extended hours. The important issue is to ensure that the level of service being offered is clear to users and is reliably provided. Once the centre is recognised the growth in demand can be used to leverage funding for further staffing.

There is a significant expansion in information and communications technology beyond the telephone, and centres should consider if non-traditional delivery mechanisms could be used. This may include internet delivery of poisons information to professionals and the public (see www.afritox.co.za).

The rise in access to mobile telephones and mobile internet as well as SMS/text services may be part of the mix of delivery to both professionals and public. Access to such services is growing rapidly (3-6).

Some poisons information services provide access via a toll-free telephone number, where the poisons centre bears the costs of the call. This can be rather expensive, although it may be possible to obtain sponsorship for such a line, for example from a telecommunications company.

7.2 Staffing

Once the hours of operation and the preliminary operational conditions of the poisons information service have been decided it will be necessary to recruit staff. The minimum acceptable professional qualifications for those delivering the service should be determined. In addition, secretarial and administrative staff, and, possibly, a librarian, or an informatics specialist will be needed.

The centre should have a Director who is responsible for the operation of the centre and who should, ideally, be employed on a full-time basis or a full-time equivalent. The Director’s tasks include recruiting and supervising other staff, developing and maintaining good relations with colleagues and other collaborators in the poison control programme, and ensuring the quality of the service. The Director should also be able to promote research, raise funds, and undertake the further development of the information service. If the Director is a medical toxicologist then she or he would also take overall responsibility for the medical advice provided by the service.
The staff providing the poisons information service can be referred to as poisons information specialists. Poisons information specialists are usually university graduates and may be drawn from a range of disciplines, including various branches of medicine, pharmacy, nursing, chemistry, biology, toxicology and veterinary science. In some countries, for example the USA, this role is professionally recognised and accredited (7).

Poisons information specialists should be able to give information to all types of enquirer on the basis of the evaluated data available at the centre, and in accordance with agreed patient management protocols. In cases where information is not available at the centre, they should know how it may be obtained. They must also know when to consult a medical toxicologist or adviser in a special area and should be able to record details of enquiries, cases, or consultations, using a standardized method. It is important, therefore, that these staff are well trained (see below).

If staff have other roles it will be necessary to have a standard operating procedure that clearly describes how staff should deal with competing demands (for example if a nurse is providing care for a patient and a telephone call comes to the centre, who will deal with this and in what time frame). Thus a potential weakness of using non-dedicated staff is that the quality of the poisons information service can suffer if staff have to divide their attention between other work and the poisons information service, with a consequent negative impact on perceptions of the service by users.

Initially, when the call load to the centre is small it is possible for a poisons centres to operate with only two staff, with out-of-hours cover being provided from home or provided from another department, for example a medical ward. Once the call load builds up sufficiently to require a staff presence at the poisons centre on a 24-hour basis there should be a sufficient number of poison information specialists to ensure at least one person being on duty at any given time. The frequency of enquiries is likely to vary during the course of the day, and it may be necessary to have additional staff on duty at certain times. In this respect, patterns vary throughout the world, and it is up to the individual centre to ensure that its service is adequate for local needs. As a guide, a 24-hour service requires at least 6-8 dedicated, full-time equivalent poison information specialists to allow for coverage of staff absences for illness, holidays, and professional training (1).

Staffing rosters will be an issue for any service that is attempting to run a 24-hour service and models are available from other medical services. Roster development software can be found on the internet. The roster should factor in meal breaks and, if the service is busy, it is advisable to roster in time away from the telephones so that other work can be done, such as carrying out case follow-up, preparing treatment protocols and so on. Advice can be sought from existing poisons centres on different models of roster.
Medical staff should be available to consult on more complex or serious cases of poisoning that are beyond the remit of the poisons information specialists. The medical members of the team could be drawn from emergency, intensive care, and treatment units to work part-time in the information unit, thus adding to their own experience. There should, however, be at least one medical toxicologist, i.e. a qualified physician with experience in the treatment of cases of poisoning. Ideally this should be someone who works full-time at the poisons centre, though it is recognised that this is often not possible, even in well-resourced countries (8).

