DATA MANAGEMENT IN EMERGENCY MEDICAL TEAMS (EMTs): THE DATA MANAGER ROLE VERSUS THE ROLE OF THE EPIDEMIOLOGIST

ABSTRACT (258)

Medical and epidemiological documentation in disasters is pivotal to both recording patient care and providing real-time information to the host country. Furthermore, documentation informs post-hoc analysis to improve the effectiveness of future deployments.

Although documentation is considered important and indeed integral to healthcare response, it faces many barriers and challenges. Some of these challenges include working in a hectic and pressured environment whilst also working without robust standards for data management and training. Furthermore there is a shift in mindsent wherein the majority of health-care focus shifts to direct clinical care and diverts almost all attention from quality documentation. International guidelines are currently light on the description of how health data should be managed practically during disasters in order to ensure accuracy and completion.

This paper separates the tasks of the epidemiologist and the data manager (DM) in an Emergency Medical Team (EMT) and discusses the importance of data collection in the specific case of an EMT deployment. Although it may be possible (and is often the case in reality) to combine both roles to be carried out by one person, they remain quite distinct and should not be considered to be the same. The main objective of this paper is to provide guidance and task descriptions to EMTs and field hospitals when training, recruiting and preparing DMs and epidemiologists to work within their teams. The separation of tasks will likely lead to better quality data as it commits DMs to being concerned with the provision of real-time documentation from patient arrival through to compiling daily reports.

Keywords: Emergency Medical Teams (EMTs), Epidemiologist, Data manager, Disaster, Role Description

INTRODUCTION

Most disasters and many major incidents have significant short and long-term impacts on population health; placing additional demands on health-care organisations (WHO-PAHO, 2003). Following disasters, damaged or destroyed health facilities may be unable to adequately provide healthcare services to victims and the high rate of injury worsens the impact and renders response management more complex (Mäyrä et al., 2011). When such events exceed the capacity of the country to cope with its own resources, assistance from external sources is often required (UNISDR, 2009).

This international relief is often provided in the form of an Emergency Medical Team (EMT) deployment. EMTs are groups of health professionals whose goal is to treat patients in a country affected by an emergency or disaster. Over recent years it has come to be expected that these EMTs comply with the classification and minimum standards set by World Health Organisation (WHO) and its partners (Norton, Schreeb, Aitken, Herard, & Lajolo, 2013; WHO, 2017). As highlighted by the WHO (2013), such teams had not always historically integrated smoothly into the usual disaster co-ordination mechanisms. This was due to a wide variation in capacity, competency and adherence to professional ethics. Furthermore, following events, such as the earthquake in Haiti (2010), serious questions were raised about the clinical competence and practice of some of the foreign medical teams (now known as EMTs) who delivered some unacceptable practices during their provision of international medical assistance (Inter-Agency Standing Committee, 2011). The WHO EMT verification system was created to ensure greater accountability, quality and coordination of EMTs. One of the WHO verification requirements is to demonstrate that individual clinical care will be documented and that the team will report daily to the Ministry of Health (MoH) and EMT Coordinating Cell (EMTCC) (WHO, 2016).

THE IMPORTANCE OF DATA COLLECTION

The Sendai Framework for Disaster Risk Reduction (SFDRR) underlines the importance of data collection and paragraph 19 directly refers to knowledge (UN General Assembly, 2015):

"Disaster risk reduction requires a multi-hazard approach and inclusive risk-informed decision-making based on the open exchange and dissemination of disaggregated data, including by sex, age and disability, as well as on the easily accessible, up-to-date, comprehensible, science-based, non-sensitive risk information, complemented by traditional knowledge".

The SFDRR also points to the importance of promoting "the collection, analysis, management, and use of relevant data and practical information" at national and local levels, as well as to "ensure its dissemination, taking into account the needs of different categories of users".
There can be no clearer mandate to EMTs to look at the way medical documentation currently exists in their organisation and ensure it is able to contribute to the wider aims of generating practical, useful disaster data.

