

Review

# Guidelines for International Forensic Bio-archaeology Monitors of Mass Grave Exhumations

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Received 29 May 2002; received in revised form 5 March 2003; accepted 11 March 2003

## Abstract

The systematic exhumation of mass graves is becoming a frequent occurrence globally. Historically, it has been mostly anthropologists with their particular expertise in osteology that have been engaged by non-governmental organizations (NGO) to monitor mass grave exhumations and postmortem examinations, conducted by a host country or international forensic team, to ensure competence and a concern for justice. The excavation of graves and examination of their contents for the purposes of personal identification of victims and/or collection of evidence for prosecution require the creation of standards that meet international concerns for forensic investigation of the highest quality. However, many anthropologists are not experienced with large sites; do not have much, if any, expertise in archaeology; and are not equipped by training to assess the quality of a forensic pathologist's autopsy. This contribution is directed to both the NGO and the bio-archaeologist who are involved in the exhumation of mass graves. The experience and skills appropriate for the bio-archaeological monitor are outlined; similarly, the policies and standard operating procedures (SOP's) of the NGO that will enable the bio-archaeologist to perform their task are detailed. It is becoming increasingly clear that how a grave site was created, filled, and concealed, along with subsequent processes of site formation (e.g. slumping, robbing, animal scavenging and taphonomic alteration), require the expertise of a forensic archaeologist to discover and record site complexity along with associated forensic evidence. Similarly, the bodies themselves which are often skeletonized, fragmented and commingled pose challenges for the anthropologists and pathologists whose postmortem examinations must be critically evaluated. A model protocol for observations to make at the site as well as at the mortuary facility is provided to guide the monitor and to provide a structure for reports which are of standardized content suitable for international agencies concerned with mass grave investigation.

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**Keywords:** Mass graves; Archaeology; Anthropology; Site formation; Exhumation; Postmortem examination; Monitoring protocol

## 1. Introduction

The following guidelines are directed towards both the agency which seeks to employ an individual to evaluate the

quality of mass grave exhumations, as well as the bio-archaeologist<sup>3</sup> who is contemplating a career working internationally in the forensic sciences. A somewhat dated model, issued by the United Nations in 1991 for the exhumation of mass graves and postmortem examination already exists as a monitoring guide for the forensic

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<sup>3</sup> We have elected to use the term 'bio-archaeologist' to unite the roles of physical anthropologist and archaeologist because it usefully implies a broader skill base including the biological sciences such as botany, entomology and zoology as well as some familiarity with surveying and excavation techniques including site formation processes and material culture.

pathologist [1]. As human remains recovered from mass graves are often semi-skeletonized and because anthropologists were in the vanguard of forensic scientists to apply their skills internationally to recover and contribute to the process of identifying remains from mass graves or in large numbers,<sup>4</sup> it transpired that anthropologists have been employed by various agencies to monitor postmortem examinations, including full autopsies. This is arguably inappropriate; but, given the preponderance of (semi)skeletonized remains in this context, the skills of the experienced forensic osteologist are often welcome and necessary. Nevertheless, the forensic bio-archaeologist, no matter how experienced in routine domestic case work, is vulnerable when placed in such a position of responsibility to charges of naiveté about forensic science in general and forensic pathology in particular. Clearly, the goals of identification of individuals and prosecution of perpetrators arising from large-scale killing will be better served by alerting those concerned to the appropriate qualifications of international forensic bio-archaeology monitors.<sup>5</sup> We need to determine if current monitoring practices and personnel are appropriate.

## 2. Appropriate qualifications and experience

Anthropology is a holistic discipline with fuzzy intellectual boundaries. The role of internationally applied forensic anthropology is expanding while at the same time drawing upon its traditional roots and is in the process spawning, perhaps rightly, a host of tangential concerns involving not only osteology but family rights, human rights, gender discrimination, international law, surveying and remote sensing techniques, exhumation strategies, taphonomy, and so on. This raises the significant distinction emerging between forensic anthropology (*sensu stricto*) and forensic archaeology. In North America, forensic archaeology (with its emphasis on excavation) is currently subsumed within forensic anthropology (with an emphasis on skeletal analysis), whereas in the UK and some countries in Europe, practitioners of the two specialties may come from quite

<sup>4</sup>There is no single or satisfactory definition of a mass grave. Simply put, mass graves contain many bodies, that are often jumbled and incomplete from individuals who were murdered and secretly hidden by agents of the state or civilians during times of war or civil conflict.

<sup>5</sup>The ideas presented in this paper arose from our personal experiences gained through the monitoring of sites and postmortem examinations in Bosnia–Herzegovina, Croatia, Afghanistan, East Timor and Serbia on behalf of the Physicians for Human Rights, United Nations High Commission for Human Rights, the International Commission on Missing Persons from the Former Yugoslavia and the Federal Commission on the Missing Persons and Humanitarian Issues of FRY Government, none of which organizations should be construed as necessarily endorsing the views expressed here.

separate disciplines (archaeology and anatomy/forensic medicine). This situation results in forensic teams fielded internationally with quite disparate skills.

Practically speaking, no one individual, certainly including the authors, is likely to possess all of the skills described below. Nevertheless, a pragmatic self-appraisal by the bio-archaeologist who wishes to offer themselves as monitors may be assisted by this ‘job description’. Also, international organizations and agencies, inter-governmental organizations (IGO) or non-governmental organizations (NGO) involved in expediting mass grave exhumations may be enabled in their search for the ideal candidate. It is not advocated here that the bio-archaeologist be a specialist in the diverse forensic sciences indicated below; rather, one should have some knowledge, albeit theoretical only, in such areas so as to render a reliable opinion as to the quality of the work being observed, particularly so as to notice errors of omission and commission [2].