A centre should have secretarial and clerical staff to assist in the establishment, maintenance, and updating of the information system. There should be expertise to manage and supervise the centre’s financial resources, equipment needs, and operational requirements, as well as dealing with personnel matters.

7.3 Training
Poisons centres are medical services and should have staff who are qualified, and trained and experienced in appropriate skills, including communication skills. The type and style of training will vary from centre to centre and will depend on the aims of the service and who it is to serve. Different communication skills are needed when dealing with the lay public compared with dealing with health professionals, so appropriate training will be needed. WHO has a collection of materials on training12.

An international group of clinical toxicologists has developed an open access curriculum in toxicology via a Wikisite called WikiTox13. The aim of this project is to improve the management of poisoning by providing materials that can be used for self-learning or for teaching. All of the content is freely accessible to anyone who visits the site.

Secondment to existing centres is often used as a way of training and enhancing the skills of poisons centre staff, when funding can be found to support this.

All professional staff should have the opportunity for continuing professional development, for example through participation in training courses or scientific meetings. If possible some funds should be budgeted for these activities.

7.4 Location
Poisons information services are based in many locations but two predominate: within a hospital and as part of an academic institution. Some centres may be located in their own premises but are often also attached to, or organisationally part of, another institution such as a hospital.

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12 http://www.who.int/ipcs/poisons/training_manual/en/
13 http://curriculum.toxicology.wikispaces.net
Location within a hospital, particularly one with emergency and intensive care services, offers some advantages. It provides ready access to a network of medical disciplines that will support and enhance the work of the centre, enabling staff to deepen their knowledge of the clinical aspects of poisoning. It may also offer access to a medical library and a clinical laboratory. Location within an academic institution means that the centre will have easier access to, among other things, libraries, research facilities, and educational activities. Another possible location is within a public health institute or ministry. This potentially permits more activities relating to prevention of poisoning and a closer relationship with decision-making authorities.

The rooms allocated to the poisons information service should be large enough to permit the efficient storage and retrieval of documents and to accommodate the service’s routine activities. Ideally the “answering” service should have its own room with telephones and computers, plus the basic files, protocols, and books needed by the information specialists on duty. There should be a separate room for those doing other work and for meetings. This will ensure a relatively quiet environment for the staff on duty on the telephone information service.

Staff on duty should have a private area providing the basic facilities for personal hygiene and rest. Food and drink, or the means to prepare it, should also be available, as well as vehicle parking space outside the building if appropriate. When the service starts functioning on a round-the-clock basis it may also be necessary to provide a bed for rest between duty periods especially night duty.

The director should have an office or suitable private area for specific work, interviews, and consultations etc.

Security is important: staff should feel physically safe, especially if working out of hours, and having a secure location with adequate security arrangements is vital. This may be achieved by using the facilities of a host organisation. Hospitals will, for example, often have 24-hour operations and will have in place security systems that the poisons centre can make use of. If the centre is not in such an institution it will have to make its own arrangements.

If staff are working from home or at another remote location, then their security as well as the security and the confidentiality of data, patient records and manufacturers’ information will need to be ensured.

Provision should be made for the maintenance and cleaning of equipment and facilities at the centre; this is often the responsibility of the administration of the building where the centre is located.

7.5 Furniture and equipment
The minimum furniture needed for a new centre consists of desks and chairs and a large work table. The storage of case records, files and documentation requires bookshelves and filing cabinets. Some of these should be lockable for the storage of
confidential data. As the service develops, additional space, furniture, and storage facilities should be made available for the growing collection of books, published material and files.

Optimally, there should be specially designed workstations incorporating computer terminals where appropriate.

As the majority of the poisons information service is provided over the telephone this is an essential piece of equipment. As a minimum there should be two telephones – these may be landline telephones or mobile telephones. A fax machine is also useful.