DATA COLLECTION IN AN EMT

The objective of medical documentation in disasters is to transparently record the care provided, provide accurate and timely data to the host country and to allow comprehensive post-deployment analysis to improve the effectiveness of future deployments (Jafar, Norton, Lecky, & Redmond, 2015; Mills, 2005). All EMT members will play a part in this, however there are some team members and roles whose primary focus involves data generation, collation and analysis.

EPIDEMIOLOGY

The WHO (2018) defines epidemiology as:

"the study of the distribution and determinants of health-related states or events (including disease), and the application of this study to the control of diseases and other health problems".

The term refers to the use of epidemiological methods, such as surveillance and scientific research, to assess and investigate adverse health effects after an event, both short- and long-term, and to anticipate consequences of future events on affected populations (Malilay et al., 2014). This definition includes various areas of epidemiology (e.g. communicable disease, environmental health, chronic disease etc.) and uses different methods to assess the scope of public health problems in communities.

Disaster epidemiology (i.e. applied epidemiology in disaster settings) presents a source of reliable and actionable information for decision-makers and stakeholders in the disaster management cycle (Malilay et al., 2014). In detail, as specified by the authors, disaster epidemiology activities, such as rapid needs assessment and surveillance, assist decision-makers by providing situational awareness for characterizing an incident's immediate effects on human health, short- and long-term consequences, and impacts of targeted actions and interventions.

In case of EMT deployment, the term 'disaster epidemiology' gains a further meaning which includes collecting of data on coordination, communication and management skills to develop lessons-learned and to contribute to evidence-based decision-making for future events.

Considering the significant surge in medical demand and the variety of services provided by EMTs, gathering information from deployed EMTs and the subsequent data analysis is crucial for coordination and decision-making to facilitate a timely response (WHO, 2016).

THE CHALLENGES OF DATA COLLECTION

Despite its importance, many countries do not systematically collect disaster-related data and information (Weichselgartner & Pigeon, 2015). The chaotic and confused nature of a disaster, and simultaneous lack of standardisation, training and awareness, compounds the paucity of quality documentation and any notion of methodologically sound data-collection (Waldman & Noji, 2008) The usual non-systematic data collection during disasters makes the collation of information very challenging. Documentation can be time-consuming and has the potential to detract from patient care, (Clynch & Kellett, 2014). In day to day practice, in many countries, the sheer amount of documentation routinely recorded at every medical encounter has grown dramatically so that it may now occupy between one quarter to one half of a clinician's time (Clynch & Kellett, 2014). It stands to reason, therefore, that this time may increase even further if staff are not familiar with the environment and documentation processes and subsequently this may push documentation lower down the list of priorities.

In field hospital facilities, organisation of care delivery is an immediate problem (Burnweit & Stylianos, 2011). A major challenge facing EMTs is to impose order on the chaos present and prevent its extension into the medical treatment of patients (Levy, Blumberg, Kreiss, Ash, & Merin, 2010). A structured documentation process is an essential component of this, which also provides data to inform effective resource utilisation. However, we need to acknowledge that data management in such a setting requires planning, allocated personnel and field guidance. Therefore cross-disciplinary practice with clarity over defined roles is essential.

Beyond data collection, we are faced with the issue that EMTs do not routinely share and disseminate their data with other EMTs, researchers or non-governmental organisations (Weichselgartner & Pigeon, 2015). The reasons for this are multifactorial; disaster response involves a range of actors (e.g. WHO, NGOs, MoH and others) with individual, sometimes

competing priorities. Data ownership by national authories and custodianship by international organisations can be difficult to reconcile and the appropriate levels of consent for exchange of clinical information, even in anonymised form, can be hard to define. The framework provided by a GloPID-R workshop highlights that "to facilitate effective sharing, it is vital to cultivate relationships built on trust, full engagement, mutual understanding and shared respect for high standards of quality in research" (GloPID-R, 2018). Administrative and ethical obstacles to data sharing can impede innovation in disaster relief, international research collaboration and implementation of best practice and cutting-edge technology in EMT operations. The specific practice-oriented characteristics of the EMT and disaster management research domain, require that co-operative solutions are found so that innovation and research can be evaluated and promoted by EMT practitioners in conjunction with focussed and rigorous academic institutions with the resources to support such work.

