

How did the Medical Intelligence Unit handle with the Influenza Pandemic in the French Armed Forces in 2009 ?

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Abstract— In 2009, the French Military Health Service relies on its Medical Intelligence Unit to help to respond to the risk of A (H1N1) pandemic influenza for his forces. As of April 24th, the physician in charge of this team is informed that a respiratory disease caused by a new influenza virus is reported in two American. In collaboration with physicians of the French military epidemiological surveillance team, the Medical Intelligence Team immediately notifies the military decision makers. From that day, the Medical Intelligence Team sends to the authorities daily reports to keep them informed of the number of cases per country and documents to help them to better manage the pandemic. On June 11th, the World Health Organization declares phase 6 pandemic. During the summer 2009, thanks to the advanced researches, a vaccination is proposed. In September 2009, the entire planet is hit, therefore sending daily messages with the number of country cases is no longer of interest and it is stopped. The health risk assessment is then gradually integrated to a daily monitoring of influenza cases among military and to the military influenza observation system. Through this experience, it seems that the Medical Intelligence Unit has fulfilled its mission of helping the decision makers by transmitting them quickly validated and synthetic information.

Keywords— *medical intelligence, scientific document, experience, A (H1N1) influenza, french armed forces.*

I. INTRODUCTION

In order to preserve the health of its soldiers all around the world, the French Military Health Service has conceptualized a medical intelligence mission defined in 2004 as the collection, analysis and dissemination to those who need it, of polymorphic health information, coming from populations outside of the military population, in order to identify and prevent potential health risks for the military population, in the field of defense (1).

This mission was entrusted to the Medical Intelligence Unit of the Military Epidemiology and Public Health Department, a multidisciplinary military unit that includes physicians and veterinarians specialised in health risk assessment, scientific librarians specialised in "documentary assessment", computer scientists and webmasters.

To fulfil its mission, the unit has developed a process of scientific paper monitoring (called documentary intelligence) and rumor and mass media monitoring, so that the team is aware of the environment around the armed forces (2).

The health risk is not only an epidemic one, but it can be an industrial one, when the armed forces deploy themselves in an urban environment for example. The risk can also be a veterinary risk because of disease transmission from animals to humans and vice versa, as it was the case for the A (H1N1) pandemic influenza.

Thus, when the pandemic emerged in Mexico in March 2009, very little was known about this new virus, its dangerousness and its contagiousness.

Faced with a conflicting information flow about the virulence of the new virus, the French Military Health Service, the Joint Headquarter and the Operational Headquarter relied on the Medical Intelligence Team, in order to quickly get the "best information" and so make the "best decision" to preserve the health condition of the forces.

This article relates how the medical intelligence team experienced the management of the A (H1N1) pandemic influenza. This experience is unique because there is no "turnkey" solution to deal with such a big health crisis, moreover in the armed forces. This experience is related in chronological order from the alert sent on April 24th, 2009 concerning the emergence of a febrile respiratory illness caused by a new A (H1N1) "swine" influenza virus in two American children up to the end of sending messages twice daily, when the pandemic had affected the entire planet.

Before describing this experience, we remind the process of medical intelligence in the French armed forces (3).

II. MEDICAL INTELLIGENCE

Medical Intelligence is a process that includes six steps (Figure 1) based on AFNOR standard X 50-053 of April 1998 establishing a monitoring process (4).

The first step is the definition of the themes of the monitoring with consulting the recipient of the process.

The second step is the automated collection of information from diverse origins, in all languages, and from polymorphic sources.

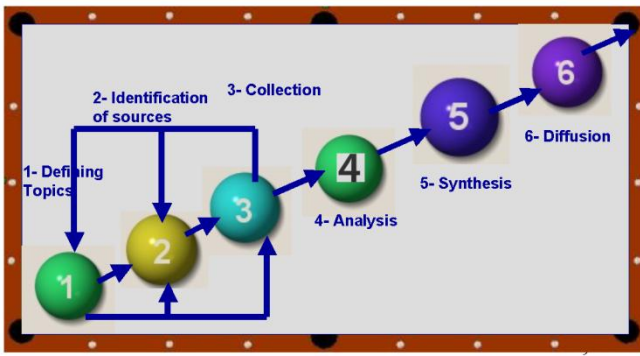


Fig. 1. The 6 steps process of the medical intelligence in the French armed forces

The last steps are the analysis, synthesis and dissemination of information collected to recipients of the process in the form of sheets, documents, messages or watch bulletins, but also their compilation in a decision support system (Figure 2). This decision support system is based on four information systems: BEDOUIN, REDUVES, INTRACESPA and BOUGAINVILLE (5).

