Lessons learnt conducting minimally-invasive autopsies in private mortuaries as part of HIV and tuberculosis research in South Africa

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Conducting autopsies in private mortuaries

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SUMMARY

Current estimates of tuberculosis disease burden and cause-specific mortality in HIV-positive people rely heavily on indirect methods, which are less reliable for ascertaining individual-level causes of death, and mathematical models. Minimally-invasive autopsy (MIA) is useful for diagnosing infectious diseases, provides a reasonable proxy for the gold standard in cause of death ascertainment (complete diagnostic autopsy) and, used routinely, could improve cause-specific mortality estimates. From our experiences performing MIAs in HIV-positive adults in private mortuaries in South Africa (during the *Lesedi Kamoso* study), we describe the challenges we faced and make recommendations for the conduct of MIA in future studies or surveillance programmes, including strategies for effective communication, approaches to obtaining informed consent, risk management for staff, and efficient preparation for the procedure.

Key words

Research design; Mortality; Public health; Methods; Tuberculosis

SETTING

Tuberculosis (TB) is likely the leading cause of death (CoD) in HIV-positive people and is often under-recognised as a cause of morbidity.[1] Estimating TB mortality is challenging: current estimates depend heavily on death certificates, which are often inaccurate in HIV-positive people;[2] verbal autopsy, which differentiates poorly between TB and other HIV-associated CoD;[3] and mathematical modelling.[4] Complete diagnostic autopsy is the gold standard for determining CoD, but rates are declining worldwide;[5] minimally-invasive autopsy (MIA), however, performs well in diagnosing infectious disease[6] and is faster, technically easier, more portable, probably cheaper, and more acceptable to individuals and families.[7] Most autopsy studies have included only individuals dying in health facilities[1] and are poorly representative of most high TB burden countries, where many deaths occur in the community.

A community-based MIA surveillance programme at sentinel sites would improve quantification of disease burden and mortality estimates, but any such venture would encounter many challenges. From mid-2013 to late 2016, we conducted an MIA study in South Africa (*Lesedi Kamoso* ["light for the future"]) to estimate 1) the autopsy prevalence of TB and other infections[8] and 2) CoD[9] in HIV-positive adults who died after enrolment into a trial of empirical TB treatment ("TB Fast Track").[10] Based on our experiences conducting MIAs in private mortuaries and using information collated from field notes and discussions with the research team, we describe how challenges were overcome and provide guidance for those planning similar studies or considering incorporating MIA into surveillance programmes. We do not discuss technicalities of the MIA procedure, as detailed guidance has been published by other groups.[11,12] The parent and sub-study received ethical approval from the research ethics committees of The University of the Witwatersrand, the London School of Hygiene & Tropical Medicine, and local health authorities.

ASPECTS OF INTEREST

Preparation

Three to six months before data collection begins, the proposed autopsy activity should be discussed with local stakeholders (Figure 1), including community, traditional, and religious leaders; the police; patient

advocates; mortuary owners; managers of local clinics and hospitals; and, ideally, a representative of the Department of Health. We suggest providing a plain-language written summary, in local languages, with contact details of key personnel and oversight bodies. Meetings should be held at regular intervals for the duration of the programme, allowing for findings to be shared and for stakeholders to discuss concerns.

Ideally, this preparation period should also include formative work, conducted by social scientists, to gain a deeper understanding of the dynamics within the community, burial and cremation practices, and beliefs around death, dying, and autopsy. The scope of religious beliefs and practices should also be explored. Information collected during the formative work should inform the design of participant information sheets, the routes by which participants and families are approached, and the training of staff in obtaining consent and counselling individuals and families.

Death notification

We were largely reliant on family members informing clinic-based research staff of the death of a participant. On most occasions (229 [79%] of 289 deaths), notification occurred after burial and an autopsy could not be completed. We observed that the likelihood of timely notification depended on the trust between the clinic-based researcher and the participant/their family: researchers were more likely to be informed in time if they were seen as supportive and understanding, and particularly if they were regularly 'checking in' (sometimes informally) on the health of the participant.