DATA ROLES: WHOSE JOB IS IT ANYWAY?

WHO EMT MINIMUM DATA-SET FOR DAILY REPORTING

The WHO (2016) has developed "a package of essential data items for EMT reporting derived from medical records of patients treated by EMTs" called EMT Minimum Data Set (MDS). The MDS provides an overview of the type and severity of cases seen, medical resource requirement, ongoing needs and potential outbreaks. It provides support for decision-making involved in the coordination and management of the EMT's response. The daily summary section enables the EMTCC/MoH to gain quick insight into the main indicators of the EMT activity, namely: number of patients, outcomes and bed count. The needs and risks section aims to report urgent risk factors within the affected community as well as communicate what support is required for that particular EMT. This standardisation is a step in the right direction, however the process of ensuring these standards are met remains unclear.

INTERNATIONAL GUIDELINES FOR EMTs

Thus far, the role of epidemiologist and DM within a EMT have not been delineated within international guidance. Reference is made to collection, collation and reporting of data however the process of delivering this is not encapsulated within a role description. The WHO Classification and Minimum Standards for Foreign Medical Teams in Sudden Onset Disasters makes reference to poor data coming from disasters, yet does not reference the need for specific staffing to manage data. (Norton et al., 2013). The EU amendment of the Commission Implementing Decision 2014/762/EU which outlines preparation and planning for what it refers to as natural and man-made disasters, despite referencing data-handling, does not refer to either the role of an epidemiologist or DM (ECHO, 2017). The Sphere Project (2011) states that:

"the lead agency produces a regular overall health information report, including analysis and interpretation of epidemiological data, as well as a report on the coverage and utilisation of the health services".

However, there is no description or detail pertaining to the mechanism or role of whoever is expected to handle and manage this data. Instead the focus lies within outbreak response and does not consider the acute use of data to manage disaster response more broadly. This problem is amplified when different actors (e.g clinical care teams, EMTCC logistics and academic epidemiologists) require different information which is hard to provide from a rapidly assembled dataset in the field. If unsatisfactory data collection tools are distributed without relevant buy-in across the response, there is a risk that they will not be used and individual teams will design alternative, but fragmented and inefficient ways of generating the specific data which they want.

THE ROLE OF THE EPIDEMIOLOGIST AND THE DATA MANAGER IN AN EMT

Without reference to role descriptions it is difficult to draw attention to the importance of documentation and data. Put simply, if the role is unclear and undesignated, it is highly likely that it will either be overlooked or poorly executed. Below a description of the roles of an epidemiologist and a DM in an EMT using available literature. The main objective of this is to provide guidance to EMTs and field hospitals when training, recruiting and preparing data mangers and epidemiologists to work within their teams. Having role descriptions does not seek to dictate whether each role could or should be adopted by the same single person or by more than one person, however it distinguishes the separate tasks required by each role to ensure that adequate attention is paid to specific aspects of both roles.

LITARTURE REVIEW

THE SEARCH

A literature review was carried out to collect information about the main tasks related to the role of data manager and epidemiologist in case of disaster or humanitarian intervention. The search was performed through Google Scholar; the search engine provides not only scientific literature but also job desctriptions and advertisements. The search consisted both of a primary search using keywords and a secondary grey literature search.

The search selected English language literature using each of the following keywords: 1) data manager; 2) epidemiologist; 3) disaster; 4) humanitarian emergency; 5) field hospital 6) job description 7) role description 8) tasks. Documents containing a combinations of these words were selected and reviewed (for criteria of inclusion see Table 2).

