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ONLINE UPDATES: A COLUMN FOR SEARCH ANALYSTS

Emily Vardell, Column Editor

Chemical Hazards Emergency Medical Management (CHEMM)

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ABSTRACT. The Chemical Hazards Emergency Medical Management (CHEMM) website from the National Library of Medicine is designed for first responders and medical providers who are planning for and responding to chemical hazards events. It includes pages tailored to the individual interests of specific groups, including first responders, health care providers, mental health professionals, toxicologists, and more. The featured decision support system CHEMM Intelligent Syndromes Tool allows users to identify the chemical a patient was exposed to in a mass casualty event.

KEYWORDS. Chemical hazards, decision support tools, disaster information, emergency preparedness, first responders, National Library of Medicine

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INTRODUCTION

Developed and developing countries are dependent on chemicals for health, wealth, and economic prosperity.¹ While these chemicals support agriculture, housing and health, pharmaceuticals, transportation, food preservation, and more, they also pose a serious risk of accidental or intentional release. Although efforts are made to identify, prioritize, and mitigate the risk factors involved in the storage and release of chemicals, it is also necessary to invest in emergency preparedness and disaster response tools to prepare for a hazardous chemicals event.

The Chemical Hazards Emergency Medical Management (CHEMM) site seeks to “enable first responders, first receivers, other healthcare providers, and planners to plan for, respond to, recover from, and mitigate the effects of mass-casualty incidents involving chemicals.”² As a resource from the National Library of Medicine (NLM), CHEMM is free to everyone and includes a downloadable version that would be available during and following an event even if the Internet were not accessible. CHEMM was produced by the U.S. Department of Health and Human Services (HHS), Office of the Assistance Secretary for Preparedness and Response, Office of Planning and Emergency Operations, in cooperation with the Division of Specialized Information Services at NLM and many subject experts. CHEMM provides a full list of those responsible for the CHEMM site <<http://chemm.nlm.nih.gov/about.htm>>.

The home page of CHEMM provides one-click access to a wide variety of tools and resources (see Figure 1). The prominent links in the banner at the top of the homepage are labeled “First Responder,” “Hospital Provider,” and “Incident Preparedness.”



Legend: FIGURE 1: Home page of CHEMM

FIRST RESPONDERS PAGE

The information available on the First Responders page is organized under the topics “Responding” and “Training & Planning.” These sections are subdivided further to provide a complete overview of the steps required to respond to and plan for chemical events. Under “Preparing to Respond,” readers can view pages that outline types of emergencies and personal protection checklists. Additional checklists are available under “Arrival on Scene,” including a checklist for initial actions and procedures. The “Casualty Triage” section provides guidelines

and algorithms from the U.S. government for handling these types of situations. There are additional links included for agent-specific triage, including hydrogen cyanide, mustard agents, nerve agents, phosgene, and other hazardous chemicals. Selecting one of these specific agents displays a page that includes information on agent identification, hot zone (the area where the hazard chemicals are located), decontamination zone, and support zone. This information is specific to the user role selected. In the upper right hand corner, “1st responder” is selected; however, a user only has to select “hospital provider” from the drop-down menu to display information pertinent to that role.

Back on the “Information for First Responders” page, the “Casualty Treatment” section provides links to treatment guidance, including acute treatment following exposure to specific agents (that links to the same information as listed above), mental health treatment/guidance, and guidance for specific populations. The “Psychological Issues” page that displays when mental health treatment/guidance is selected provides an overview of the impact of traumatic events on a person’s mental health. In a format somewhat similar to the NLM consumer health database MedlinePlus[®], an overview of the condition is listed as well as a chart of the common emotional, cognitive, physical, and interpersonal effects of traumatic stress following a disaster. Additional information targeted to mental health and children outlines common reactions in this patient group. The bottom of the page provides quick links to federal guidance from Health and Human Services, Health and Human Services Collaborations, and others (e.g., the Department of Veteran Affairs). The “Other Resources” section links to articles in PubMed and PDF versions of materials that could be distributed following an event.

The last sections on the “Information for First Responders” page are comprised of “Casualty Transport,” “Training,” and “Planning.” It is important to note that not all of the

sections contain links to additional information. Based on the format, most likely the CHEMM developers will be adding additional links to provide further information, but at this time some sections appear to be works in progress.