### 2.1. Forensic anthropology (*sensu stricto*)

The competent forensic anthropologist should be expected to possess or be quite aware of the following areas of core expertise:

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- Hard tissue variation (genetic and acquired)
- Hard tissue markers of age, sex, ancestry and stature
- Local criteria to assess skeletal variability
- Recognition of stomatological intervention
- Dental anatomy and variation
- Ontogeny of the human skeleton including neonates
- Recognition of animal bones
- Ancient/historic bodies
- Soft tissue anatomy
- Altered states of bones and teeth
- Osseous and dental pathology
- Hard tissue indicators of life’s rigors
- Effects of animals on bones/bodies
- Variation in, and stages of, decomposition
- Time since death from skeletonized remains
- Radiographic appearance of bone, teeth and objects
- Cremated bones and teeth
- Recognition of ante-, peri-, and post-mortem injury
- Saw and tool marks on bone
- Surgical effects on bones (including amputations)
- Stigmata of torture
- Qualifications to provide expert witness testimony
- Chain of custody
- Understanding of manner, mode and cause of death
- Methods of personal identification
- Basic tenets of mitochondrial and nuclear DNA typing
- Types of trauma (esp. gunshot wounds)
- Statistical methods to find minimum number of individuals
- Crimes scene types (e.g. robbed sites)
- Taphonomic processes and agents (e.g. bioturbation)

Decay variables (temp/humidity, coffins)  
 Identification methods, including facial reproduction  
 National/ethnic clothing and cultural items  
 Ability to write reports (word processing)  
 Public speaking (including media)  
 Aspects of forensic jurisprudence (e.g. Daubert standard)

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The forensic anthropologist must understand and be able to address in reports and the court such issues as the strengths and weaknesses of particular methods (e.g. stature reconstruction standards). In addition, this individual can be expected to be able to recognize the following evidence types and determine if they are being noted and handled properly:

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Dental restorations, including prostheses  
 Clothing materials/constituents and types  
 Jewelry and personal effects  
 Documents  
 Biological evidence (entomological and botanical)  
 Firearms and explosive ordnance  
 Soils  
 Animal scats and pellets  
 Diatoms  
 Surgical field dressings  
 Medical procedures (e.g. catheterization)  
 Prostheses and procedures (e.g. staples, wires)  
 Resuscitative procedures and signs  
 Restraining devices  
 Mortuary procedures  
 Burial patterns/grave markers (e.g. proscriptions)

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## 2.2. Forensic archaeology (*sensu stricto*)

On the assumption that the forensic bio-archaeologist is additionally responsible for monitoring aspects of surveying and exhumation, the following functions should also be able to be evaluated by the monitor:

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Ground search methods  
 Site formation analysis and description  
 Basic surveying (e.g. total station)  
 Field logistics  
 Contour mapping  
 Spatial control (creation of datum points)  
 Excavation methods  
 Artifact collection, documentation and preservation  
 Heavy equipment usage  
 Health and safety matters  
 Sediment analysis (including backfill)  
 Sampling statistics (including control samples)  
 Site recording (including forms)  
 Screening

Casting of features  
 Basic photo and video photography  
 Dendrochronology  
 Logging of data electronically and on paper  
 Containerization of evidence  
 Basic human anatomy and descriptive terms  
 Use of a metal detector  
 Collecting and preserving insect and botanical samples  
 Handling skeletal remains, packing and labeling

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We particularly want to address two emerging roles of the archaeologist: disclosing site formation processes [3]; and finding evidence of cause of death germane to determination of the manner of death. Forensic archaeology is fundamentally applying the mapping and exhumation skills of the archaeologist to death scenes or places where bodies have been disposed. One must consider the concept of what is a site. In imaginary terms, one should have a time-lapse camera that runs backwards so that one could see what has happened every day to change things from the way they were at death to the way things are now. When we see a site for the first time, we must remind ourselves that its boundaries are arbitrary and defined by the investigator. The boundaries of the site, in space and time, as conceived at the time of investigation will not be the same boundaries that existed in the past. The investigator is looking for influences that are not immediately apparent or, at the time of investigation, are not even present. There may well have been a protracted episode of postmortem alteration of the body by the perpetrator including an attempt to obliterate the remains. Then, there is the process of subsequent exposure to the elements, possibly involving animal activities. There may be concealment of the mortal remains with sealing and hiding behaviors. Next, there are processes of scene response to disturbance (e.g. colonization by weeds, slumping and compaction). Deliberate removal of remains to hide evidence elsewhere results in secondary graves with their characteristic features of body dismemberment and commingling, a far too common occurrence in the former Yugoslavia. Then, we have the processes of discovery and recovery. Finally, while the site is being processed, it will change both naturally and as a result of the things the investigative team does. Clearly, the scene as treated by the investigators has to be visualized as part of an extended process involving many influences—all of which have to be understood to explain the state of the remains when it comes time to present the evidence in court [4]. The traditional training and experience of archaeologists with field logistics, site assessment, survey, mapping, and excavation equip them particularly to deal with crime scenes such as mass grave sites that have a prolonged history of transformation.

Those who first encounter a site and commence to expose the victims through careful excavation confront evidence that is critically important to determining the manner of

death. That is, the archaeologist exposes temporal and spatial relationships that help explain how the bodies came to be in the observed state. For example, mass graves are usually dug by heavy machinery whose activities affect the annual ring formation of branches and roots, providing a time frame for the activity. The machine used to dig the hole leaves impressions typical of its type-evidence which can be compared among sites; this can be shown through very careful excavation of different soil layers and the thorough delineation of the walls and floor of the grave (Jon Sterenberg, personal communication). As bodies are scooped, dumped or thrown from trucks into the site, body parts become separated and almost inextricably mixed; soil pushed on top to hide the evidence preserves the location of restraining devices (ligatures and blindfolds) as the bodies–decay relationships which careful archaeological methods can reveal and preserve through precise mapping. Only the most careful excavation will preserve the physical relationship of these to the body. Contextual information has as much value as the remains for reconstruction of events surrounding a death. Is the associated length of cloth, a headscarf, a blindfold, a gag, a bandana, a garrote, a sling, or simply an adventitious inclusion? Will dislocated neck bones preserve their abnormal juxtaposition during transport of the excavated remains? Only contextual observations at the scene can capture this evidence. In other words, the archaeologist encounters evidence as to the cause of death that must be recorded then and there, not later at autopsy by which time the evidentiary quality may be degraded or lost. The forensic pathologist's responsibility to elucidate the manner of death will be expedited.