Inclusion Criterion	Details

Language	Only references written in English were included
Reference	Incomplete or inaccurate references were not included
Topic	Document must discuss and describe the tasks of the Data Manager and the Epidemiologist

Table 2: Details of the Inclusion Criteria Applied to Search Results

Selected studies were analysed to extract information about the role of the Data Manager and the Epidemiologist with a special focus on disaster and humanitarian crisis intervention.

The results of the research were also handled to experts in order to enrich the quality of the information collected; practitioners involved in disaster and humanitarian crisis response, such as the PHE or the UK-Med, were asked to review the paper and provide their contribution.

RESULTS

A total of 5620 results were found; 5597 records were excluded after reviewing the title and after duplicate removal. 23 records meeting the criteria were identified. 13 works met all the criteria for the search for a description of tasks and roles (See Table 3). The content of these sources contribute to the discussion of both data management and epidemiologist roles in the context of disaster reponse in the subsequent sections.

	TITLE	AUTHOR/ORGANIZATION	TYPE	DATA MANAGER	EPI	DATA MANAGEMENT	YEAR
1	Public Health Guide for Emergencies	The Johns Hopkins and IFRC	Textbook			x	2008
2		Carter Center	Job Description	x	x		2018
3		Wellcome Trust	Job Description	x			2018
4		ICAP	Job Description	x			2018
5		University of Maryland	Job Description	x			2018
6		RTI International			x		2018
7	2nd National Symposium on Medical and Public Health	The Johns Hopkins	Symposium Information	x	x		

	Response to Bioterrorism						
8	Outbreak surveillance and response in humanitarian emergencies	WHO	Guidelines				2012
9	The steps in outbreak investigation including the use of relevant epidemiological methods	Health Knowledge	Textbook			x	2016
10	Epidemiological Activity Manager	MSF	Job Description		x		2018
11	Epidemiologist	MSF	Job Description		x		2018
12	Epidemiologist	MSF	Job Description		x		2019
13	Data management	UK-Med	Standard Operating Procedure (SOP)	x	x	x	

Table 3: Research selected for review

THE ROLE OF EPIDEMIOLOGIST AS A MEMBER OF AN EMT

There are a number of resources to identify the expected role of an epidemiologist more generally in resource-poor deployments provided by Non-Governemental Organisations (NGOs) and international organization such as Médecins Sans Frontières (MSF) and the WHO (see list of websites); however, the specific role in an EMT is not formally described. There will of course be epidemiologists working outside of designated EMTs for example for WHO and the MOH, however the aim here is to focus on the role of an epidemiologist working *within* an EMT. Table 4 lists the roles as derived from the generic resources, split between four phases. In considering the outlined tasks, the possibility of rapid changes in the health environment and availability of information should be borne in mind; EMT epidemiologists

must work systematically whilst being flexible to shifting priorities and unexpected events. Furthermore, assimilation of often incomplete information is required with much more speed within emergency response in order to inform overall health response management.

