

Emerging Training Needs of Forensic Scientists: Addressing the Challenges of Chemical, Biological, Radiological and Nuclear Disasters

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ARTICLE INFO

ABSTRACT

SHORT COMMUNICATION

Article history:

Received: 12 Dec. 2019

Revised: 5 Feb. 2020

Accepted: 15 Feb. 2020

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In cases of chemical and biological terrorism, many citizens are injured which leads to great social impact. Chemical, Biological, Radiological, and Nuclear (CBRN) detection in-service training for forensic teams is indispensable to incorporate expertise to address concerns on weapons of mass destruction. Forensic science laboratories around the world are determined to fight the changing face of crime in the rapidly advancing technical scenarios globally by continually upgrading its technical acumen and embracing new technologies in its domain. The mission of training of forensic scientists is to prepare nationally accepted guidelines for the forensic examination of CBRN related materials and residues.

Keywords: Forensic science, CBRN (Chemical, Biological, Radiological, and Nuclear), Scene of crime, Investigation, Detection, Training

Introduction

The Forensic Science Laboratory System is committed to accurate applications of scientifically accepted protocols to the display of best evidence in an effective and efficient manner for keeping alive the motto of providing justice to the community at large. The forensic scientists proudly and profoundly believe in the dignity and respect of each and every human beings and are striving to strengthen the judicial system working with a broad mind to discharge duties effectively with personal values and professional ethos intact in the

very pursuit of truth and social justice. Forensic Science Laboratories around the world are determined to fight the changing face of crime in the rapidly advancing technical scenarios occurring globally by continually upgrading their technical acumen and embracing new technologies in their domain. The main objective of this paper is to highlight the training needs of forensic scientists and their effectiveness in the prevailing CBRN threat situation. In order to develop CBRN forensics response and successful detection of

evidence at a crime scene contaminated with Chemical, Biological, Radiological and Nuclear (CBRN) agents, training of forensic scientists is an absolutely vital part of CBRN defense. The trained scientists will be able to handle traditional evidence in a hazardous environment and defend their reports successfully in court trials and prosecutions of the individuals who carried out attacks. It will also provide information about the type and class of CBRN agents used. The medicinal needs of survivors of such attacks may also be planned accordingly which is mitigating the overall damage to men and the environment. With this approach, the main components including the Scene of Crime (SOC) investigation, the reason for providing specialized training for forensic scientists and the training needs in detail has been addressed. The concluding remarks are based on the overall understanding of CBRN threats and states the dire need for documented guidelines as CBRN investigations require forensic results.

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Counterterrorism operations of forensic science have gained importance as suspected use of chemical, CBRN materials add complexity to any international or internal conflicts. Further CBRN forensics may not only help to identify provenance and attribution but also combat fake

news and conspiracy theories. It is been a long time since traditional forensic laboratories need to be equipped with CBRN capabilities and to meet this need, the first step is to train the traditional evidence collection forensic teams as to how they are supposed to operate in a CBRN environment.

I. Scene of crime investigation

Any incident of crime, accident, natural disaster, armed conflict leaves traces at the scene of the incidence. Scene of Crime (SOC) investigation is a process that aims at recording the scene as it is first encountered, recognized and collected all physical evidence potentially relevant to the solution of the case as the objective of the investigation is to accurately interpret the facts, reconstruct the events and understand what must have really happened. SOC investigation is the initial point for the successful use of physical evidence by the forensic science laboratory and the investigator. The role of forensic science services starts at the crime scene with the recognition and recovery of physical evidence and proceeds with its analysis/evaluation of the results in the laboratory. The findings are presented to judges, prosecutors, lawyers in need of the information.

The forensic scientists debuted at the SOC are there to provide support to the investigating agencies round the clock, seven days a week in some laboratories. There has been a geometrical progression in the demand of inspection of the SOC by the investigating agencies since 2011 especially in the city of Delhi, India. The nature of SOC's covered pertains to an explosion, fire, and arson, shooting/ gang wars, encounters/ suspected suicides due to poisoning/ shared psychosis/gaseous poisons, chemical spillage, a crime against women, Narcotic drugs seizures, and etc.

The Crime Scene Experts conduct technical inspection of all types of crime scenes. Duties include arranging photography, collection, examination, and preservation of evidence which may be included but are not limited to any combination of the following tasks:

a) Visually and physically examining and inspecting all types of crime scenes for the recognition, collection, and preservation of physical evidence such as latent fingerprints, shoeprints, and tire tracks, body fluids (blood, semen, and saliva), hair and fibers, weapons and other materials in stressful and unpleasant environments, recovers, unloads and impounds firearms and other weapons using sound safety precautions.

b) Utilizing specialized equipment and procedures to determine the presence of blood and seminal fluid and collecting body fluids, hair, fibers, gunshot residue, and other trace of the evidence and materials, dusts for and completes lifts for fingerprints, casts shoe impressions and other evidence preserving techniques as required.

c) Preparing and utilizing presumptive tests, various chemicals, powders, compounds and casting materials used in a photographic/forensic laboratory, and preserving techniques.

d) Performing the photography/videography of various types of crime scenes and evidence as well as post-mortem examinations, measures, making mathematical calculations and diagrams of the crime scenes.

e) Providing specialized field training and rendering an opinion or drawing conclusions utilizing skills in a respective sub-discipline. The crime scene expert may be required to testify in a court concerning scenes processed and evidence collected and preserved.