Informed consent

Whenever possible, we requested consent for MIA from participants at enrolment to the parent trial: of 2,200 participants asked, 1,675 (76%) agreed; participants were not offered a financial incentive for participation. We approached the family for permission to proceed if the decedent had consented to MIA at enrolment or for written consent if the decedent had not been asked (the MIA sub-study was initiated some months after the start of the parent study and therefore some participants were not asked to consent to

MIA at enrolment). If a decedent had declined to consent at enrolment, the family was not approached. Of 43 families approached, 36 (84%) gave consent for MIA.

We developed consent procedures after discussion with clinical research experts in South Africa, including those previously involved in autopsy studies. It should be noted that these procedures were considered suitable for a study involving adults only; studies or programmes that involve children will entail different considerations and consent processes should be formulated after consultation with relevant experts. Investigators must be familiar with local legislation around human tissue research, adhere to informed consent guidelines published by professional and regulatory bodies, and are advised to consult local experts and institutional review boards. The recommendations below are intended to improve communication during the consent-taking process (a common reason for initial refusal of consent in our study was misunderstanding of the purpose of autopsy; for example, we were frequently asked to justify the need for further examination when the person had already died). As in all health research, participants or families giving consent should be allowed to make an informed decision about their own or their relative's participation and all parties must be made aware that they are free to decline or withdraw consent at any point without risk of immediate or deferred consequences.

The experiences of staff and our fieldnotes suggest that individuals enrolled into the parent study were more likely to consent to MIA if a researcher could discuss MIA in an open and transparent manner; had a good understanding of the purpose of autopsy in a research context; and was willing to discuss broader topics, such as life after death. An individual consenting to MIA for themselves was also made more likely by the involvement of a family member in the consent process, availability of additional plain-language written information, and availability of a staff member for follow-up conversations (some individuals came back to give consent for MIA at a later date, or simply wanted to continue the conversation with the researcher).

The process for getting consent or permission from the family of a deceased individual may be complicated by pre-existing tensions within the family; we found it helpful to make our discussions as inclusive as

possible and took particular care to communicate with senior family members. On some occasions we had to make two or three visits to a household before a final decision was made. Families were not offered a financial incentive for participation, though they were often (informally) assisted with transport to and from the mortuary on the day of the MIA. Among families who gave permission, we observed that decision-making family members understood the MIA procedure and the purpose of the study; the discussion took place some days before the funeral, with reassurance that MIA would not delay proceedings; and, most importantly, the researcher(s) had a good understanding of the relevant cultural norms and were able to listen, empathise, and give families space and time for discussion.

To our surprise, on more than one occasion a family member requested to observe the autopsy and reported afterwards that they found it a positive experience; however, this was not the norm, and acceptability of this practice may be very different in other settings, depending on local expectations and beliefs, underpinning the need for a robust understanding of the context in which MIAs are to be conducted. In addition, almost all individuals enrolled into our study were from a Christian background, and the funeral often did not take place for a week or more after death, giving us time to obtain permission and complete the MIA. This too may be very different in other settings, and may result in a smaller window in which the MIA can be conducted; the success of an MIA programme in such settings is likely to depend on the existence of a strong death notification system, ideally one integrated into hospitals.

Interactions with hospitals and mortuaries

Many private mortuaries in South Africa have informal agreements with hospital staff to facilitate the rapid transfer of the deceased from hospital to mortuary; often these are well-established networks with financial implications for those involved. Our experiences suggest that attempts to conduct MIAs in hospitals are unlikely to succeed unless clear instructions are issued and enforced by senior hospital management or unless the MIA programme is integrated into hospital procedures.

In our study, all MIAs were conducted in private mortuaries; most mortuary staff were helpful and welcoming, though we did encounter some opposition: twice we were unable to complete the MIA. As described above and in Figure 1, early engagement with mortuary managers, with opportunities for questions and clarification, would have made these interactions considerably easier; however, our study was conducted over a wide geographical area that included several hundred mortuaries, and we were not able to do this. On the day of the MIA, we advise that, if possible, researchers travel to the mortuary accompanied by a senior family member to facilitate direct communication between the family and mortuary staff. Providing mortuaries with written information and contact details of study personnel helped establish trust and made future interactions considerably easier; over the course of the study, we developed relationships with some mortuary managers, and would visit mortuaries on days when autopsies were not being conducted to update them on the study's progress.