Phase	Tasks
Pre-deployment	Design and deliver relevant training for the EMT (e.g. communicable disease alerts and surveillance)
	Support the development of recording systems (paper/electronic)
	Develop relevant research protocols & confirm adequate training and ethical safeguards
	Identify data requirements of potential deployments
	Develop outbreak/disease surveillance SOPs pertinent to the EMT
	Provide a baseline outbreak/communicable disease situational report based on available information
During	Attend health cluster meetings with WHO, MoH and other partners
	Identify further data needs and develop existing systems to support this
	Contribute to public health surveillance for specific communicable diseases posing an outbreak threat
	Supervise data collection, ensure the correct use of data collection tools liaising closely with data management, ensure quality is mainained
	Contribute to relevant report-writing
	Advise the clinical team based on epidemiological data
	Implement and monitor any relevant protocols
	Supervise and deliver any agreed research activity
	Regular analysis, visualisation and interpretation of data which may be presentated in a number of ways, eg rep
	internal meetings
	Prepare routine epidemiological reports as agreed by EMT senior management
In relation to communicable disease outbreaks (e.g. as part of Early Warning and Response Network (EWARN))	Participate in preliminary assessment of alerts or suspected disease outbreaks
	Participate in detailed assessments to confirm an outbreak in liaison with external partners with agreement of E
	Conribute to the development and refinement of case definitions for outbreak monitoring in liaison with extern
	Support local partners in case-finding interviews
	Contribute to wider partner discussions around control measures e.g. vaccination campaigns, WASH intervent
	Develop descriptive and analytical epidemiology
	Evaluate control measures
	Support surveillance systems in the community
	Provide expert input into information campaigns
	Maintain a daily registry of patients seen and any specimens collected/ sent to the laboratory
	Create a line list of cases and report daily to the district level
	Immediately notify alerts to surveillance officer, including rumours
	Maintain an alert log of notified alerts
	Co-ordinate with cluster focal points
	Compile EWARN priority diseases data in weekly reporting form
	Train relevant staff in EWARN function and activities
	Provide expert input into the media strategy within the EMT and in conjunction with the wider health cluster
	Write and disseminate an outbreak report (including recommendations)
	Analyse medical and non-medical data recorded

Post-Deployment	Debrief with the medical staff to assess the relief effort and to improve EMT performance
	Produce handover documents, final reports and 'lessons learned' documents Produce any relevant outbreak reports and EMT general reports

Table 4: Epidemiologist tasks within an EMT

THE ROLE OF THE DATA MANAGER IN EMT

The DM is responsible for the systematic collection, storage and management of individual patient data collected by the EMT staff. They must ensure that the data recording is as complete as possible and that the data are regularly shared via the agreed health coordination mechanisms (Inter-Agency Standing Committee, 2011). This role needs to be performed in close collaboration with any EMT information technology support staff and based on a good recording system to ensure uniformity of data, easier reporting and data-based decision support (Bleeker, Derksen-Lubsen, Van Ginneken, Van Der Lei, & Moll, 2006). As with the epidemiology function, an important distinction between data management under routine circumstances and in the context of an EMT is the need for data to be collected, curated and disseminated quickly enough for real-time decision making as an emergency unfolds.

One of the earliest tasks for the DM (in collaboration with the EMT team lead) is to discuss and agree with the EMTCC and MoH the plan for data handling post-deployment. They need to establish what the expectation will be regarding individual record retention and utilisation of any anonymised data. Early discussions and any conflicting views need to be addressed with the assistance of the EMTCC. Once the EMT is operational, the DM is responsible for supervising the collection of medical data using the method design and adopted by the EMT, they are also responsible for training any local staff in any relevant data entry roles such as patient registration. Ideally the patient record should follow each patient's journey from the entry point up until the exit point of the hospital. The DM, using a pre-planned strategy, should ensure no data loss via collation and collection of the records. These records will be used to

populate the expected daily report required by the WHO which will include all MDS items. The daily report should cover a 24-hour period of EMT activity and the DM should ensure that guidance is followed as to what data should be included when, from patients who are still undergoing care at the time of reporting. Although the WHO do provide some guidance on this, the EMT, via the DM, needs a consistent and standard approach. All data must be stored securely according to the individual EMT SOP (likely to include password protection of digital records and locked containers for paper records with designated key holders).

One of the most challenging parts of the DM role will inevitably be engagement and interaction with the clinical team to reinforce the need for accurate documentation. Liaison with the EMT team lead will be crucial, but so also will be involvement of EMT members during non-clinical duty time, so that the process becomes an integral part of everyone's role.

Resources on the DM role and tasks are limited; however, the UK EMT have developed a standard operating procedure (SOP) specifically for data management and this provides a blueprint for the practical tasks of maintaining data quality during a deployment (UKMed, 2018).

Table 5 summarises the task of the DM according to the time of the intervention (pre, during and post).