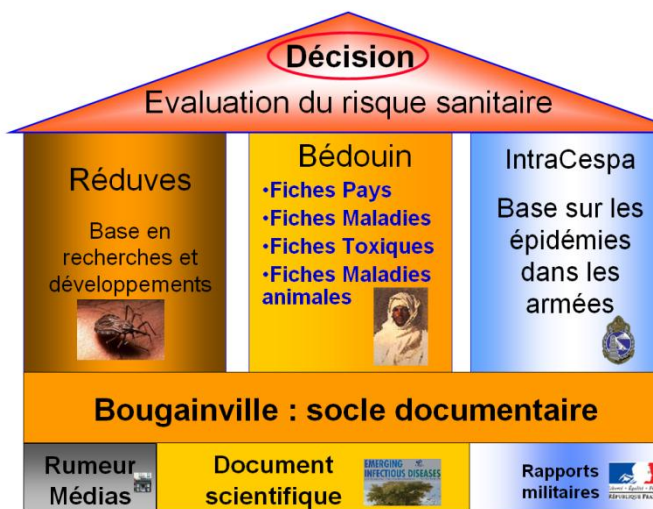


Fig. 2. The decision support system of the Medical Intelligence Team

The medical intelligence process is not a linear process. There are feedback loops, especially on the topics related to the media and political news, crises and in conjunction with the decision makers and users of the process.

BEDOUIN is an epidemiological database on overseas and inter-tropical zone. It provides information on health risks for forces deployed out of France.

REDUVES is the name of the research and development database. Its mission is to inform of the latest scientific

publications about health risks, particularly in terms of research and development.

IntraCESPA contains all the reports, epidemiological surveillance newsletters, public health programs and investigations concerning epidemics in the French armed forces.

BOUGAINVILLE is a database compiling scientific articles and books on infectious diseases and biological and chemical hazards. It is the documentary base of the Medical Intelligence Unit.

We will now relate chronologically how the medical intelligence team experienced the pandemic.

III. LIVED EXPERIENCE

Everything began on **April 24th, 2009**, when the physician in charge of the Medical Intelligence Unit is informed of the declaration by the Center for Disease Control and Prevention in Atlanta (CDC), USA, of a febrile respiratory illness caused by a new A (H1N1) "swine" influenza virus in two children in southern California. The same day, the team notifies the military decision makers with an alert bulletin.

In order to be aware of the real health risks of this new virus, both for civilians and for the French armed forces, the entire unit is on the alert and seeks to clarify the zoonotic potential of this "swine flu". There is very little information answering the question on the Internet, in the media and scientific publications. Scientific documents confirm that the "classic" swine flu is usually a mild respiratory disease in pigs. The ongoing researches focussed on the publications of the World Organisation for Animal Health (OIE) confirm that many subtypes of influenza viruses circulate in pigs (H1N1, H1N2 and H3N2) and that for each subtype, several viruses are known, including not less than five H1N1 viruses that cause influenza in pigs. The swine influenza viruses are occasionally found in other animal species, including humans. In most cases, men are infected through direct contact with pigs. According to the publications, the virus is not well adapted to humans. However, it can be transmitted but only between a few people before disappearing (6). Finally, the last scientific documents found clearly show that the risk of contamination while consuming pork is insignificant. Indeed, the influenza virus is killed by cooking temperatures of 70 ° C, corresponding to the usual instructions for pork cooking (7).

During the day, the documentary research also aims to provide military decision makers with information on the genetic origin of the recombinant virus in order to anticipate its virulence. The researches show that influenza viruses of both febrile respiratory syndromes described in the U.S.A are genetically similar and contain a unique combination of gene segments that have never been reported in the past. On the other hand, the strain is genetically different from A (H1N1) human influenza viruses previously described. However, the source of both cases remains unknown. None of the cases has been in contact with pigs and no epidemiological link can be found between them (8). The two American cases quickly

seem not to be isolated cases, but are actually the tip of the iceberg. Retrospectively, it appears that the same virus is the cause of many cases of influenza since mid- March 2009 in Mexico, hence the name of "Mexican flu."