HOSPITAL PROVIDER PAGE

The second featured link on the CHEMM home page is labeled “Hospital Provider.” The “Hospital Provider” page is laid out in a similar way to the “First Responder” page and includes much of the same information, such as casualty triage algorithms, casualty assessment, and casualty treatment. There are additional links, however, that customize this page to the unique interests of this group. The first section is labeled “Preparing to Receive,” which is for hospital providers who will respond to a chemical hazards event. This section includes background information on known chemical agents, including blister agents/vesicants, blood/systemic agents, caustics, choking/lung/pulmonary agents, incapacitating agents, long-acting anticoagulants, organophosphorus pesticides and nerve agents, and riot control agents/tear gas. Selecting one of these agents, for example blister agents/vesicants, displays a page which gathers information from a variety of resources (such as the Centers for Disease Control (CDC), the Wireless Information System for Emergency Responders (WISER) from NLM, and the Environmental Protection Agency (EPA)) and provides links to the pertinent information on that agent from each of the resources listed. If a reader is interested in comparing the different resources that are pooled on this page, a link is provided to a very useful chart outlining the similarities and differences of these resources: <<http://chemm.nlm.nih.gov/toolcomparator.htm>>. This chart is quite useful for librarians and others who are interested in the various disaster information

resources, as the chart very clearly distinguishes between the different tools and features of each resource.

Additional information available on the “Hospital Providers” page includes links to the treatment options overviews that were mentioned in the “First Responders” page. There are also links to information on “Personal Protective Equipment (PPE)” which provide an overview of the different levels of protection, the types of protection, and the elements of a PPE management program. References and additional resources are listed on the bottom of the PPE page for those interested in further information. “Decontamination Procedures” are also available from the “Hospital Providers” page, including a video on the decontamination of children. Another resource that is unique to the “Hospital Providers” page is a link to “providing guidance on what to look for at a later time.” This links to a follow-up instructions form, which can be provided to treated patients to outline the next steps in their treatment. The form includes space to outline when an emergency department should be called, who to contact for a follow-up appointment, any restrictions on activity or alcohol consumption, and directions on medication follow-up. There is even a section for listing websites for additional information, which could be a potential area for librarians to get involved and offer assistance. This page also offers links to information that is aimed at community members who are looking for additional guidance. These materials come from the CDC, EPA, and the Occupational Safety & Health Administration.

INCIDENT PREPAREDNESS

The last large link on the CHEMM home page is entitled “Incident Preparedness.” The page includes a short list of links that outline the steps that should be taken to prepare an individual,

an institution, or a team to respond to a chemical hazards event. Under “Create Your Planning Document,” users are linked to federal response planning documents, including the National Response Framework document, training courses, and incident annexes, which describe the operations necessary to address a specific situation. These materials, created by the Federal Emergency Management Agency (FEMA), are supplemented with National Preparedness Guidelines from the Department of Homeland Security (DHS) and the National Incident Management System.

The “Incident Preparedness” page also includes limited links to national planning scenarios (it appears additional information will follow in this section as well), a Comprehensive Preparedness Guide from FEMA, and an “Other Information” section with additional tools and resources from related government agencies, such as the Agency for Healthcare Research and Quality (AHRQ) and the CDC. The compiled resources on this page would be a good starting point for those interested in preparing planning documents for an institution.

In addition to the three largest links, “First Responder,” “Hospital Provider,” and “Incident Preparedness,” the home page features a box in the right-hand side labeled “Quick Links.” This same box appears on every page within CHEMM. When the “Quick Links” box appears on the home page, the first link is labeled “New Users: Where Do I Start?” (This is the only “Quick Links” link that is unique to the home page.) This page begins with direct links to “First Responders” and “Hospital Providers” who might be responding to a chemical emergency. The rest of the information on the page is organized around orienting a user to CHEMM and learning the basics, the types of chemical emergencies, and how chemical events are discovered. Also included is information about chemical agents, management guidelines, and the site.

CHEMM INTELLIGENT SYNDROMES TOOL (CHEMM-IST)

Another resource featured in the “Quick Links” box includes the CHEMM Intelligent Syndromes Tool (CHEMM-IST). This interactive decision support tool (see Figure 2) is one of the most unique things about CHEMM. It was developed by “experts in medicine and emergency response as an aid for identifying the chemical a patient was exposed to in a mass casualty event.”³ Please note that at the time of publication, CHEMM-IST remained in the prototype phase of development and is not recommended for patient care.