Other considerations

Sterile instruments and procedures are not needed if conducting only histological examination of samples; however, we wished to perform aerobic and mycobacterial culture on samples, but had no access to an autoclave and encountered difficulties when trying to establish and maintain sterile fields. Useful items of equipment, including those used to maintain asepsis in the field, are listed in Table 1. All waste generated during MIA should be considered potentially infectious: many private mortuaries do not have procedures for clinical waste disposal, so we transported waste to a nearby health facility where this could be done safely. The World Health Organization provides guidance for transporting potentially infectious materials.[13]

To minimise risk during MIA, staff (four research assistants and a driver, in our study) should be trained in safe practices; educated about potential risks; and advised of the importance of knowing their own HIV status. These procedures should, ideally, be embedded within an occupational health programme: all staff should undergo regular screening for active TB and staff who are HIV positive should be made aware of their increased risk of TB and encouraged to take antiretroviral therapy. In addition, at regular intervals during the study, we organised debriefing sessions, led by a psychologist, to discuss issues arising from conducting

autopsies and dealing with bereaved families, and to provide team members with tools to manage stress and avoid burnout.

CONCLUSIONS

MIA, used in routine surveillance, could improve estimates of disease burden and cause-specific mortality, but the barriers to effective deployment should not be underestimated. If autopsies are to be more widely conducted outside of hospitals, health professionals and research organisations will need to engage wholeheartedly with the communities in which they work and strive to understand local beliefs and practices around death. Thorough preparation, education, transparency, respect, trust, and partnership with communities will be central to this process.

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AUTHOR CONTRIBUTIONS

All authors were involved in conducting the study, in either an operational or oversight capacity. ASK wrote the first draft of the manuscript and developed the figure. All authors critically reviewed and made edits to the manuscript, and all authors gave their permission for submission. The authors declare no conflicts of interest.

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TABLES

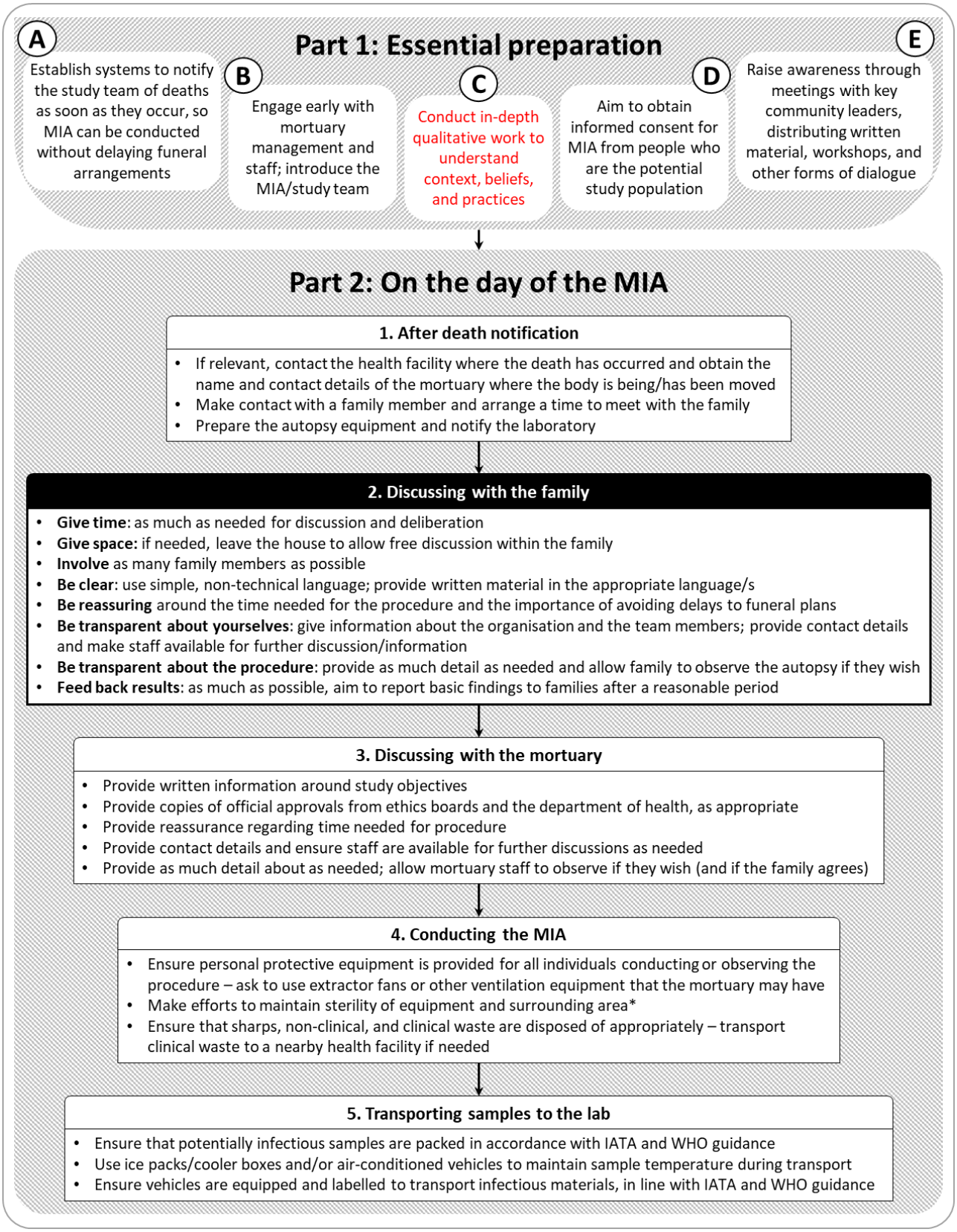
Table 1. Suggested essential equipment for conducting an MIA in the field