The same day, the World Health Organization (WHO) notifies a global alert about the new disease.

The next day, on **April 25th, 2009** a crisis centre is constituted at the Military Epidemiology and Public Health Department. This crisis centre is composed of the head of the department, the physician in charge of the Medical Intelligence Unit and epidemiologists. This multidisciplinary crisis centre will work closely until the end of the crisis.

That day, it was decided to set up a very detailed monitoring of new world cases twice daily. The aim of this monitoring is to be aware of the cases distribution in the overseas territories, where the Navy calls at and where French embassies can be found. To carry out these assessments, the Medical Intelligence Team compares several sources, including WHO, CDC, the Global Public Health Intelligence Network (GPHIN), the number of cases published every day on Wikipedia, as well as information available on Ministries of Health websites. The information network used by the Medical Intelligence Team transcends all political, diplomatic, cultural or religious barriers.

During the following days, the crisis centre is requested several times a day by the Joint Headquarter, including its Operational Headquarter, the Decision Support Unit specialised in radiological, biological and chemical fields, the General Staff of the Army, the General Staff of the Navy, the General Staff of the Air Force and the Military Health Service Headquarter to get timely information and make the best health decisions. Retrospectively, the Medical Intelligence Unit seems to have been one of the pillars on which the decision makers could rely on to get information quickly. For example, the crisis centre has been asked many times by the General Staff of the Navy to make decisions on Navy ships that had to make stops near Mexico. What decision make? Did the ship have to land or not? What kind of risks in case of landing and what countermeasures? If not, where to stop? Why? How?

On **May 1st, 2009**, the first two cases are laboratory confirmed in France (9). From that day, a lot of health advisors in the French Army and in the French Military Health Service rely on the Medical Intelligence Unit to get the latest information about the pathogenicity of the virus and to better prepare the "pandemic influenza plan" in the armed forces.

The media raise concerns in the opinion because of the risk of possible genetic reassortment of the new virus and the potential crossing of species barrier, so that an epidemic in humans begins to be feared. In addition some flu experts publish very pessimistic evolutions of the pandemic and in the absence of vaccines, a scenario similar to the "Spanish flu" also due to a particularly virulent and contagious (H1N1) strain can be feared. This pandemic that spread from 1918 to 1919 is still present in the collective memory. It is considered as the most deadly pandemic of the story in a short period of time. According to the Pasteur Institute, 30 million people

died during this epidemic, and up to 100 million according to recent reassessments.

In an attempt to bring some answers to these questions, the team conducts research in national scientific databases, such as the Public Health Database, but also international databases as MedLine (10), the Weekly Epidemiological Record (WER) published by WHO and articles published in Eurosurveillance by the European Centre for Disease Prevention and Control (ECDC) in Stockholm. The team also provides to decision makers documents collected on swine influenza viruses, especially those of H1N1, H1N2, H3N1 and H3N2 subtypes, as well as the latest publications on antiviral treatments against seasonal flu and cases of resistance. At that time, no vaccine containing the new influenza virus causing illness in humans is available. The team focuses on publications about seasonal flu vaccines, to try to get some answers and to know if these vaccines could provide protection against the new virus.

The documents sent by the crisis centre to the decision makers suggest that pessimistic models are wrong and that the "Spanish flu" scenario won't happen.



Fig. 3. Chronology of A (H1N1) confirmed cases on May 1st, 2009. Source: Medical Intelligence Unit.

On **May 2nd, 2009**, although the A (H1N1) influenza virus is not a classical swine influenza virus, the first animal cases are confirmed in a pig farm in Canada (11). In almost all swine cases, workers with flu symptoms will be found in the affected farms. Transmission thus highlights that man infected pigs and not the opposite. Retrospectively, we will never know the initial reservoir of the virus because it is a reassortant of avian, swine and human viruses.

On **May 11th, 2009**, the epidemic is spreading rapidly. The Medical Intelligence Unit regularly sends updated number of cases to those who need it (Figure 4). To anticipate the epidemic that will reach the northern hemisphere and more specifically France during the winter, the team is monitoring the number of cases reported in the southern hemisphere, especially in New Caledonia. This monitoring is made thank to a close collaboration with the military epidemiological surveillance unit, because the health of the French Armed Forces in overseas territories is routinely monitored by the epidemiologists of this unit.