### 2.3. Forensic bio-archaeological methods

Each of the core and related areas of expertise noted above are based upon access to personnel competence with a variety of methods and equipment; including the following:

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Osteometry  
 Histological thin sectioning  
 Microscopy  
 Still and digital photography  
 Radiography  
 Ability to read dental charts and notation  
 Use of electronic surveying instruments  
 Use of remote sensing instruments  
 Use of maps  
 Use of global positioning system instruments  
 De-fleshing methods  
 Quantitative analysis (esp. statistics)  
 Good drawing/sketching skills  
 UV fluorescence  
 Computer use (including software)  
 DNA analysis

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### 2.4. General skills

Finally, there are some collateral abilities and areas of knowledge that are useful as a monitor:

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Other languages  
 Personal immunology shots  
 Ability to drive (including four wheel)  
 Professional demeanor  
 Good interpersonal skills  
 Confident and pleasant manner  
 Cultural/ethnic sensitivity  
 Human rights issues  
 International humanitarian law

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### 3. Appropriate policies and procedures of the employing agency

International organizations and agencies, IGO's and NGO's have varying levels of experience with mass graves. Some organizations will have previously fielded monitors and have a clear idea of what they want; others may be novices. Consequently, the applicant needs to have confidence that she or he will be given the resources to do the job properly and will be protected from any negative consequences by the hiring organization.

Typically, the essence of the monitor's job is to observe exhumations and postmortem examinations and to write evaluative reports. The contents of a typical report are outlined later. The following materials or services should be available to the monitor:

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Transportation  
 Communications (e.g. mobile, sat. phone/radio)  
 Business card  
 List of staff names with positions  
 Local identification document (if required)  
 Medical insurance  
 Living allowance/salary advance  
 Global positioning system (GPS) instrument  
 Translator  
 Maps of the site area at various scales  
 Background information about site  
 Camera (35 mm and digital)  
 Protective clothing  
 Basic equipment (e.g. trowel, compass, tapes)  
 Copies of standard operating procedures (SOP's)  
 Forms (if required)

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The monitor should be provided with all possible background information. The political history is important but may be confusing to the newcomer. The local investigative team may possess information about the events leading up to the creation of a mass grave only some of which is public or

accessible to the NGO. Political agendas do not disappear with the cessation of hostilities; consequently, the monitor must be critical of everything that is said or overheard about a site. Even the information supplied to the monitor by the employer may be suspect in part. A common occurrence in parts of the former Yugoslavia was for the monitor to be assured that a site had been checked for land mines. The employer has a responsibility to ensure that this step has indeed been taken. Some NGOs provide awareness training in land mine accidents. Health and safety concerns are not acute in our experience [5], however, others working in parts of the former Yugoslavia have had numerous encounters with armed grenades, rocket propelled grenades and other unexploded ordnance (Jon Sterenberg, personal communication). The most dangerous activity, by far, is driving to and from the site.

### 3.1. Authority and responsibilities

The monitor should be instructed in the limits of their authority and responsibility. This is based fundamentally on the mandate of the organization contracting the monitor. For example, if the agency is concerned solely with identification of remains and not the collection of forensic evidence, this has to be understood by the monitor. Local entities may try to extract promises of support (jobs, materials and funding) from a monitor who likely has no authority to make such commitments. A problematic area, discussed further below, is disclosure of information. A monitor can anticipate having to talk to the media on occasion. Most organizations have media policies that provide guidelines for best handling questions from the media. Similarly, the monitor may be asked by a host country or even by their own organization to give public talks about their experiences. Frank disclosure and answers to questions from the floor can potentially jeopardize an investigation. The monitor has the difficult task of balancing privacy concerns, the public's desire to know, the family association's right to know and the employer's need to function within inter-governmental political structures.

A common situation that has arisen from the political sundering of the former Yugoslavia is the need for monitors from one entity (e.g. Serbian Republic) to observe the exhumations or autopsies performed by another entity (e.g. Bosnia) in the host entity's jurisdiction. In immediately post-conflict exhumation of mass graves, the level of distrust may be such that an independent organization is required to monitor the monitors from grudgingly interacting entities.

An allied problem is the degree of warrantable disclosure among NGOs. It is not uncommon for several organizations to monitor aspects of a mass grave exhumation. There may be justification for sharing information but sometimes, particularly, where political pressures still pertain, mandates may clash. The International Committee of the Red Cross has a policy of strict neutrality that could be jeopardized by another agency being observed to impart politically sensitive information.

The contracting organization must ensure that the presence of the monitor at a site is expected and accepted by local authorities and that their basic duty of critical observation is understood.

Some organizations, particularly those that intend to hand-off their function one day to local agencies, include a teaching and training function in their monitor's responsibilities. As soon as a monitor starts to share in the exhumation/identification process by showing how to perform a task (e.g. excavation methods and osteometry) they become participants, team members. Their monitoring role is arguably compromised. Some organizations, however, remain comfortable with this dual role.