Computer equipment is also essential for accessing the internet, storing and processing information, producing documents and so on. There should be at least two computers, one printer, and one scanner. This would allow for one computer for the information service and one for the administrative/secretarial staff. Ideally the computers should be networked and there should be provision for making back-ups. Backing up can be done to an external hard drive or to the host institution’s network. In the latter case proper security and confidentiality arrangements should be in place.

At least one computer should have internet access. Since email is an important means of communication a dedicated email account is also needed. The poisons centre should have a website and even a dedicated ‘cloud’ (that is hosted in a remote location) for email and document storage. There will need to be proper and documented arrangements to ensure secure and confidential storage and observance of any national legislation on data protection.

Other basic office equipment includes a photocopier and, depending on the setting, air conditioning units and/or heating units.

If the poison centre stocks antidotes and other substances used in the treatment of poisonings, a refrigerator and a lockable cabinet for storing pharmaceutical agents will be required.

The role of a centre in education and training may require it to have its own audio-visual equipment, such as a data projector and screen, and a television and video/CD player.

7.6 Documentation

When poisons centres receive enquiries it is important that these are properly documented. Such records serve a number of functions as listed below.

1. Demonstration of demand for the service which may be linked to continued funding.
2. Ability to track cases:
   a. for individual case management;
   b. to identify trends or outbreaks;
c. for medico-legal reasons – the enquiry record provides evidence that the poisons information service was consulted about a particular case and gives an indication of the information exchanged about the case.

3. Provide reports to different bodies for different purposes, for example government departments, regulatory agencies, manufacturers, research bodies.
   a. Such reports may be mandatory.
   b. They may be revenue generating.

Such documentation must meet the needs of the centre and comply with local laws or regulations on confidentiality. Poisons centres should also try and build on other poisons centres’ experience and use established and maintained coding systems. Many centres in the US and Europe have independently created and maintained coding schemes (for agents and clinical effects and so on) and in later years have attempted to produce harmonized systems. In the US, for example, the American Association of Poison Control Centers (AAPCC) maintains a standardised terminology to describe cases of poisoning and relies on a commercial partner (Micromedex®) to code agents and products. The AAPCC has effectively imposed a minimum data set that all centres collect, which are then compiled in the National Poison Data System (9).

WHO has developed an internationally agreed set of terminologies and classifications for use in documenting poisoning cases in order to promote the collection of data by poisons centres in a comparable way14.

Although electronic capture and reporting of data may be the ideal and a goal, early on it may be appropriate for cases to be recorded on paper and input to a computer system later. Such records may have special legal status and form part of a patient record. They should be seen as confidential and stored securely.

7.7 Data management

The poisons centre needs to be able to store, process and analyse data collected during poisons information calls as well as to build up its own databases of chemicals, products and treatment protocols. The centre can choose to build its own databases, it can commission a bespoke data management system or it can purchase or subscribe to an existing data management system. There are likely to be recurring costs associated with such systems as software upgrades will periodically be necessary. If a database is built in-house or commissioned then the source code and documentation should belong to the centre and be capable of transfer for development and support. If a commercial system is used the need to pay for support or to develop in-house expertise needs to be factored in. If the centre is hosted in a university or large hospital it is possible that the institution’s computer

14 http://www.who.int/ipcs/poisons/harmonization/en/
department will provide support; bear in mind, however, that the strategic needs of a large organisation may not fit well with the needs of a small and specialist centre.

7.8 Information resources

Poisons information services clearly require access to information resources in order to make accurate, practical and evidence-based recommendations to enquirers. These recommendations will come from the knowledge and experience of the poisons centre staff but also from textbooks, journal articles, electronic databases and, critically, monographs or similar documents that are produced by individual poison centres or are acquired from commercial and non-commercial providers of toxicology databases. Such internal monographs may synthesise the available literature and opinion, the knowledge and experience of clinical staff, and reviews of case histories generated by the centre or the host institution, especially if there are facilities for treating patients.

There are many textbooks, databases and webpages that discuss and purport to give toxicological and poisons information. When setting up a new centre it would be prudent to make use of the experience of colleagues in relevant medical disciplines and in other long-established poison centres in selecting the most reliable of these sources. Some suggestions are given in Annex 1.