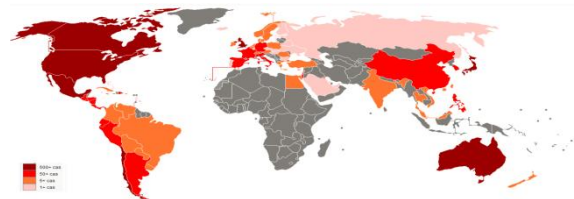


Fig. 4. Chronology of A (H1N1) confirmed cases on May 11th 2009. Source: Medical Intelligence Unit.

On **June 11th, 2009**, the pandemic takes a turn. WHO declares Phase 6 Pandemic Alert (13). The Medical Intelligence Unit tries to bring documentary responses to the health crisis, which has now become a politic crisis. The Unit decides to disseminate the WHO recommendations to help countries to manage pandemic A (H1N1) 2009 influenza (14).

In **July 2009**, the automated document screening informs of advances in vaccine production. Among the documents collected, the team decides to transmit the report of the special meeting that occurred on July 7th, 2009 and published by the Strategic Advisory Group of Experts on immunization (15).

During the summer, apart from the twice-daily update of new human cases, the monitoring of animal cases is continuing. It appears that the pandemic virus has been detected in Chile in two turkey farms with egg drop syndrom. Other outbreaks will then also be reported in Canada in September 2009, in the U.S.A in November 2009 and in France in January 2010. Again a transmission from man to animal is suspected, and not vice versa.

In **August 2009**, a summary of diagnostic tests available for the A (H1N1) 2009 virus, an update of pandemic and seasonal viruses circulating and of the progress made in antigenic and genetic characterization of the new virus and its antiviral resistance are disseminated. At this moment, it appears that the CDC has developed a real-time PCR diagnostic method for the virus detection. The literature review shows that many other institutions have developed methods of conventional and real-time PCR and sequencing protocols for screening and confirmation of the presence of the virus. According to the documents coming from the WHO, the Medical Intelligence Unit informs the decision makers that the organization recommends the use of a type A/California/7/2009 virus for the development of a vaccine against the pandemic influenza. Various publications are collected and disseminated, for example, a systematic review of the use of oseltamivir (Tamiflu®) and zanamivir (Relenza®) against the new virus in children, published in the British Medical Journal in 2009(16).

In **early September 2009**, the military medical authorities are informed that The Lancet has published an article showing that Intra - Venous Zanamivir (Relenza®) could be a solution in case of classical treatment failure, according to a therapeutic trial that allowed the rescue of a 22 years old immunocompromised patient (17). The results of the first vaccine clinical trials reported by CLS Biotherapies in the USA, Medicago Inc in Canada and Sinovac in China are also disseminated. The team also reports the results of the first tests of the type A/California/7/2009 (H1N1) vaccine virus with adjuvant conducted on 175 adults and published in the New England Journal of September 10th, 2009 (18), as well as the use in animals of new influenza drugs at Lakewood Amedex Inc.

During the summer 2009, the French government already announced that he had chosen a mass and non-mandatory vaccination campaign, which should begin on October 20th, 2009. It was decided that two injections would be necessary with a three weeks interval; the vaccine virus chosen was the

A/California/7/2009 (H1N1) adjuvanted virus already mentioned.

On **September 17th, 2009**, after a request of the Joint Headquarter, a daily epidemiological surveillance system focusing on influenza cases is implemented in the French armed forces, complementary to the monitoring done by the Medical Intelligence Unit.

On **September 29th, 2009**, in conjunction with these two monitoring systems, the Military Influenza Observation System, a seasonal monitoring system, is reactivated to enable the monitoring of the forces and an efficient and proactive assessment.

At the end of September 2009, as the Medical Intelligence Unit seemed to have predicted in May 2009, the evolution of mortality and pandemic status seems favourable. A vaccination plan is set up. The whole planet has been affected by the A (H1N1) 2009 influenza virus. An updated monitoring of the cases worldwide is no longer of interest, and the sending of factsheets twice daily then gradually stops, especially since all the cases cannot be biologically confirmed anymore. The number of cases is now just indicative and considered more as a trend than a reality and is largely underestimated (200 to 400 times more probable cases than declared cases).

From **November 16th, 2009**, in the French armed forces, vaccination against the new virus becomes regulatory for particularly vulnerable personal and for the personnel with priority missions. For all other staff, it is highly recommended (19).