### 3.2. Reports

Experienced organizations that produce many reports have generated standard report structures that ensure a uniform product for internal and external consumption. These should be shown to the monitor. It is disheartening to labor over a report only to have it rejected because it is non-conforming. A good practice is to separate observation from inference, to keep description distinct from speculation. However, this is often easier said than done and indeed the experienced monitor may be quite justified in inferring, for example, that jumbling of remains is part of a disrespectful attitude associated with the manner of the victims' deaths.

This raises the issue of what is to be done with the observations made by a monitor. There were situations, where the authors had the anomalous experience of monitoring the activities of a host country's forensic team who averred their procedures, were totally transparent and that any questions could be asked, any steps observed; and yet their political superiors forbade disclosure until their courts had finished with the complete investigation. This sort of situation can muzzle an NGO such that their reports remain confidential virtually forever. Both the employer and the monitor should be aware that confidential reports might be subpoenaed. Clearly, the NGO has to have a policy about public disclosure but one that will not negate their monitoring role entirely. One solution is to generate two reports: detailed "in-house" reports that can contain contentious, highly critical and occasionally speculative sections; as well as an executive summary that hopefully meets the mandates of the organization and serves the common good. The final release of a contentious ("politically sensitive") report can be delayed interminably within an NGO simply by requiring revisions. On the other hand, a lazy monitor who will not meet report deadlines can seriously undermine an employer's mandate.

The employer has a responsibility to decide what should or should not be included in a report. For example, does statistical inference qualify as forensic evidence? If one can show a statistically significant tendency in a series of single burials for shallowly-buried bodies to bear gunshot wounds while deeply buried bodies do not, should one cite this relationship in a report as evidence to support an oft-heard

allegation that natural deaths were being exhumed to inflate the apparent scale of killing? One project manager insisted that statistical relationships were not scientific facts, and that, since one could not categorically predict that every deep burial was a natural death, whereas every shallow burial was a homicide, the statistical finding had no place in a report.

It is commonplace to include photographs of bodies in a mass grave report as they can impart important information easily. However, such figures can be deemed to violate privacy concerns or to be inflammatory to a degree that militates against a fair trial or which may revive ethnic tensions.

The employer must consider to what extent a report is theirs and theirs alone versus the intellectual property of the report author. Who “owns” the information? Can it be used for scientific publication and teaching or training purposes? Should the employer vet manuscripts arising? Does a disclaimer by the author that a report is issued by the employer sufficient to protect the report author from any negative consequences?

Reports can be written as court documents or as an investigative aid. The author should be clear who is the intended audience. Investigative reports are usually in-house documents that may contain speculative sections, hearsay, and recommendations for further actions, whereas a report destined for court must be defensible in its entirety.

### 3.3. Standard operating procedures (SOP's)

Whether the mandate of the agency includes direct involvement in exhumations and postmortem examinations or is restricted to monitoring, its agents should have clear standards for how one deals with mass graves and their contents. For example, there can be SOP's (local or NGO) for:

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Site assessment (e.g. pre-visit, de-mining)  
 Site preparation (logistics, surveying, security)  
 Site surveying  
 Excavation/exhumation  
 Chain of custody for physical evidence  
 Commingled remains/re-association of fragments  
 Autopsy procedures (esp. skeletal)  
 Recording methods (e.g. is photography allowed?)  
 Storage  
 Tissue selection (e.g. pubes for age, molars for DNA)  
 Site clean-up  
 Standards for adequate personal identification  
 Methods for assessment of sex, age and stature  
 Procedures for determining elapsed time since death

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These days, advances in DNA typing may seemingly preclude the need for an investigative team to document other markers of individuality (e.g. tattoos, scars, healed fractures and dental attributes). However, family members may be unconvinced of the rightness of matching DNA

profiles if other individualizing traits (including clothing) have not been shown to be consistent with the DNA identification [6]. The anthropologist's and pathologist's responsibility to collect and document classic observations as to identity remains as pertinent as ever for the time being.

Further discussion is required about the problem of identifying incomplete and commingled body parts using DNA. Regrettably, many sites with multiple remains are secondary sites in which bodies are badly mixed and fragmented. This is a pressing and somewhat novel challenge for local organizations and for NGOs. A typical SOP requires sampling of: (i) all “articulated remains” (say, >25% of a set of remains); (ii) the commonest skeletal element; and (iii) other remains demonstrably not included in the previous (e.g. a child); i.e. a total sample equivalent to the minimum number of individuals (MNI). This meets the requirement of identifying those individuals who were represented at a site in a rational fashion with minimal cost. In addition, one must sample all major body parts (heads/skulls, upper, and lower bodies) *for the express purpose of re-associating these* whenever possible even though this will necessarily inflate the number of DNA profiles created beyond the MNI. This is an ethical responsibility borne towards the families of the victims. Most commingled sites will contain re-associable upper and lower body parts (each held together by clothing) as well as heads/skulls. However, there is a possibility that some sets of remains will have constituent parts that are now in different burial sites. Thus, DNA profiles from body parts must be compared within, and later between sites. As there must be rational allocation of limited resources for DNA analysis, one SOP is to create categories of remains prioritized as follows:

- (a) complete remains with presumptive identification;
- (b) partial remains with presumptive identification;
- (c) complete remains without presumptive identification;
- (d) partial remains—including heads, upper bodies, lower bodies, or other major body parts (e.g. torso);
- (e) single skeletal elements which were previously determined to furnish the best estimate of minimum number of individuals (plus requisite other elements that entered into the calculation of MNI);
- (f) archived specimens.