7.8.1 Books & Journals

Books, journals, and other published literature are essential for the work of a poison information centre. Each centre should have at its disposal documentation that is relevant to the national or regional situation and written, whenever possible, in the local language(s).

The main literature requirements include the following.

- Indexes, guides, and listings relating to medicines and to agricultural and other chemical products on the local market, plus the local pharmacopoeia.
- Books or other publications on the animal and plant toxins of the region.
- Standard textbooks of medicine (general and paediatric), chemistry, pharmacology, and analytical toxicology.
- Journals of medicine and toxicology.
- Dictionaries relating to the main areas covered by the documentation in the centre.

Advice on useful textbooks can be obtained from existing poisons centres. While textbooks are expensive it is possible to acquire some through non-commercial or subsidised routes. The following are agencies that may be able to assist:

› Operation Medical Libraries (OML): http://medical.alumni.ucla.edu/volunteer/oml.aspx) OML maintains a contact list of recipients. Submitting a request to OML may result in donations shipped from the USA;
Book Aid International (www.bookaid.org) - provides general books to many countries.

It will also be necessary to have access to some key medical journals. The HINARI Programme\(^\text{15}\), set up by WHO together with major publishers, enables institutions in low and middle income countries to have free or low-cost access to a large collection of biomedical and health literature. The HINARI collection includes TOXINZ\(^\text{®}\), the toxicology database of the New Zealand National Poisons Centre.

Some other low-cost or free electronic resources are listed in Annex 1. Access is, of course, predicated on the poisons centre having reasonable access to the internet.

### 7.9 Poisons centre publications and reports

Preparing publications and internal reports forms an important part of staff development and training. In addition, publications improve the standing of the centre and may be valuable in cementing the centre in its host institution, which may of course be a university. If possible the opportunity should be provided for staff members to present their work at national or international conferences, particularly those organised by poisons centre or clinical toxicology associations.

### 7.10 Quality

The poisons information service must have in place systems and procedures to ensure the service is safe and is providing sound advice. Such systems need also to be able to demonstrate – to internal and external audit – that the service meets the needs of users and is of a consistently high quality.

Quality assurance systems typically include the requirement for staff induction training, ensuring that all staff have job descriptions and that they understand their roles and the limits on the service they should provide. Written procedures, instructions and checklists help ensure staff and service users understand what is and can be expected. These written procedures can be used as useful training tools and may form the basis of an internal accreditation or certification scheme. In time certification may be developed into an externally validated academic qualification.

Staff appraisal as well as internal audits of adherence to protocols can help assure quality. Such systems require the commitment of staff and other resources and these overheads need to be recognised.

Some centres may wish to seek external standards accreditation using, for example, an ISO 9000 standard for quality management\(^\text{16}\).

\(^{15}\) http://www.who.int/hinari/

\(^{16}\) http://www.iso.org/iso/iso_9000
7.11 Additional cost items

Antidotes
If the poisons centre keeps a supply of antidotes then the initial outlay to purchase these can be substantial. Antidotes may be purchased by the health authority, with the poisons centre responsible for their storage and dispatch. In this case funds may also be needed for courier services. If the antidotes are dispensed on a cost-recovery basis then the administrative costs for billing and ensuring payment should also be factored in.

8. Proposed cost model for setting up and running a poisons information service

This cost model has been developed for the poisons information service component of a poisons centre. The cost elements are divided into capital expenditure, most of which would be needed in order to set up the centre, and recurring annual expenditures. The cost elements described above are presented in Table 2. This table is a template that covers the first three years of operation and can be adapted as needed when planning a poisons centre.

The actual costs will depend on many factors, including the location of the poisons centre, the extent to which in-kind support is provided by the host institution and, most importantly, the type and number of staff.