On **November 29th, 2009**, approximately 1.42 million cumulative cases have been reported worldwide since April 2009. A map of cumulated incidence is sent to military decision makers (Figure 5).

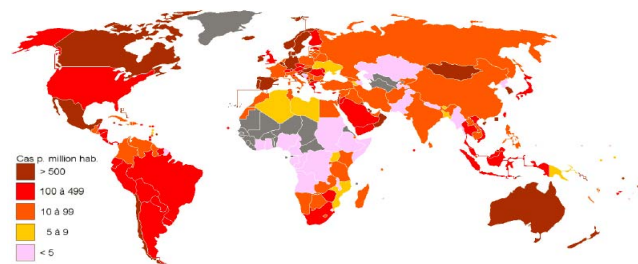


Fig. 5. Map of cumulated incidence on November 29th, 2009. Source Medical Intelligence Unit.

IV. DISCUSSION AND PROSPECTIVE

After this crisis that was first a health crisis, then a media crisis and finally a politic crisis, many questions have emerged. In particular, the management of the pandemic and the decisions taken by the civilian health authorities but also by the military authorities were they the best suited to the situation? On this issue, the Medical Intelligence Unit cannot give an answer. Its mission was limited to quickly provide validated health information to decision makers. The team reported in May-June 2009 that some epidemic models were

too alarmist and lacked in credibility. However, the mission of the Unit is not to decide. It does not make any recommendations nor implement specific countermeasures. Its objective is to provide a "good information" to help the decision maker to make the "best decision" at the "right time". But in fact did the Unit provide the "good information"? Was it at the "right time"? It is difficult to answer to these questions and they could be themselves the subject of a publication. There are a lot of public health projects that have tried to answer to these questions. For example, the "Chronisanté" project was an information system of decision support for chronic disease management, developed on the initiative of the High Council of Public Health. This system has shown that these specific questions rely on complex issues related with the information content. In this context, content management, information modelling and added value are important in decision making. It has also been demonstrated that the visualization of information is useful to stakeholders. Finally, automated techniques are useful to reach a state of performance, robustness and enough efficiency (20). The only questions that the Medical Intelligence Unit can begin to give answers in this article remain the monitoring process itself.

Was the team tasked by military decision makers to help them managing the pandemic? The answer is yes, very often, even daily if not several times a day at the beginning of the crisis. One might even say it has been a pillar for the decision makers to get health information. It helped them not to lose their time facing the plethora of information circulating, often of variable quality, because the information sent was synthesized from many sources that were themselves analyzed.

In addition, the composition of the team, with different profiles (physicians, veterinarians, scientists, librarians, webmaster...), was a benefit to manage the pandemic, because of the different but highly complementary approaches and visions, and therefore a kind of complementarity in the responses to the decision makers.

Finally, evidence of the proper functioning of the Unit was its complementarity in all stages of crisis management with the other pillars of the military epidemiological information system. This included working closely together within the Military Epidemiology and Public Health Department, with the epidemiologists and the daily influenza surveillance system, enabling overall system efficiency.

V. CONCLUSION

To fulfil its mission of anticipating health risks in its forces, the French Military Health Service has conceptualized a health risk assessment mission that was entrusted to the Medical Intelligence Unit. The unit has developed a monitoring system to help the decision makers to make their decisions, particularly during pandemics. This article is a good case study. In fact, it relates chronologically the experience of this unit during the pandemic A (H1N1) 2009 influenza. The story begins on April 24th, 2009 when the physician in charge of this team is informed of a febrile respiratory illness caused by a new influenza virus in two children in the USA and

immediately notifies the military decision makers. Day after day, the unit actively follows the health problems related to the pandemic, with a monitoring of influenza cases in the southern hemisphere and twice daily the sending of updated messages on the evolution of the number of cases per country. In May-June 2009, the team warns that the health disaster predicted by some pessimistic experts' models and relayed by the media will not take place. In September 2009, the new influenza virus has hit the entire planet. The trend seems favourable in the northern hemisphere. The vaccination plan is set up. The Medical Intelligence Unit slowly stops sending its twice daily messages and a daily epidemiological surveillance of influenza in the armed forces and the Military Influenza Observation System replace the monitoring. It seems, through this experience, that the Unit fulfilled its mission of gathering and disseminating health information to help the decision maker to make decisions, especially by allowing them to save time. However, the overall management of the pandemic has raised many questions, including the relevance of decisions made.

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