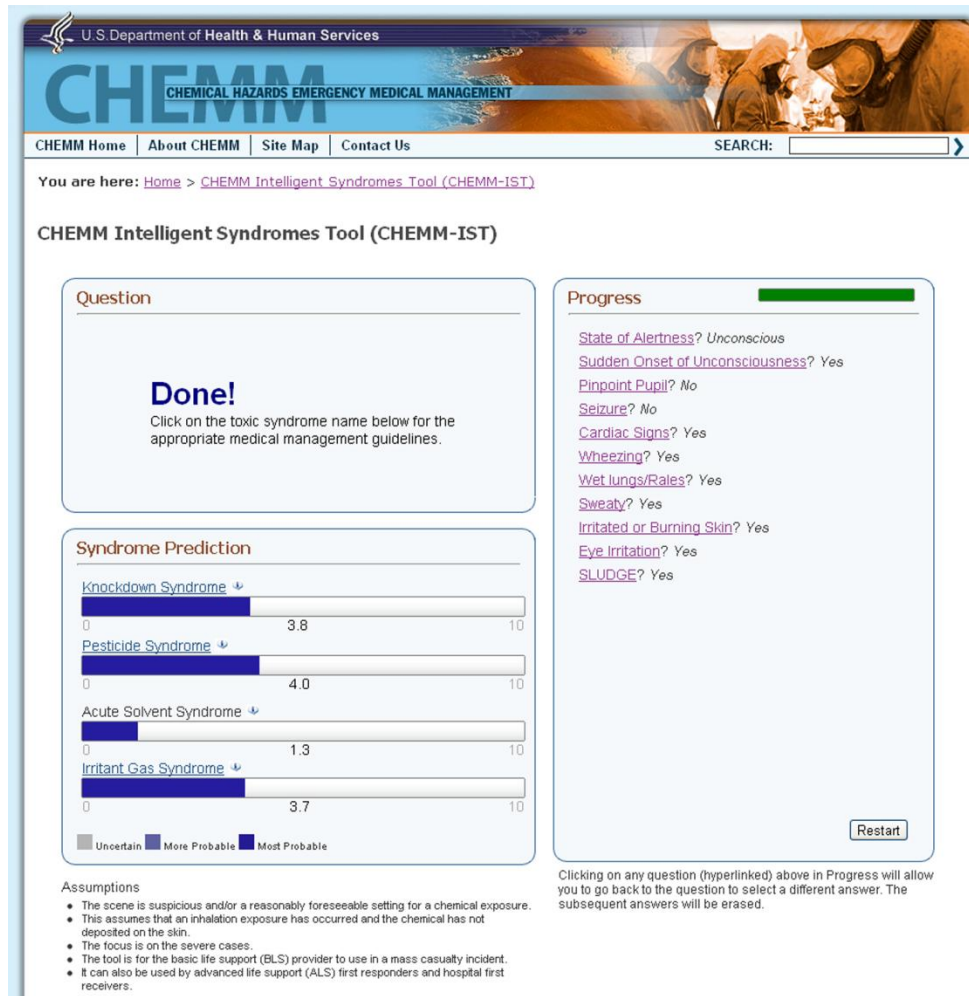
Legend: FIGURE 2: CHEMM Intelligent Syndromes Tool

CHEMM-IST is comprised of three boxes: “Question,” “Syndrome Prediction,” and “Progress.” The first question in the Question box is “State of Alertness?” with four options: unconscious, altered, awake, and anxious. The second box, “Syndrome Prediction,” lists Knockdown Syndrome, Pesticide Syndrome, Acute Solvent Syndrome, and Irritant Gas Syndrome, each with a bar underneath labeled 0 on the left side and 10 on the right side. The third largest box on the right side, labeled “Progress,” is empty until an answer is selected. Based on the user’s answer to the first question about alertness, a subsequent question will be asked. For a sample search, “unconscious” was selected. This prompted the question “Sudden Onset of Unconsciousness?” with possible answer choices including *yes*, *no*, and *can’t assess*. This also alters the bars underneath each of the syndromes in the “Syndrome Prediction” box. With only one question answered, the bars now show the largest bar for Knockdown Syndrome and the smallest bar for Irritant Gas Syndrome. A legend at the bottom of the “Syndrome Prediction” box indicates that grey-colored bars mean the prediction is “uncertain,” light-blue colored bars mean “more probable,” and navy-colored bars mean “most probable.” The “Progress” box on the right shows the answer to the first question (i.e., “State of Alertness? Unconscious”). Clicking on the hyperlinked question in the progress box will take the user back to the previous question, allowing users to adjust their answers.

To continue the example, *yes* was selected for the question, “Sudden Onset of Unconsciousness?” This both changed the bars in the Syndrome Prediction box and added the question to the Progress box. For the next question, “Pinpoint Pupil?” the author selected *no* from the possible answer choices, including *yes*, *no*, and *can’t assess*. For the next question “Seizure?” the same answer choice was selected. The following question was “Cardiac Signs?” with a description stating “a patient with cardiac signs will exhibit arrhythmia, bradycardia or

hypotension.” For this question *yes* was selected. *Yes* was also selected for “Wheezing?,” “Wet lungs/Rales?,” “Sweaty?,” “Irritated or Burning Skin?,” “Eye Irritation?,” and “Sludge?” (description: salivation, lacrimation, urination, defecation, gastrointestinal, emesis). With the selection of *yes* for each of these questions, the bars below each of the syndromes changed to reflect the prediction of the appropriate syndrome. The more questions answered, the darker the color of the bars, indicating the more probable the diagnosis.

