Rapid reporting of emerging disease outbreaks using unofficial sources: Lessons from ProMED

Larry Madoff, MD
ProMED, International Society for Infectious Diseases
University of Massachusetts Medical School
Massachusetts Department of Public Health

Hosted by Prof. Timothy Landers
The Ohio State University College of Nursing

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Epidemiologic Notes and Reports

Pneumocystis Pneumonia --- Los Angeles

In the period October 1980-May 1981, 5 young men, all active homosexuals, were treated for biopsy-confirmed Pneumocystis carinii pneumonia at 3 different hospitals in Los Angeles, California. Two of the patients died. All 5 patients had laboratory-confirmed previous or current cytomegalovirus (CMV) infection and candidiasal infection. Case reports of these patients follow.

Patient 1: A previously healthy 33-year-old man developed P. carinii pneumonia and oral mucosal candidiasis in March 1981 after a 3-month history of fever associated with elevated liver enzymes, leukopenia, and CMV viremia. The serum complement-fixation CMV titer in October 1980 was 256; in May 1981 it was 32. The patient's condition deteriorated despite courses of treatment with trimetrexate-sulfamethoxazole (TMP/SMX), pentamidine, and acyclovir. He died May 3, and postmortem examination showed residual P. carinii and CMV pneumonia, but no evidence of neoplasia.

Patient 2: A previously healthy 30-year-old man developed P. carinii pneumonia in April 1981 after a 5-month history of fever each day and of elevated liver-function tests, CMV viremia, and documented seroconversion to CMV, i.e., an acute-phase titer of 16 and a convalescent-phase titer of 256 in anticomplement immunofluorescence tests. Other features of his illness included leukopenia and mucosal candidiasis. His pneumonia responded to a course of trimetrexate-TMP/SMX, but, as of the latest report, he continues to have a fever each day.
Emergence of HIV/AIDS

- A plasma sample taken in 1959 from an adult male living in what is now the Democratic Republic of Congo showed HIV
- HIV found in tissue samples from an American teenager who died in St. Louis in 1969
- HIV found in tissue samples from a Norwegian sailor who died around 1976
- Evolutionary model suggests HIV transferred to humans in 1930 +/- 15 years

Why wasn’t HIV detected earlier?
“Because infectious diseases have been largely controlled in the United States, we can now close the book on infectious diseases.” — (attributed to) William Stewart, US Surgeon General, 1969

“Even with my great personal loyalty to [the discipline of] infectious diseases, I cannot conceive of a need for 309 more infectious diseases experts unless they spend their time culturing each other.”

Robert Petersdorf, MD
1978
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“Microbes are ranked among the most numerous and diverse of organisms on the planet; pathogenic microbes can be resilient, dangerous foes. Although it is impossible to predict their individual emergence in time and place, we can be confident that new microbial disease will emerge.”

-Institute of Medicine, 1992

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IHR 2005 (took effect in 2007)

- Obligation to notify WHO notify of events that may constitute a public health emergency of international concern; not limited to any particular diseases
- Authorizes WHO to consider unofficial reports of public health events
- WHO now encouraging member states to adopt informal “Event-Based Surveillance”

Traditional public health reporting
Traditional Public Health

- Advantages
  - Robust
  - Sensitive
  - Accurate
  - Validated
  - Quantitative

- Disadvantages
  - May be slow
  - Incentives for non-reporting
  - Broken links may lead to non-reporting
  - May miss uncharacterized or novel disease
  - Expensive

Event-based “informal” surveillance

- Ministries of Health
- WHO
- Informal-source surveillance
- Media
- Healthcare workers
- Laboratories
- Lay public
- Local health officials
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Informal source surveillance
(Event-based surveillance, Biosurveillance)

- Advantages
  - Speed
  - Transparency
  - Multiple sources including
    -clinicians
    - labs
    - media, blogs, Internet
    - official
  - Identifies any event
  - Inexpensive

- Disadvantages
  - Potential inaccuracy
  - Non-quantitative
  - Biases
    - Information richness
    - Language
    - Sensationalism

Information sources for EBS

- Media reports
  - Systematic search of relevant media
- Astute observers
  - Health care workers
  - Laboratorians
- Official sources
- General public
  - Social media
  - Blogs, chatrooms, YouTube
  - Toll-free phone number

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The ProMED-mail electronic outbreak reporting system began in August 1994 to monitor emerging infectious diseases globally
- Moderated e-mail lists, website, social media
- Early warning system for emerging disease outbreaks
- Emphasis on rapid reporting
  - Posts are vetted by SMEs but not "peer reviewed"
  - Standard for <24 hour turnaround
  - Requests for Information (RFIs) for unconfirmed reports
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ProMED mail
Program for Monitoring Emerging Diseases

- Free subscription
- 85,000 subscribers in > 180 countries
- All reports are screened and commented upon by expert Moderators before posting
- Average of 8 reports per day
- Emphasis on “One Health”
- Regional network system

Could information sharing over the Internet and the use of ‘informal’ or unofficial information sources enhance the detection of emerging diseases?