Category / sub-category / item/s			Comments
Documentation	Approvals from research ethics committee/s and national, provincial, and district department of health		All documentation that is handed to families or mortuary staff should be approved by oversight bodies and should include study team contact details
	Plain-language summary of study aims and activities for families		
	Plain-language summary of study aims and activities for mortuary owners and staff		
	Formal information sheets and consent forms		
	Lab request forms		
Personal protective equipment	N95 mask		Suggested as a minimum set per person. Appropriate training around universal precautions and disposal of sharps should be conducted.
	Goggles, visor, or other eye protection		
	Gown/apron		
	Non-sterile latex gloves		
	Alcohol gel		
	Hair net and shoe covers (or rubber boots)		
Autopsy kit	**Preparatory**	Headtorch	Medium for transportation of samples should be tailored to lab requirements.
		Folding work-surface/s	
		For cleaning: Povidone iodine; cold sterilant (min 150ml)*	
		For samples: Formalin; sterile saline	
	Sharps	Sharps bin	Suggest use of disposable equipment unless able to access sterilising facilities (cold sterilant* can be used to disinfect)
		Scalpel (small)	
		Tissue biopsy needles	
		18G hypodermic needles	
		Spinal needle/s	
		Skin sutures (nylon, 4-0)	
		Surgical scissors	
	BAL/ CSF/ Blood/ Urine	Catheter/s (male and female)†	
		Nasogastric tube/s‡	
		Syringes (20ml)	
		Sterile lubricating gel (sachets)	
		Sterile saline pack/s (200ml)‡	
	Other	Sterile gauze; alcohol swabs; surgical forceps; needle-holder; plasters	
		Sterile gloves and sterile procedure kits (if needed)	
Miscellaneous	**Waste & transport**	Waste bags (one for clinical waste, one for general waste)	See WHO/IATA guidelines for requirements around transportation and labelling of potentially infectious specimens
		Paper towels and cleaning fluid	
		Bio-bottles	
		Ice packs	
		Styrofoam insulation container	
	Other	Clipboard, pens, and permanent marker	
		Scissors and adhesive tape	
		Spare batteries (for headtorch)	

*Can be used to disinfect (in ~5–10 minutes) or sterilise (in ~15–20 minutes, depending on manufacturer) steel instruments. †Required only if collecting urine. ‡Required only if conducting modified broncho-alveolar lavage
BAL: bronchoalveolar lavage; CSF: cerebrospinal fluid; IATA: International Air Transport Association; MIA: minimally-invasive autopsy; WHO: World Health Organization

FIGURES

Figure 1. Overview of processes and interactions needed to obtain consent for and conduct MIA in a private mortuary or other community location



*Sterile precautions required only if attempting to collect samples for bacteriology (e.g., microscopy or culture)

IATA: International Air Travel Association; MIA: minimally-invasive autopsy; WHO: World Health Organization