Once an answer has been selected for all of these questions, the Question box displays the message: “Done! Click on the toxic syndrome name below for the appropriate medical management guidelines” (see Figure 3). Based on the answers above, the syndrome with the highest prediction is Pesticide Syndrome. Hovering over each of the syndromes in the Syndrome Prediction box will display a short summary of each syndrome, focusing on the cause and symptoms of each. Selecting the name of the syndrome will display a page specifically on that syndrome with information from different government agencies, as described in the “Hospital Provider” section of this article.



Legend: FIGURE 3: CHEMM Results.

The CHEMM-IST decision support tool is one of the highlights of CHEMM as a resource for first responders. This tool could be envisioned as a standalone resource and would be ideal in a mobile phone format so that responding physicians could make treatment decisions at the point of care.

ADDITIONAL RESOURCES

Additional resources available under “Quick Links” on each page are “Acute Patient Care Guidelines” (including the pre-hospital management and emergency department/hospital management of those exposed to hydrogen cyanide, mustard agents, nerve agents, and phosgene), “Types and Categories of Hazardous Chemicals” (the same list available in the “First Responder” and “Hospital Provider”), “Emergency Contacts,” and “Dictionary.” The “Emergency Contacts” page is a good compilation of critical phone numbers for professionals organized by role, including a section for response providers, medical/hospital providers, and public and community resources. Librarians may wish to bookmark this page for easy reference in the event of a disaster or as a resource for emergency preparedness. The “Dictionary,” adapted from resources from the CDC and the Central Intelligence Agency (CIA), gathers a thorough list of definitions that steer away from jargon or technical speak. This is a list that could be understood by anyone somewhat familiar with health sciences information and could be recommended as a bookmark, especially for those who provide reference support on these topics. This page also links to additional dictionaries from the CDC, International Union of Pure and Applied Chemistry (IUPAC), and Society of Toxicology.

The CHEMM home page, in addition to featuring the three pages covered extensively in this article (“First Responder,” “Hospital Provider, and “Incident Preparedness”) as well as the “Quick Links” box, organizes information further with a list of entry points. It appears these entry points link to the same information available in the “First Responder,” “Hospital Provider,” and “Incident Preparedness” pages, but package it in a different way. This method appeals to the philosophy of requiring as few clicks as possible to get to the information needed, but it also causes a considerable amount of overlap in the information available on each of the pages.

Perhaps the designers of CHEMM assumed users would go directly to the area that was designed for them rather than exploring the site extensively.

The additional links on the home page include “Quick Chemical Identification,” with direct links to CHEMM-IST and the Wireless Information System for Emergency Responders (WISER); “Acute Patient Care Guidelines” and “Types of Emergencies,” both discussed previously; and “Initial Event Activities,” “Patient Management,” “Medical Treatment Modifiers,” “Tools, Guidelines, and Planning,” and “References/Data Center,” all of which combine links to resources previously discussed in this article but organized around that particular theme.

CHEMM continues this thematic trend in the “CHEMM for You” section at the bottom of the home page. Here information is further grouped by role, including first responders in the field, health care providers at the hospitals/poison centers, mental health professionals, public information officers, industrial hygienists/toxicologists, response planners, trainers, and the public. In each of these pages, those who serve in these roles will find a list of the resources most relevant to them and written at an appropriate level.

In the lower right corner of the CHEMM page, there is a box featuring links to other resources, all government agencies that work in emergency preparedness, including CDC, FEMA, HHS, DHS, and others. This is the only section which is not fully available in the downloadable version of CHEMM, as the sites require Internet access.

The entire CHEMM resource can be searched using the box in the upper right hand corner of the page. Results are evaluated using a starring system to indicate the strength of the results. This may be a good way to approach the available information for a user who is not sure where to begin.

CONCLUSION

As one of the top factors most likely to produce disaster events in this century,⁴ chemical hazards should be included in emergency preparedness plans and disaster preparedness response tools. CHEMM provides quick links organized by responder role and is available as a downloadable tool in events where the Internet is inaccessible. As a decision support tool, CHEMM-IST could assist responders in identifying the chemical hazards present and provide treatment specific for that chemical hazard.

FOR MORE INFORMATION

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Queries may also be sent via the “Contact Us” link on the CHEMM home page or directly at [<http://chemm.nlm.nih.gov/about.htm#feedback>](http://chemm.nlm.nih.gov/about.htm#feedback).

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