In-kind support may include some or all of the following: office space, energy costs, telephone line costs, journal subscriptions, measures to protect the security and safety of staff and equipment, and sharing of some staff costs. This in-kind support can be very valuable and may not appear as a ‘cash’ item on the poisons centre’s accounts, nevertheless it is vital that these costs are recognised and accounted for as their sudden loss can be a severe blow. Understanding the value of the in-kind support may enable corrective action to be taken and will make an explanation of the need for additional financial support more transparent.
**Table 1: Budget sheet template for a poisons information service – to be adapted to the local situation**

<table>
<thead>
<tr>
<th>CAPITAL EXPENDITURE</th>
<th>YEAR 1</th>
<th></th>
<th>YEAR 2</th>
<th></th>
<th>YEAR 3</th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>Cost</td>
<td>No.</td>
<td>Cost</td>
<td>No.</td>
<td>Cost</td>
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<td><strong>Equipment</strong></td>
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<td>Fax machine</td>
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</tr>
<tr>
<td>Computer (networked)</td>
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<td></td>
</tr>
<tr>
<td>Laptop computer</td>
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<tr>
<td>Computer back-up media and device</td>
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</tr>
<tr>
<td>Printer (networked)</td>
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<td></td>
</tr>
<tr>
<td>Scanner</td>
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<td>Photocopier</td>
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<td>Office bookshelf e.g. 5 shelf</td>
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<td>Lockable 4 drawer filing cabinet</td>
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<td>Air conditioner</td>
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<td><strong>Information resources</strong></td>
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</tr>
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<tr>
<td>Data projector</td>
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<tr>
<td>Projector screen</td>
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<tr>
<td><strong>SUB TOTAL</strong></td>
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</table>
## Recurring Costs

<table>
<thead>
<tr>
<th>Year</th>
<th>Staff - As Whole Time Equivalents</th>
<th>Other costs</th>
<th>Sub Total</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Medical lead/Director</td>
<td>Rental for premises</td>
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</tr>
<tr>
<td></td>
<td>Junior medical officer</td>
<td>Electricity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Poisons information specialist(s)</td>
<td>Consumables (paper, printer ink, pens etc.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Librarian/Documentalist</td>
<td>Telephone rental (fixed line)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Support staff (secretarial)</td>
<td>Telephone call costs (fixed line)</td>
<td></td>
</tr>
<tr>
<td>YEAR 1</td>
<td></td>
<td>Cellphone rental</td>
<td></td>
</tr>
<tr>
<td>YEAR 2</td>
<td></td>
<td>Cellphone call costs</td>
<td></td>
</tr>
<tr>
<td>YEAR 3</td>
<td></td>
<td>Toll-free number(s) - will vary with volume</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other costs</td>
<td>Internet access</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Journal subscriptions (NB some free through HINARI)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Subscriptions to on-line sources</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Subscriptions to a database management system</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Subscriptions to Afritox</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Subscriptions to Poisindex</td>
<td></td>
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<td>Staff training</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Antidotes</td>
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### Year 1 Costs

<table>
<thead>
<tr>
<th>No.</th>
<th>Cost</th>
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### Year 2 Costs

<table>
<thead>
<tr>
<th>No.</th>
<th>Cost</th>
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<tbody>
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</tbody>
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### Year 3 Costs

<table>
<thead>
<tr>
<th>No.</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

### Sub Total

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</tbody>
</table>

### Total

<table>
<thead>
<tr>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>
## Annex 1: Free or low-cost online resources on toxicology and general medicine