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Origins

“The year was 1993 and to some attendees at a [bioweapons] conference in Geneva co-sponsored by the Federation of American Scientists (FAS) and the World Health Organization (WHO), the convergence of two important trends was becoming apparent. The first was the role of emerging infectious diseases... The second was the dramatic coming of age of the Internet.”

“At a follow-up conference in the U.S. in 1994, attendees joined an e-mail list that allowed them to stay in touch with one another and share news in their field. It began with some 40 subscribers, but as news of outbreaks spread among these inaugural subscribers was forwarded to colleagues, others sought to subscribe to the list and within months hundreds joined. The list was named ProMED-mail.”

Archives of Medical Research
36 (2005) 724–730

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Regional Programs of ProMED-mail

- ProMED-ESP, ProMED-Port: Latin America in Spanish and Portuguese
  – API
- ProMED-MBDS (Mekong Basin Disease Surveillance Collaboration)
  – MOHs of Cambodia, China, Laos, Myanmar, Thailand, Vietnam, WHO, Rockefeller
- ProMED-EAFR: English-speaking Africa
  – Regional network focused on anglophone Africa
- ProMED-FRA
  – Regional network focused on francophone Africa
- ProMED-RUS
  – Russian language reports from the countries of the independent states of the former Soviet Union
- ProMED-MENA
  – Middle East/North Africa in English with Arabic summaries
- ProMED-SoAs
  – South Asia – Subcontinent in English

Staff Locations

59 staff in 37 countries

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![Number of Subscribers](chart1.png)

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*Global English network only; similar volume on regional services in addition.

1060 posts refer to *Eurosurveillance* reports

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Meta Info

PRO Test

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<td>Peru</td>
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<tr>
<td>□ Not Yet Classified</td>
<td>Humans</td>
<td>Peru</td>
</tr>
</tbody>
</table>

Add new disease search where term starts with contains ends with peru peru, Illinois, United States peru, Maine, United States nairobi, Nairobi, Kenya

Name: Peru
Country: Peru

Most recent 20 alerts:

- 2017-09-27 17:10:14: Se incorporaron dos vacunas al Calendario Nacional de Vacunación - BORGADO Informa
- 2017-09-27 17:10:14: Se incorporaron dos vacunas al Calendario Nacional de Vacunación - BORGADO Informa
- 2017-09-27 16:30:35: Primera campaña de vacunación contra la Aflotoxina y la Brucelosis - Chaco, Salta, Resauración

http://www.wpro.who.int/emerging_diseases/documents/docs/eventbasedsurv.pdf

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WHO on EBS:

Event-based surveillance is the organized and rapid capture of information about events that are a potential risk to public health. This information can be rumours and other ad-hoc reports transmitted through formal channels (i.e. established routine reporting systems) and informal channels (i.e. media, health workers and nongovernmental organizations reports), including:

- Events related to the occurrence of disease in humans, such as clustered cases of a disease or syndromes, unusual disease patterns or unexpected deaths as recognized by health workers and other key informants in the country; and

- Events related to potential exposure for humans, such as events related to diseases and deaths in animals, contaminated food products or water, and environmental hazards including chemical and radio-nuclear events. Information received through event-based surveillance should be rapidly assessed for the risk the event poses to public health and responded to appropriately.
Unlike classic [traditional or indicator-based] surveillance, event-based surveillance is not based on the routine collection of data and automated thresholds for action but rather on unstructured descriptions and reports.
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Nipah virus in Malaysia, 1998-1999
Human encephalitic cases

Source: Jonathan Epstein, EcoHealth Alliance

PNEUMONIA - CHINA (GUANGDONG): RFI

Date: 10 Feb 2003
From: Stephen O. Cunnion, MD, PhD, MPH
International Consultants in Health, Inc
Member ASTM&H, ISTM

This morning I received this e-mail and then searched your archives and found nothing that pertained to it. Does anyone know anything about this problem?

"Have you heard of an epidemic in Guangzhou? An acquaintance of mine from a teacher’s chat room lives there and reports that the hospitals there have been closed and people are dying."