Phase	Tasks
Pre-deployment	Lead the development and testing of the selected recording system (paper/electronic)
	Develop detailed Data Management SOPs
	Deliver a training programme to EMT staff familiarise them with the proposed data collection method and the importance of the collection of data
	Ensure all equipment for data collection is encompassed within the EMT kit-list
	Support the trialling of data management processes via field simulation
During	From point of arrival in country, set up the initial data management processes (which may not be complete until the full field hospital is constructed)
	Consider how/if theEMT with integrate any external agency expectations of joint databases

	As the field hospital develops, establish steady-state data management/flow protocols according to SOPs Identify any data flow issues and work with the team leads to resolve these to avoid data loss Train and support lay and medical staff in collection of data Supervise data filing, ensure the correct use of data collection tools by clinical staff and provide responsive feedback on poorly completed data Integrate any emerging epidemiological concerns within data processing Attend the Health Cluster meetings with WHO and MoH
	Discuss with the WHO and MoH the approval to keep non-patient identifiable record information for post-deployment analysis
	Fill in and submit the WHO daily report
	Identify further data needs with the WHO/MOH and provide data management support as required
Post-Deployment	Organise and manage the data collected including planning for handover Debrief with the medical staff highlighting good/improved practice and areas requiring more work with a view to improve quality of EMT performance in data collection Collate any learning from the deployment and plan alteration to the data plan accordingly

Table 5: Data manager tasks within an EMT

Who they?

DISCUSSION

Every EMT has the responsibility to complete a medical record for each patient and report daily to the MoH and the EMTCC. The role of the DM in this process is essential, especially as we know very well that securing and maintaining priority status for medical documentation in disasters is difficult. Similarly, the role of the epidemiologist which will involved liaison beyond the EMT itself into the community and wider co-ordination mechanisms, is integral. Without role descriptors for each of these, it is easy for them to be amalgamated into one. Depending on the context, it may be that a single person can take the responsibility for all tasks of each role however the main aims and focus of each role is very separate, despite having some crossover (see figure 1 for the main roles and crossovers). Therefore, EMTs need to be very clear about the tasks they are asking of their staff in these roles and if taken on by separate individuals they must work in close collaboration.

Taking the decision within an EMT as to whether two members of staff can be used for the roles will depend on resources and circumstances as well as the skill-set of team members. Deciding to have a single team member covering both roles requires some testing of this capacity in drills and pre-deployment simulation. It may be that a single person can cover both roles, but concurrently other members of the clinical team are trained to assist during non-clinical duties.