Keeping track of evidence is essential in a criminal investigation. Mass graves quickly contribute hundreds of objects, bodies and body parts. Some of these are encountered upon excavation, some at autopsy. Some kinds of evidence are non-material (such as physical relationships or color) and can only be recorded but not collected as such. Consequently, the investigative team should have an SOP for cataloguing in a rational, consistent and simple manner all “evidence” and linking such to the photographic record. The key to this challenge is to have a single evidence officer who assigns numbers to objects, issues the number, oversees visual recording, ensures linkage between the object and its number upon collection and maintains an evidence log. This individual is typically a scene of crime officer (SOCO)

who has responsibility for continuity of evidence collected both at exhumation and at autopsy. Likely, this individual will also be responsible for transferring the information from the evidence and photographic logs to an evidence database. Historically, there is too much separation functionally between the scene investigators and the forensic pathologists, e.g. photographs in the field need to be linked to the autopsy reports with ease through close communication and a unified process of recording and collecting the evidence.

The main goals of postmortem examination are to determine the cause and manner of death and to collect and record data for identification of mortal remains. Generally, post-mortems should be carried out in a standardized and consistent manner throughout the process that is subjected to monitoring. It is essential, at the early stage of a given site's investigation, to disclose the organization of the pathology team, their qualifications, and experience in similar investigations. The monitor's duty is to determine the availability of standard operating procedures (SOP's), body schemata, the existence and use of different forms, and standardized autopsy/postmortem reporting format(s). It is important to evaluate compatibility between proposed SOP's for post-mortem examination with recognized international protocols and standards for this kind of work, including but not limited to the UN Minnesota Protocol, Interpol DVI system and many others. These observations should be regularly checked during the ongoing process to ensure the postmortems are consistent. While analyzing SOP's for postmortem examination, the monitor should make considerable efforts to understand whether the proposed procedures further the professed goals of the investigation—identification of mortal remains and/or determination of cause and manner of death—since these procedures must meet ethical standards and the needs of the families to have confidence in conclusions about the fate of their missing relatives.

A step which has been neglected somewhat in the past is an evaluative review of autopsy reports (including anthropological observations). The exhumations and autopsies may have been well monitored but the contents of autopsy reports (which may not materialize for months) are not checked against field observations. One recommendation to deal with a large number of reports is to review a sample (e.g. 10%). It can be SOP not to copy these but to return originals/copies to the contributing agency.

### 3.4. Procedures for ensuring professional conduct

It is a natural tendency, especially among the staff of philanthropic organizations, to want to be liked-to be popular. Similarly, the monitor may develop strong emotional bonds with professional and lay individuals from host countries. It becomes increasingly difficult to write reports that contain criticism of one's friends. A strong professional ethic must be nurtured by the employer.

Speaking from personal experience, competing interested parties may try to exploit the naiveté of the monitor.

Particularly in those situations in which monitored exhumations by one political entity are taking place in another entity's territory, the monitor will receive outraged assertions from both sides that the other is manipulating the process or cheating. For example, one entity may aver in media releases that the other entity is inflating the number of bodies exhumed that day. The monitor may observe that TV cameras always appear just when a child's remains are to be lifted. Is the neutrality of the monitor compromised if she or he attends a much publicized mass re-burial?

The monitor must be sensitized to the potential for deliberate or unintentional misuse of images and information obtained by the media. It is good policy to invite media to a site at prescribed times and set aside time for photographs to be taken and interviews conducted in an organized setting. Bad reporting is harmful to all. One pitfall to be avoided is to have an uninformed reporter misconstrue an evidence number adjacent to a set of remains as signifying the total number of bodies at that site. Typically an evidence log contains an accumulating sequence of numbers that includes all features of note including numerous artifacts. The monitor should be provided with the means to evaluate how a local entity is handling media coverage.

Returning for a moment to the topic of scientific publications arising from monitored exhumations, the employer and the author should be concerned with the question of whether a manuscript contains research results obtained without informed consent. Clearly, it is unethical to conduct research on murder victims. Can tissue taken for one purpose (generating a biological profile of an unknown individual) be used for another (testing accuracy of techniques for determining age at death once an individual has been identified)? The answer is probably "No!". If one has made enough observations of bodies in mass graves to derive generalizations about decompositional phenomena (e.g. adipocere formation at depth), is this research? A guide for the employer is to decide whether information gained is at the expense of the individual. In the example just given, perhaps the scientific insight can be deemed benign and ethical. However, let us take another example. If blood is taken from thousands of relatives of missing persons as part of the process of identifying remains using shared patterns of DNA, and an interesting tendency for heteroplasmy (more than one mitochondrial type in any one individual) emerges, this bears upon the certitude of identity and upon the general advance of scientific knowledge. Neither the victims nor their relatives gave their tissues for research purposes. Can the observation of heteroplasmy be published? Is it ethical from your perspective, from that of a family's?

Disclosure of pay scale is inappropriate. Internationals may be paid at rates like those of their originating country. Similarly qualified individuals from the host country are often paid much less. This is unfortunate and best dealt with by silence and a demeanor which communicates that the true currency of value is the quality of work done.

#### 4. Observations to be made by the monitor

The monitor can take a passive role and simply record what is happening or can intervene to improve the procedures; but the NGO has to be supportive of the latter action that clearly places the monitor in a participatory role. The monitor's task is to document whether all the appropriate steps for processing a mass grave are being performed to recognized or international standards. However, the goal of the investigation has to be understood. If the investigation is for prosecutorial purposes it may be sufficient to identify only a single body with certainty from a mass grave. Personal possessions may get short shrift from the team. If the purpose is identification of all individuals and all their body parts, then the forensic evidence (e.g. cartridge cases) may be slighted.

##### 4.1. Recording methods

Several options are available: diary notation, voice recorders, forms, and visual record (typically, still/digital photography). One's field notes can be subpoenaed; but these are usually less complete and accurate than the typed version created episodically (e.g. in the evenings). Certainly, one's field notes contain misspellings, incorrect inferences, omissions, and so on. Consequently, it is a good practice to create a coherent, clean copy of one's field record that one is prepared for others to read and which can be defended in court if required.