II. Training forensic scientists

Lack of specialized training programs in the relevant field in order to be updated with recent trends/technologies is a major bottleneck faced by forensic scientists. There is a dire need for training forensic scientists to enhance and update their knowledge in the forensic domain and to be prepared for the emerging threat of the perception of any country with its strategic geographic location or hostile neighbors (1-5). The exposure of scientists to the training will result in better management of scenes of crime, fostering research, and development the activities and opening

new ways of specialized testing/examination of scientific evidence.

III. Training needs

There is a special need for having a vision to provide structured training programs to the forensic scientists with state-of-the-art technologies/equipment in order to successfully resolve critical incidents and achieve its mission of preparedness to respond to the call of investigating agencies as soon as possible. There is an emerging dire need to train forensic scientists as a part of preparedness and capacity building measures for updating their expertise in the scene of crime investigation and refreshing the skill acquired to raise the expertise level to be in tandem with the technological advancements. With changes in technological advances and an increased emphasis on research and development in forensic science, forensic scientists are ready to take the challenge and move from the established traditional role to become a key player in challenging investigations in the service of the nation. There would be a surge in the demand for Chemical, Biological, Radiation and Nuclear (CBRN) defense for the forecast period 2018-2023(6).

a) Recently, the forensic science laboratories globally look forward to building their capacity in scene of crime investigation through wide situational awareness so that it is ready to become a partner in pre-crisis planning, critical incidences and major investigations in the scientific/technical domain to plan preventive measures and effectively respond to terrorist or criminal use of hazardous devices, explosives, structural collapse, mass disasters (air crash/railway accidents) and weapons of mass destruction (WMD) which include biological weapons, radiological, nuclear or chemical threats (7-9). Forces like National Disaster Response Force (NDRF) in India has the expertise to respond to CBRN disasters and to conduct training workshops on planning, preparing, responding and management of CBRN in emergency situations.

b) Forensic scientists need to be trained by the experts of Disaster Response Forces as a part of

preparedness and capacity building measures for updating their expertise in the scene of crime investigation for the furtherance of forensic science. With the vast experience of Disaster Response Forces in these areas, the scientists may also be given an overall briefing of all important components in the training session as the training will fill the gap of different perspectives to the cross-cutting issue of CBRN which is grounded in the same basic principles common to all other crime scenes.

c)The forensic scientists need to be trained on the most dynamic aspect of the impending scenario. Having arrived to the SOC, they should know how to respond to the next responsibility of ensuring medical attention while minimizing contamination of the scene for a collection of the exhibits. The training of the forensic expert's team will ensure that the sanctity of the scene of the crime is not compromised and the exhibits are properly packaged/preserved and transported to the Forensic Science Laboratory at the earliest as per the standard protocol.

d) Potential hazards may arise from a number of sources: chemicals, either those present at the scene, as in the case of clandestine production of chemical agents, chemicals used as part of the investigation/chemical weapons, biological materials, unexploded explosives, firearms, environmental factor as excessive heat/cold, unsafe structures especially when collecting evidence at fire and bombing scenes, insecure environment, e.g. offender still present at the scene, sharp objects, radiological, nuclear and electrical risks, poisonous gases, and etc. The scientific personnel working at crime scenes may be exposed to various health and safety hazards. It should also be noted that not all hazards are immediately obvious and some may come up as the investigation unfolds. Therefore, risk assessment overview is indispensable and this should be included in the training.

e)A complete session in the training should be dedicated to the instruments/equipment used in the detection of CBRN, their operation, functioning and maintenance.

f)The four distinctive as well as interrelated components of SOC investigation are namely information management, manpower management, technology management, and logistics management. Deficiencies, negligence, and overemphasis of any one of these components may imperil the overall SOC investigation. The forensic scientists may be given an insight into the practical working in a threat situation, preventive measure as a part of risk assessment, joint/collaborative exercises, initial response, communication, and coordination mechanism so that forensic laboratories can gear up to be a partner in collective response in event of disasters.

IV. Concluding remarks

The mission of training forensic scientists is to prepare nationally accepted guidelines for the forensic examination of CBRN related materials and residues. The mission will be accomplished by:

a)Promoting professional development in CBRN related emergency response.

b)Providing guidelines for CBRN investigations, examinations, reporting and establishing quality assurance guidelines.

c)Specifying requirements for analysts' knowledge, skills, and abilities.

d)Gaining national acceptance of CBRN forensic investigation guidelines.

e)Performing collaborative exercises with national and international organizations.

f)Providing different means of information exchange within the forensic science community and other major stakeholders in the domain of disaster response. Fostering a strong professional relationship with Disaster Response Forces is bound to strengthen the capability of forensic laboratories.

Acknowledgments

The author would like to express her sincere gratitude to Ms. DeepaVerma, Director, Forensic Science Laboratory GNCT of Delhi and Sri.K.C.Varshney, Head of Office, Regional Forensic Science Laboratory, ChanakyaPuri for their keen interest & encouragement.

Funding source

There was no funding source for this study.

Conflict of interest

The author declares no competing conflict of interest.

Authors' contribution

The author conceived and conducted the study alone.

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