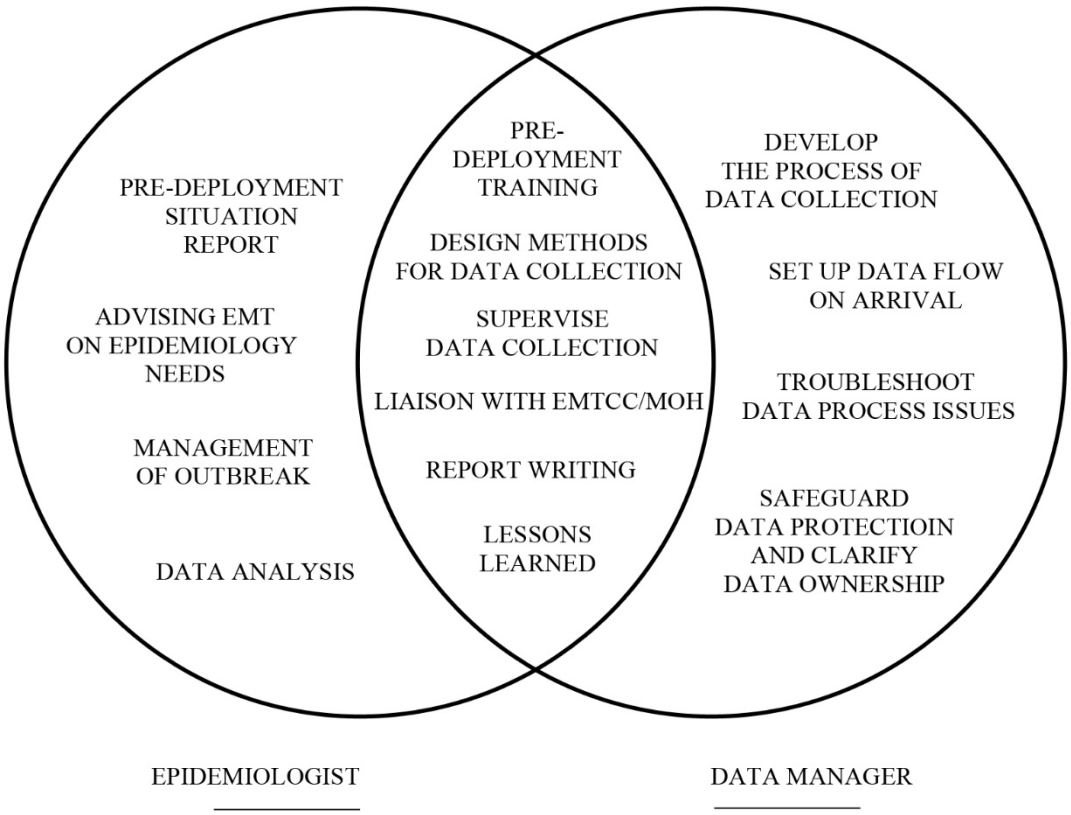

Fig. 1: Venn Diagram shows the common tasks between the epidemiologist and the data manager in an EMT

The key element to this process is planning on the part of the EMT. To leave either role without clarity is likely to result in poor documentation and reporting practice. Therefore, building training around these roles into usual EMT practice will develop familiarity with common pitfalls and lessons learned from past disaster response efforts. This will allow for learning and improvement in practice.

Coordination in disaster is essential and relies on information reported by individual teams. Similarly, post-deployment analysis and future improvements hinge on accurate and adequate data.

CONCLUSION

This paper provides a description of the tasks and responsibilities of the DM and the epidemiologist in an EMT in case of disaster. Just as clinical staff are expected to undergo training specific to field hospital work, DMs and epidemiologists ought to receive specific training for their own roles. It is this groundwork which will pay dividends in the future of disaster response co-ordination as it integrates focussed data training in the EMT pre-deployment plan. In time this will change the narrative on disaster documentation and data and allow the international community to confidently understand how best to move forward in medical disaster response.

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REFERENCE

Bleeker, S. E., Derksen-Lubsen, G., Van Ginneken, A. M., Van Der Lei, J., & Moll, H. A. (2006). Structured data entry for narrative data in a broad specialty: Patient history and physical examination in pediatrics. *BMC Medical Informatics and Decision Making*, *6*, 1–7. http://doi.org/10.1186/1472-6947-6-29

Burnweit, C., & Stylianos, S. (2011). Disaster response in a pediatric field hospital : lessons learned in Haiti. *Journal of Pediatric Surgery*, *46*(6), 1131–1139. http://doi.org/10.1016/j.jpedsurg.2011.03.042

Clynch, N., & Kellett, J. (2014). Medical documentation: Part of the solution, or part of the problem? A narrative review of the literature on the time spent on and value of medical documentation. *International Journal of Medical Informatics*, *84*(4), 221–228. http://doi.org/10.1016/j.ijmedinf.2014.12.001

ECHO. (2017). Amendment of Comission Implementing Decision 2014/762/EU.

GloPID-R. (2018). *Principles of Data Sharing in Public Health Emergencies*.

Inter-Agency Standing Committee. (2011). Coordination and registration of Providers of foreign medical teams in the humanitarian response to sudden-onset disasters: A Health Cluster Concept Paper. *FMT Concept Paper*, (May 2011), 1–7.