An excavation of a mass grave is a complex, busy situation. Typically, the monitor will only be able to keep an eye on part of the action; i.e. many functions and findings will be unmonitored. The advantage of having a form listing procedures that can be ticked off during the monitoring is that it is an aide memoire for the monitor. Errors of omission by the monitored team are best spotted this way. Photography, if in conformity with confidentiality of the investigation, is mandatory for a monitor's report; but their visual impact may be misused by others (e.g. newspapers) if the images are obtained improperly or prematurely.

In practical terms, it is our practice to make point form notes (with dates and times noted) throughout the process. Sketches are included which show relationships (e.g. layout of the support structures at a processing site). A record of film roll and exposure number or digital image is maintained.

#### 5. Annotated model protocol for monitored exhumations and postmortem examinations

**General** (record initially, daily and/or throughout process the following): (classic descriptors of what, who, when, where, why and how)

Monitor's Name, role and organization (e.g. NGO).  
Date and time (24 h clock).

Location—site name, number (any abbreviations), country. GPS or other map coordinates.

Local entity/organization.

Daily personnel (note changes): names, titles, affiliation, and roles.

Prevailing weather (note changes).

Monitor's photographic record (roll and exposure numbers).

Visitors: times, names, affiliations (get business cards).

Daily functions (see next).

##### Functions (description without evaluation)

- *Logistics* (e.g. field set-up)
  - Transportation.
  - Structures (e.g. mortuary tent).
  - Services (e.g. electricity).
  - Machines.
  - Equipment.
- *Site assessment*
  - Health and safety considerations (e.g. mines, unexploded ordnance and caves).
  - Search techniques (e.g. cadaver dogs, surface grid and sub-surface remote sensing).
  - Surface features (e.g. vegetation cover, slope and water flow).
  - Surface topography (e.g. boulders, gullies and northern exposure).
  - Agents of site alteration (e.g.):

Freeze/thaw	Changes in water level	Rivers and creeks
Slope wash	Scavengers	Burrowing rodents
Birds	Porcupines	Insects
Gravity	Plants	Seasons
Day length	Sunlight	Lightning
Fire	Heat	Salt water
Snow pack	Melt water	Site security

- *Site security*
  - Physical (e.g. police tape and dogs).
  - Personnel.
  - Interaction with visitors and media.
- *Spatial control/site survey*
  - Use of standardized methods.
  - Datum points, grids (e.g. appropriateness of grid unit scale).
  - Mapping methods (e.g. total station).
- *Excavation/exhumation*
  - Size and organization of team (including locally hired personnel).
  - Use of standardized methods (e.g. evidence log, photographic log).
  - Availability of equipment and materials.
  - Scheduling (e.g. pace of work, stoppages and bottlenecks).

- Health and safety considerations (e.g. machinery, shoring and ammonia vapors).
- Feature disclosure.
- Appropriate use of labels, scales and directional markers.
- Collection of physical evidence.
- Collection of relational evidence (e.g. among remains, forensic evidence and soil/rock samples).
- Delineation of mortal remains.
- Spatial organization of remains (e.g. commingled remains, laid in rows).
- Measures taken to prevent body disarticulation during exhumation/recovery.
- Articulation with SOCO's and pathologists.
- Techniques of lifting and containing.
- Site protection.
- Handling of spoil.
- Site closure (e.g. backfilling).
- *Postmortem examination*
  - General condition of mortuary, including availability of instrumentation and necessary consumables.
  - Safety considerations for autopsy/postmortem examination:
    - Protection of staff (e.g. protective clothing, gloves, masks and eyes).
    - Disposal of sharp instruments.
    - Cleaning of instruments and examination tables.
    - Mortuary hygiene.
  - Availability of advanced equipment (e.g. fluoroscope and portable radiography).
  - Communication between exhumation and pathologist teams.
  - Reception of remains to the morgue (including chain of custody if applicable).
  - Clothing and footwear of remains:
    - Thoroughness of clothing search for documents/personal possessions.
    - Washing and drying of clothing and footwear.
    - Quality of description of clothing and footwear, relating to individual identification and damage and traces of perimortem events, e.g.:
 

Clothing (type, color, size, brand)	Clothing alterations and defects
Footwear	Personal jewelry (finger rings, necklaces)
Keys	Paper and coin money
Pocket watch	Wrist watches
Paper documents	Cigarette papers
Tobacco	Cigarette holders
Amulets	Ballistic evidence
Ligatures/blindfolds	Instruments of trauma
Pill medications	Trace evidence
(Para)military insignia	Ethnic garb
  - Labeling and storage of clothing and footwear upon examination.
- Examination of documents
  - Recording of information critical to identification.
  - Photography.
  - Preservation and storage (including chain of custody).
- Examination of artifacts in clothing and on or in the body
  - Description and extent of analysis.
  - Photography.
  - Preservation and storage (including chain of custody).
- Fingerprinting
  - Note factors precluding fingerprinting (e.g. postmortem changes, body parts, severe destruction of hands or lack of reference sample).
- Screening of mortal remains for presence of foreign objects, in particular missiles and explosive ordnance fragments, and methods (e.g. X-ray technology, metal detectors), or lack thereof.
- Basic condition of remains (decomposition and integrity)
  - Use of standardized terminology to describe state of tissues.
  - Use of diagrams to show body part recovery (including antemortem amputations).
- Assessment of postmortem changes to determine elapsed time since death.
- External examination
  - External genitalia.
  - Assessment of age at death.
  - Meticulousness of search for individualizing traits.
  - Techniques and accuracy of measurements to estimate size of injuries/alteration.
  - Attention paid to detailed recording of injuries that may have contributed to death.
  - Recognition and recording of any stigmata of torture (e.g. scars, patterned injuries, ligatures) and organized killings (e.g. blindfolds).
  - Delineation between ante- or peri-mortem injuries versus post-mortem trauma.
  - Delineation between deliberate methods of body destruction (e.g. disarticulation, burning) and incidental postmortem injuries (e.g. mechanical or other damage during collection, transport and burial).
- Internal examination
  - Full autopsy including opening of all three body cavities (cranial, thoracic and abdominal), removal of organs for detailed examination.
  - (Alternatively) limited autopsy (with justification).
  - Consistency of application of full or limited autopsy.
  - Recognition and recording of previous postmortem examination.