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PNEUMONIA - CHINA (GUANGDONG): RFI (2)

Date: 10 Feb 2003
Moderator comment:

[ProMED-mail appreciates the preliminary information above and would be grateful for any additional information. The etiology and extent of this apparent outbreak of pneumonia are unclear, as is whether the outbreak is secondary to influenza. - Mod. LM]

Acute Respiratory Syndrome in Hong Kong
SAR, Viet Nam

• WHO Press Release 12 Mar 2003
  – WHO issues a global alert about cases of atypical pneumonia. Cases of severe respiratory illness may spread to hospital staff. Since mid February 2003, WHO has been actively working to confirm reports of outbreaks of a severe form of pneumonia in Viet Nam, Hong Kong Special Administrative Region (SAR), China, & Guangdong province in China.
March 5: First Canadian death

Provable cases of SARS by week of onset
Worldwide* (n=5,810), 1 November 2002 - 10 July 2003

*This graph does not include 2,517 probable cases of SARS (1,521 from Beijing, China), for whom no dates of onset are currently available.
One Health

Considers disease without regard to species and recognizes the commonality of human and veterinary health

Zoonoses in disease emergence

- 1407 human pathogens
- 58% are zoonotic
- 130 of the 177 recently emerged pathogens zoonotic (RR=2.0)


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Breadth of host range vs. fraction regarded as emerging or reemerging

Novel Coronavirus – Saudi Arabia

A new human coronavirus was isolated from a patient with pneumonia by Dr Ali Mohamed Zaki at the Virology Laboratory of Dr Solliman Fakeeh Hospital Jeddah Saudi Arabia.

The virus was isolated from sputum of a male patient aged 60 years old presenting with pneumonia associated with acute renal failure. The virus grows readily on Vero cells and LLC-MK2 cells producing CPE in the form of rounding and syncitia formation.

[The clinical isolate] was initially tested for influenza virus A, influenza virus B, parainfluenza virus, enterovirus and adenovirus, with negative results. Testing with a pancoronavirus RT-PCR yielded a band at a molecular weight appropriate for a coronavirus. The virus RNA was tested also in Dr. Ron Fouchier’s laboratory in the Netherlands and was confirmed to be a new member of the beta group of coronaviruses, closely related to bat coronaviruses. Further analysis is being carried out in the Netherlands.

The Virology Laboratory at the Dr Fakeeh Hospital will be happy to collaborate with others in studies of this virus.

--
Ali Mohamed Zaki
Professor of Microbiology
Dr Fakeeh hospital Jeddah Saudi Arabia

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Novel Coronavirus - UK

Published Date: 2012-09-23 17:29:14
Subject: PRO/AH/EDR> Novel coronavirus - Saudi Arabia (03): UK HPA, WHO, Qatar
Archive Number: 20120923.1309582

NOVEL CORONAVIRUS - SAUDI ARABIA (03): UNITED KINGDOM HEALTH PROTECTION AGENCY, WHO, QATAR

*****************************************************************************
A ProMED-mail post
http://www.promedmail.org
ProMED-mail is a program of the International Society for Infectious Diseases

[1] HPA press release

Date: 23 Sep 2012 Source: Health Protection Agency UK press release [edited]
http://www.hpa.org.uk/NewsCentre/NationalPressReleases/2012PressReleases/120923acuterespiratoryillnessidentified/ The Health Protection Agency (HPA) can confirm the diagnosis of one laboratory confirmed case of severe respiratory illness associated with a new type of coronavirus. The patient, who is from the Middle East and recently arrived in the UK, is receiving intensive care treatment in a London hospital.
Novel coronavirus – Saudi Arabia

Published Date: 2012-11-04 13:11:42
Subject: PRO/AH/EDR> Novel coronavirus - Saudi Arabia (15): new case
Archive Number: 20121104.1391285
NOVEL CORONAVIRUS - SAUDI ARABIA (15): NEW CASE
************************************************
Date: Nov 4, 2012 12:11 PM
From: Ziad Memish (Saudi Ministry of Health)

Subject: Re: A new Saudi novel coronavirus case diagnosed in KSA (Kingdom of Saudi Arabia) Attached is a report we would like for you to consider releasing in ProMED-mail: In accordance with Ministry of Health’s (MoH) responsibilities for disease prevention and control, and in keeping with our practice to inform the public and the media about significant findings that result from MoH disease surveillance activities, we are announcing today [4 Nov 2012] that one of our hospitalized citizens has been confirmed to have pneumonia caused by novel Coronavirus (nCoV). This case had no epidemiological links to the 2 documented novel coronavirus cases to date.
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MERS – South Korea

MERS CoV confirmed cases in Republic of Korea, China, Saudi Arabia and other Countries
Estimated week of onset as of 19 Jun 2015

Week of Onset
Year of Onset

Republic of Korea
China
Other Countries
Saudi Arabia

Please note that the underlying data is subject to change as the investigation is ongoing. Source: WHO

