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Research for the development of logistics planning information support in health protection against biological agents

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Abstract: *Making medical countermeasures requires documentation to assess vulnerabilities, threats and operational risks and bioterrorism through the collection and processing of specific multidisciplinary data in human medicine, veterinary, phytosanitary, the environment, defense and national security, etc. Based on retrospective data and late information (medical intelligence), we can estimate the prospective risk to public health, respectively for troops and civilian population in a given area, the area of operations.*

The biological military or bioterrorist attack, whether overtly or masqueraded as human or animal epidemics can cause a major biological crisis for troops and the civilian population, for domestic and wild animals, for crops or wild plants or for the environment, which remains contaminated.

Therefore, it is important to constantly monitor the situation of infectious diseases in the area of responsibility (national territory, operations theaters) to assess vulnerability, threat and bioterrorist risk but also for making medical anti-bioterrorist countermeasures, which can only be effective by genuine cooperation between all specialized structures of the Ministry of Defense, other departments and the civil society.

Keywords: *biological attack, bioterrorism, medical countermeasures, logistics support, medical treatment*

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INTRODUCTION

Medical protection logistics planning against biological warfare agents (ABR) is based on interdisciplinary studies and specific calculations.

The complexity of this approach involves processing a database of medical, pharmaceutical and logistics that can only be operated in real time by using a suitable IT support. It consists in hardware (IBM compatible standard configuration computer), software (Windows based NATO specific program), specialized personnel (NATO computer operators, specialists in military medicine, logistics, CBRN defense, etc.) and properly equipped and secure space.

Scenarios that simulate hypothetical situations reported in the territory, will be tested by constructive simulation as functional experimental models of "war games ".[1]

EXPERIMENTAL MODELS

Making the experimental model of the information system for constructive simulation for medical protection against biological weapons and bio-terrorism and testing it as a military medical exercise demonstrated and validated the scientific data, using modeling and constructive simulation, together with UNAp/CISM, the current Center for War Games and doctrinal Experiments (CJRED) of the General Staff. [2] It was awarded a large database that can be exploited in different complementary approaches. Of all bacteria, Bacillus anthracis has been chosen for being used in the constructive simulation experiment, it is known as the biologically bacterial agent most used for biological attacks. [3]

Medical countermeasures must be known and individualized for each situation and appropriately applied, with appropriate forces and means. This requires an adequate and efficient logistic support because the scale of medical needs (medicines, sanitary materials, reagents, accommodation, transport, etc.) exponentially increases during an epidemic. As a result, at any level, health-pharmaceutical materials are rapidly becoming inadequate. The unintended consequence is that we cannot prevent illnesses or treat patients, so the affected communities are no longer capable of fighting and working and there is a risk of over mortality. Therefore, the medical protection against biological weapons requires a proper logistic planning that is also based on statistical analysis of some relevant information for this purpose. The exploitation of such data requires a dedicated computer system, with suitable software, trained personnel, quick and secure media and communications, etc. Because the computer system for the surveillance of infectious diseases caused by combat biological agents and by bioterrorism to be reliable, it must be implemented in stages, with feedback in the form of custom scenarios for biological attack or epidemic outbreak.

Achieving this pilot experiment in the Romanian Army, demonstrated the usefulness of extending simulation tests on other categories of warfare and on specific logistics for biological crisis. The system used was JCATS – Joint Conflict and Tactical Simulation. The information was delivered in the form of screen-shots that required image processing, computer analysis and interpretation. [5]

The data was processed and a computer media has been made for logistics planning of medical protection against biological warfare and bioterrorism agents through statistical analysis of the resulting data bank. To estimate the number of contaminants analysis were carried out on the three simulated hypothesis: without sensors, with military sensors and alarm on short (in barracks) and with military sensors and alarm on short distance (in barracks) together with a sensors system of the local Inspectorate for Emergency Situations (ISU) and alarm in the city. We have obtained information that was collated for each simulation, in numerical tables and graphs illustrating the impact such an undesirable event can have. [6]

The obtained data allowed the dynamic evaluation (an estimate every 5 minutes) on the effects of a biological attack with anthrax on cities with different number of inhabitants and military forces.

The post exercise analysis showed that in terms of exposed population, where a relatively small number of people, the presence of the sensor is useful, the number of people being affected (civilian and military) decreased after they triggered the alarm.

In a similar situation, in the case of larger cities it has been observed that activation of military sensors does not cause diminishing the number of affected civilians, but decreases the number of infected soldiers.

The comparative analysis of the post-biological attack, for the soldiers of the sea shows that there are a huge number of people affected in the absence of any alarm sensor (over 50%) as their protection or travel ability is restricted to the soldiers on land. Also, the percentage of affected soldiers who do not benefit from the ship protection is higher (70%), if they go out on the deck.

The major differences recorded between the high percentage of affected civilians and that of the military, leading to the idea that it is useful and necessary for the civilian population to be at least

more informed about how they should act when triggering an alarm of any kind. [7]

Following statistical analysis of the database resulting from constructive simulation system experimentation resulted in an acquisition, storage, retrieval and information-processing algorithm as an interactive database. [8]

SANITARY LOGISTICS

The statistical analysis conduct to information somehow surprising by the extremely high number of people affected, at least from the civilian population, which is not trained to respond to any alarm. Regarding the military, which is a segment of the relatively "trained" population compared to civilians, we found that the number of those affected drastically decreases, especially when special sensors for detection exist. The analysis of relevant simulation for the purpose of the experiment showed that a possible attack with anthrax spores, even if it is not repeatable, it could result in a significant number of contaminated, many of which will develop the disease, and some will die. The evolution of the epidemic will depend on the capacity of the health system (military and civilian) to promptly and adequately act with the necessary forces and means and with the appropriate logistic support, depending on the epidemiological situation of the troops and the civilian population. [8]

This means that all exposed persons should be medically supervised: rapid laboratory analyzes for different areas/neighborhoods, nasal/throat exuding for identifying B. anthracis.

The contaminated must be prophylactic treated, also with antibiotics according to the therapeutic scheme Guide for 60 days and under medical supervision. Patients should be isolated and treated for 60 days. For those with severe forms (pulmonary anthrax) intensive oxygen therapy must be also applied, etc. [9, 10, 11]

The deceased must be disinfected and handed over to and Funeral Services (the civilians) or the Logistics department (military) for transport and burial, in accordance with epidemic provisions. Incineration is contraindicated due to the large number of corpses. Repatriation is not allowed because of the contagion risk. [12]

Overall, the medical forces and means are overburdened and there is an urgent need for specific additional procurement for a 7 week period.

For such need, specific measures are necessary because sanitary-pharmaceutical materials are rapidly becoming inadequate and the only way to overcome the situation involves cooperation with all own and allied military forces as well as civil-military cooperation (CIMIC).

CONCLUSION

- Medical countermeasures against biological or bioterrorist attack are complex and require specialized forces and means, in very large quantities and in real time.
- By medical intelligence the real situation must be known and the short, medium and long term development must be assessed in order to correctly estimate the forces and means necessary for the medical countermeasures.
- By appropriate application of the logistics assurance principles and CIMIC cooperation the specific logistical support can be achieved, necessary to carry out the medical countermeasures for the prevention of diseases and treating patients.
- The logistical support for medical countermeasures against biological or bioterrorist attack must be coherent, efficient and fast.

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