– Systematic examination of structures and organs

Rectal orifice	Vaginal orifice	Oral cavity
Neck organs	Lungs	Heart
Pancreas	GI tract	Spleen
Adrenal glands	Kidneys	Liver
Bladder	Internal genitalia	Brain and meninges

- Search for signs of pre-existing disease and trauma that might aid ID.
- Understanding of ante- and peri-mortem injuries to internal organs and their analysis in the context of previously determined external injuries (e.g. direction of bullet penetration).
- Recording of postmortem alterations to the internal organs caused by postmortem trauma and decomposition.
- Odontological examination
  - Care and accuracy of assessment of postmortem dental status.
  - Understanding of postmortem dental absences.
  - Understanding and recording of dental status, e.g.:

Restorations	Restorative materials	Extractions
Endodontia	Prostheses	Orthodontic procedures
Alveolar remodeling	Dental attrition	Eruption and formation
Agenesis	Impaction	Drift
Supernumeraries	Diastema	Discoloration
Malposition	Rotation	Imbrication
Crowding	Displacement	Occlusal classes
Overjet	Overbite	Occupational stigmata
Caries	Abscess formation	Dental fractures

- Knowledge of dental charting methods with consistent use of numbering system (preferably Federation Dentaire Internationale (FDI)).
- Dental radiography and photography with scales.
- Skeletal examination (anthropological analysis)
  - Qualifications and experience in forensic osteology; especially mass graves.
  - Defleshing if performed, record the method(s) and disposal of soft tissue.
  - Osteological methods: record procedures and appropriateness.
  - The presence and correct use of osteological instruments (e.g. (electronic) calipers, osteometric board, models (e.g. pubic symphyseal and rib end casts), normative standards (e.g. childhood stature, skeletal

and dental maturation, symphyseal and auricular remodeling), computer software.

- Use of forms, charts and sketches.
- Use of photography, radiography, casts, etc.
- Re-association of body parts.
- Extent of osteological evaluation (age, sex, ancestry, stature, altered states of bone and teeth (e.g. ante-mortem trauma with remodeling, perimortem changes (e.g. cut marks and fracture), and postmortem trauma (scavenging and taphonomic changes), dental features.
- Special anthropological procedures for immature bodies (e.g. radiography and dental histology to show disturbed growth).
- Evaluation of markers of postmortem processes (e.g. disarticulation, bleaching and exfoliation) and elapsed time since death.
- Recognition and recording of hard tissue markers of individuality (e.g. robusticity, antemortem fractures, disease remodeling).
- Reconstruction of broken bones (especially crania) to determine trauma type and cause of death.
- Ability to deal with cremated remains.
- Communication between anthropologist and pathologist of findings and inferences.
- Documentation of destructive procedures (e.g. thin sections of bones and teeth, stable isotope analysis, chemical tests, bone and teeth for DNA analysis).
- Handling of samples submitted to the anthropologist and their re-association to correct set of remains.
- Understanding and application of necessary statistical methods (e.g. calculation of minimum number of individuals (MNI)).
- Recovery and collection of ballistic evidence
  - Tracing bullets and (associated) projectiles.
  - Documentation of recovered items.
  - Packing, labeling and storing of ballistic/heavy ordnance evidence (including chain of custody).
- Sampling at postmortem examination
  - Samples for DNA analysis (identification)
  - Types of samples taken.
  - Principles for sampling body parts (e.g. heightened preservation in dentin).
  - Protection from contamination during sampling and application of other standard measures.
  - Labeling of samples.
  - Immediate storage of taken samples (e.g. cooler).
  - Handling of samples for DNA (including chain of custody).
  - Samples of botanical, entomological, soil and minerals at autopsy
  - Type and reason for sampling.
  - Recognition and recovery of evidentiary types.
  - Appropriate and consistent sampling, packaging and documentation (including chain of custody).

- Other sampling of remains (e.g. toxicology, histology, jaw removal)
- Type and reason for sampling.
- Rationale for sampling and consistency of approach to sampling.
- Handling of samples (including chain of custody).
- Ethical issues of sampling (e.g. research purposes).
- Recording of the findings
  - Immediate records (notes, dictation and voice recorders).
  - Time lag between examination and drafting of reports.
  - Use of forms (e.g. chain of custody forms).
  - Use of diagrams (consistency, suitability of diagrams and comprehensibility of diagrams).
  - Photography.
  - Extent and standard of use.
  - Type(s).
  - Use of scales and labels.
  - Video recording.
  - Use of logs (e.g. photography and evidence catalog).
  - Additional documentation (e.g. creation of DVI postmortem forms).
- Pathologist's opinion as to cause and manner of death and other summary findings
  - Demonstrably based on sound scientific findings from postmortem examination.
  - Manner of death determination conformance to existing medical standards (e.g. WHO Revision of Classification of Diseases, Injuries and Causes of Death).
- Issues of storage and disposal of mortal remains.
  - Storage of examined but still not identified mortal remains.
  - Storage of clothing and personal items.
  - Storage of biological samples (including DNA samples, maggots and plants).
  - Storage of other forensic evidence (e.g. ballistic items).
  - Conditions of storage, security issues, dignity of remains, and chain of custody).
  - Release of findings (timeliness and appropriateness).
    - Court.
    - Public.