<table>
<thead>
<tr>
<th>SERVICE NAME</th>
<th>ADDRESS</th>
<th>NOTES</th>
<th>COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFRITOX</td>
<td><a href="https://www.afritox.co.za">https://www.afritox.co.za</a></td>
<td>Toxicology database to guide the diagnosis and management of poisoning, with a focus on Southern Africa.</td>
<td>Free for African poisons centres; requires registration for full access.</td>
</tr>
<tr>
<td>CCOHS</td>
<td>Main search page <a href="http://ccinfoweb.ccohs.ca">http://ccinfoweb.ccohs.ca</a> Free resources <a href="http://www.ccohs.ca/resources/">http://www.ccohs.ca/resources/</a></td>
<td>Multiple databases including RTECS and HSDB (see below) as well as in-house data.</td>
<td>Free for some resources; full access c. US$ 300/y.</td>
</tr>
<tr>
<td>ECHA</td>
<td><a href="http://echa.europa.eu/information-on-chemicals">http://echa.europa.eu/information-on-chemicals</a></td>
<td>ECHA’s public databases on chemical substances, which contain information about many chemicals in Europe.</td>
<td>Free, without registration.</td>
</tr>
<tr>
<td>INCHEM</td>
<td><a href="http://www.inchem.org">http://www.inchem.org</a></td>
<td>Peer reviewed information on chemicals commonly used, which may also occur as contaminants in the environment and food. It consolidates information from a number of intergovernmental organizations.</td>
<td>Free, without registration.</td>
</tr>
<tr>
<td>ICSC</td>
<td><a href="http://www.ilo.org/dyn/icsc/showcard.home">http://www.ilo.org/dyn/icsc/showcard.home</a></td>
<td>Data sheets that provide essential safety and health information on chemicals in a clear and concise way. Available in multiple languages.</td>
<td>Free, without registration.</td>
</tr>
<tr>
<td>SERVICE NAME</td>
<td>ADDRESS</td>
<td>NOTES</td>
<td>COST</td>
</tr>
<tr>
<td>--------------</td>
<td>---------</td>
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<td>------</td>
</tr>
<tr>
<td>TOXBASE®</td>
<td><a href="http://www.toxbase.org">www.toxbase.org</a></td>
<td>UK clinical toxicology database, intended for use by poisons centres and health professionals.</td>
<td>Price on application. May be discounted for low income countries.</td>
</tr>
<tr>
<td>TOXINZ®</td>
<td><a href="http://www.toxinz.com">http://www.toxinz.com</a></td>
<td>Database of c.190,000 chemicals (drugs, pesticides, household), products and natural toxins.</td>
<td>Price on application. Available free-of-charge or at low cost through HINARI.</td>
</tr>
<tr>
<td>WIKITOX</td>
<td><a href="http://curriculum.toxicology.wikispaces.net">http://curriculum.toxicology.wikispaces.net</a></td>
<td>WikiTox is an open access curriculum project to improve the treatment of people who are poisoned.</td>
<td>Free, without registration.</td>
</tr>
<tr>
<td>GENERAL RESOURCES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Free Open Access Meducation (FOAM)</td>
<td><a href="http://googlefoam.com/">http://googlefoam.com/</a></td>
<td>A unified search of all the FOAM resources on the Web.</td>
<td>Free, without registration.</td>
</tr>
<tr>
<td>#FOAMed #FOAMtox</td>
<td><a href="http://www.twitter.com">www.twitter.com</a></td>
<td>Twitter feed contains useful information and links.</td>
<td></td>
</tr>
<tr>
<td>SERVICE NAME</td>
<td>ADDRESS</td>
<td>NOTES</td>
<td>COST</td>
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<tr>
<td>--------------</td>
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</tbody>
</table>

**SMARTPHONE APPS //** There are many apps for medical services, but relatively few in toxicology (the following are both toxicological and emergency medicine focused)

<table>
<thead>
<tr>
<th>APP NAME</th>
<th>ADDRESS</th>
<th>NOTES</th>
<th>COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>AgileMD</td>
<td><a href="http://www.agilemd.com">www.agilemd.com</a></td>
<td>AgileMD contains clinical manuals, protocols, and policies to “help accurately and efficiently diagnose and treat patients at the point-of-care”. This is available as an Apple and Android app. Authors from San Francisco USA and there is a 24hr support service.</td>
<td>Free, with registration.</td>
</tr>
<tr>
<td>ToxToolBox</td>
<td><a href="http://toxtoolbox.com">http://toxtoolbox.com</a></td>
<td>Database of clinical summaries, formulas, and management guidelines for toxic exposures. Editor: Rais Vohra, MD - Assistant Clinical Professor of Emergency Medicine, University California San Francisco, USA.</td>
<td>Free, without registration.</td>
</tr>
</tbody>
</table>
References