Jafar, A. J. N., Norton, I., Lecky, F., & Redmond, A. D. (2015). A Literature Review of Medical Record Keeping by Foreign Medical Teams in Sudden Onset Disasters. *Prehospital and Disaster Medicine*, *30*(02), 216–222. http://doi.org/10.1017/S1049023X15000102

Levy, G., Blumberg, N., Kreiss, Y., Ash, N., & Merin, O. (2010). Application of information technology within a field hospital deployment following the January 2010 Haiti earthquake disaster. *Journal of the American Medical Informatics Association*, *17*(6), 626–630. http://doi.org/10.1136/jamia.2010.004937

Malilay, J., Heumann, M., Perrotta, D., Wolkin, A. F., Schnall, A. H., Podgornik, M. N., … Simms, E. F. (2014). The role of applied epidemiology methods in the disaster management cycle. *American Journal of Public Health*, *104*(11), 2092–2102. http://doi.org/10.2105/AJPH.2014.302010

Mäyrä, A. P., Agapiou, A., Hildebrand, L., Ojala, K. M., Mikedi, K., & Statheropoulos, M. (2011). Optical sensors for urban search and rescue operations. *Proceedings of SPIE - The International Society for Optical Engineering*, *8185*, 1–8. http://doi.org/10.1117/12.898146

Mills, E. J. (2005). Sharing evidence on humanitarian relief. *British Medical Journal*, *331*(7531), 1485–1486. http://doi.org/10.1136/bmj.331.7531.1485

Norton, I., Schreeb, J. Von, Aitken, P., Herard, P., & Lajolo, C. (2013). *Classification and Minimum Standards for Foreign Medical Teams in Sudden Onset*. *World Health Organisation*.

The Sphere Project. (2011). *Humanitarian Charter and Minimum Standards in Humanitarian Response*. http://doi.org/10.3362/9781908176202

UKMed. (2018). Data Management. UK EMT Technical Standard Operating Procedure.

UN General Assembly. (2015). The Sendai Framework for Disaster Risk Reduction 2015–2030.

UNISDR. (2009). 2009 UNISDR Terminology on Disaster Risk Reduction. *International Stratergy for Disaster Reduction (ISDR)*, 1–30. http://doi.org/978-600-6937-11-3

Waldman, R., & Noji, E. K. (2008). Field investigations of natural disasters and complex emergencies. In *Field Epidemiology* (pp. 472–473).

Weichselgartner, J., & Pigeon, P. (2015). The Role of Knowledge in Disaster Risk Reduction. *International Journal of Disaster Risk Science*, *6*(2), 107–116. http://doi.org/10.1007/s13753-015-0052-7

WHO-PAHO. (2003). WHO/PAHO Guidelines for the Use of Foreign Field Hospitals in the Aftermath of Sudde-Impact Disasters.

WHO. (2016). Minimum Data Set for reporting by Emergenvy Medical Teams.

WHO. (2017). Deploying quality-assured medical teams when disaster strikes, (November 2016), 2016–2018.

WEBSITE

The role of the epidemiologist. Medecins Sans Frontieres. https://www.msf.org.uk/job-profile/epidemiologist. Accessed 30/10/18

Epidemiologist Job Description. Medecins Sans Frontieres. https://www.jobzella.com/en/job/open-external/0594393ac58247ed61d5e62339cd9c28. Accessed 30/10/18

Epidemiological Activity Manager Job Description. Medecins Sans Frontieres https://www.msf.ch/en/media/1506. Accessed 30/10/2018

The steps in outbreak investigation including the use of relevant epidemiological methods. Health Knowledge. https://www.healthknowledge.org.uk/public-health-textbook/disease-causation-diagnostic/2g-communicable-disease/outbreak-investigation. Accessed 30/10/2018

Outbreak surveillance and response in humanitarian emergencies. WHO. http://apps.who.int/iris/bitstream/handle/10665/70812/WHO_HSE_GAR_DCE_2012_1_eng.

pdf;jsessionid=76E738EE465F739DCC020BD80FFCEA3A?sequence=1). Accessed 30/10/2018

WHO. Definition of Epidemiology. http://www.who.int/topics/epidemiology/en/ (last access 20/04/2018)