## 6. Conclusions

As opposed to large-scale natural catastrophes, which are in themselves daunting enough, mass graves containing forensic evidence pose an even more formidable challenge in their size and complexity. To collect the evidence from such sites in a manner that will permit identification of the dead, and the prosecution of those who are held accountable for creation of the mass grave, for crimes against humanity, genocide and international human rights abuses, requires a

breadth and depth of expertise that cannot as yet be found in any single forensic discipline. The necessary revolution in our training philosophy will require changes at both the highest and lowest levels. Postgraduate training courses in mass grave exhumations are in their infancy. We need also to influence the highest levels of international governance. The United Nations has created positions of Special Rapporteurs for Crimes against Women, Torture, and Extra-judicial Execution but there is no Special Rapporteur for Mass Graves. The International Committee of the Red Cross and Red Crescent has recently launched a global project to raise awareness of disappearances and the importance of effective mechanisms for clarifying the fate of those individuals who have gone missing as a result of armed conflicts and state violence. Currently, mass graves are dealt with by ad hoc agencies, often hurriedly invoked, with variable levels of expertise and ability. We need a more thoughtful and long-term response.

## Acknowledgements

Discussions that the authors have had with many forensic scientists have augmented our understanding of these complex issues. Particularly we are grateful to Stephen Corder, Robin Coupland, Doug Ford, Bill Haglund, Mike Hedley, Rick Harrington, Brenda Kennedy, Markus Rothschild, Jon Sterenberg and Heather York. A Bora Laskin National Fellowship in Human Rights Research to the senior author supported the writing of this contribution.

## Appendix A. Monitoring report structure

Title page

Site name

Country

Monitoring dates

“NGO's” observers report

Author and degrees

IGO/NGO forensic program

Draft date (d/m/y)

Abstract (possibly suitable for public release)

List of figures/photographs

### 1. Introduction

### 2. The site

#### 2.1. Site location (with maps)

#### 2.2. Personnel and roles

#### 2.3. Scheduling

#### 2.4. Logistics

#### 2.5. Site security

### 3. Field phase

#### 3.1. Field set-up

#### 3.2. Site assessment

- 3.2.1. General area
- 3.2.2. Grave
- 3.3. Exhumation procedures
  - 3.3.1. Spatial control
  - 3.3.2. Exposing the remains
- 3.4. Site formation
- 3.5. Site closure
- 4. *Human remains*
  - 4.1. Handling the remains
    - 4.1.1. Safety and hygiene
    - 4.1.2. Equipment, materials and logistics
  - 4.2. Autopsy/postmortem procedures
    - 4.2.1. Basic biological aspects
      - 4.2.1.1. External examination
      - 4.2.1.2. Internal examination
      - 4.2.1.3. Structures and organs
      - 4.2.1.4. Odontological examination
      - 4.2.1.5. Anthropological examination
    - 4.2.2. Individual traits
      - 4.2.2.1. Physical evidence
      - 4.2.2.2. Handling of documents
      - 4.2.2.3. Personal clothing
      - 4.2.2.4. Personal effects
    - 4.2.3. Sampling
      - 4.2.3.1. Tissues for analysis
      - 4.2.3.2. Samples for DNA
  - 4.3. Recording and documentation
- 5. *Forensic aspects*
  - 5.1. Biological evidence
    - 5.1.1. Human
      - 5.1.1.1. Perimortem injury
      - 5.1.1.2. Cause(s) of death
    - 5.1.2. Physical samples
      - 5.1.2.1. Botanical
      - 5.1.2.2. Entomological
      - 5.1.2.3. Other
  - 5.2. Physical evidence
    - 5.2.1. Variety of types
    - 5.2.2. Description
  - 5.3. Recording and documentation
  - 5.4. Cause and manner of death
- 6. *Storage/chain of custody*
  - 6.1. Human remains/tissue
  - 6.2. Personal effects/clothing
  - 6.3. Forensic evidence

- 7. *Evaluation*
  - 7.1. Site complexity
  - 7.2. Scheduling of functions
  - 7.3. Health and safety issues
  - 7.4. Use of standardized methods
  - 7.5. Spatial control/survey
  - 7.6. Exhumation
  - 7.7. Postmortem examination
  - 7.8. Identifications
  - 7.9. Forensic aspects
  - 7.10. Recording procedures (forms, photography, maps, video, reports, etc.)
  - 7.11. Site security/chain of custody including storage of remains
  - 7.12. Dignity of deceased
- 8. *Conclusion and recommendations*
  - 8.1. Summary of errors of omission and commission
  - 8.2. Recommendations
- 9. *Appendix*
  - 9.1. Catalogues

## References

- [1] United Nations, Manual on the Effective Prevention and Investigation of Extra-Legal, Arbitrary and Summary Executions, United Nations Office at Vienna, Centre for Social Development and Humanitarian Affairs, New York, 1991.
- [2] S.C. Clark, M.F. Ernst, W.D. Haglund, J.M. Jentzen, The Medicolegal Death Investigator, A Systematic Training Program for the Professional Death Investigator, Occupational Research and Assessment Inc., Big Rapids, 1996.
- [3] E. Harris, The stratigraphic sequence: a question of time, *World Archaeol.* 7 (1975) 109–121.
- [4] J. Hunter, C. Roberts, A. Martin, *Studies in Crime: An Introduction to Forensic Archaeology*, Batsford, London, 1996.
- [5] A. Galloway, J.J. Snodgrass, Biological and chemical hazards of forensic skeletal analysis, *J. Forensic Sci.* 43 (1998) 940–948.
- [6] J.D. Butts, Postmortem examination: statements of principles of medicolegal autopsy, in: M.F. Fierro, G.J. Loring (Eds.), *CAP Handbook for Postmortem Examination of Unidentified Remains: Developing Identification of Well-preserved, Decomposed, Burned and Skeletonised Remains*, College of American Pathologists, Skokie, 1986, pp. 13–46.