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ProMED and Zika

Unknown illness: Brazil (Maranhão) outbreak

Published Date: 2015-02-08 20:02:43
Subject: PRO/PORT> Doenca desconhecida - Brasil (MA), surto
Archive Number: 26150208.3150347

DOENÇA DESCONHECIDA - BRASIL (MARANHÃO), SURTO
******************************************************************************
Uma mensagem / Una mensaje / de ProMED-PORT
http://www.promedmail.org
ProMED-mail e um programa da / es un programa de la
International Society for Infectious Diseases
http://www.isid.org

Data: Domingo, 08 de fevereiro de 2015
Fonte: Prefeitura Municipal de Caxias, Maranhão [04/02/2015] [editado]
http://caxias.ma.gov.br/noticia/secretario-de-saude-adota-providencias-sobre-surto-de-virome-em-caxias

Secretário de Saúde adota providências sobre surto de virose em Caxias

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...The outbreak of a virus that causes fever, red spots in the body and joint pain, remains on alert health authorities of Caixias. The Municipal Health clarifies already aware of the outbreak, which is affecting hundreds of people in the city.

According to the health secretary, Vinicius Araujo, without the test result is not possible to say whether the virus has no connection or with Chikungunya fever. The agency issued a clarification note. Check the note:

"Regarding the virus outbreak that is happening in the city, were not notified to the Chikungunya fever, for all serology requested to date for the LACEN (reference laboratory tests for diagnosis of tropical diseases by the Ministry of Health in São Luís) were negative.

We ask the Secretary of State for Health to send technicians to our city to perform virus isolation research to clarify what type of virus could be circulating. Until next week this team should get.

Meanwhile, it is important that everyone keep the care of prevention of Dengue, for Chikungunya fever is also transmitted by mosquitoes _Aedes aegypti_ infected and, less commonly, by the mosquito _Aedes albopictus_ ."
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Time to outbreak discovery and public communication is decreasing

Fig. 3. Box plots of the temporal trends in the yearly median time between estimated outbreak start and (A) outbreak discovery and (B) public communication about the outbreak for selected WHO-verified outbreaks, 1996–2009. The revised International Health Regulations (IHR 2005) went into effect in 2007.

Chan et al., PNAS 2010

Synergy from multiple surveillance systems


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SURVEILLANCE AND OUTBREAK REPORT

ECDC Round Table Report and ProMed-mail most useful international information sources for the Netherlands Early Warning Committee

P Bijkerk 1, A H. Monnier 2, EB Facony 1, K Kordamandidis 1, HJ Friesema 1, MJ Kool 1
1. National Institute for Public Health and the Environment, Bilthoven, The Netherlands
2. VU University, Amsterdam, The Netherlands
3. Public Health Service, SSR Region Utrecht, Zeist, The Netherlands
Correspondence: Paul Bijkerk (paul.bijkerk@rivm.nl)

ECDC Round Table Report and ProMed-mail most useful international information sources for the Netherlands Early Warning Committee

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3. Public Health Service, SSR Region Utrecht, Zeist, The Netherlands
Correspondence: Paul Bijkerk (paul.bijkerk@rivm.nl)

- ECDC Round Table (RT) Report and ProMED-mail were the most complete and timely sources, reporting 140 of 178 (79%) and 121 of 178 (68%) threats
- The combination of both sources reported 169 (95%) of all threats in a timely manner
- Adding any of the other sources resulted in minor increases in the total threats found, but considerable additional time investment per additional threat
- Only three potential relevant threats (2%) would have been missed by only using the ECDC RT Report and ProMed-mail

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What is EpiCore?

EpiCore is a new system that finds, validates and reports outbreaks faster than traditional disease surveillance methods alone.

When evidence of outbreak is found, ProMED experts send RFI to EpiCore members in geographic region.
EpiCore Program Update
Membership and RFIs

- 1708 members representing 137 countries
- 378 RFIs posted in 77 countries
- 905 responses to RFIs
- 406 responses with content
- 164 responses used in ProMED post

Waiting for the comet

Monseur Berthiot prévenu par sa portière de la visite de la comète.
- Dauvillier

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Summary

- Control of outbreaks depends upon rapid detection and reporting
- Over the past 20 years, event-based reporting using non-traditional data has become established as an important complement to traditional public health in the detection of new pathogens
- Transparency is a guiding principle. You can’t predict who needs to know what and when
- Timeliness of outbreak detection has improved as a result of these systems

Acknowledgments

- ProMED/ISID staff and supporters
- USAID
  - Emerging Pandemic Threats PREDICT project
  - Zika and other threats
- CRDF
- Skoll Global Threats Fund
- Wellcome Trust
- Collaborators
  - HealthMap/Epidemico
  - Imperial College London
  - EcoHealth Alliance
- Past supporters
  - Oracle Corporation
  - Google.org
  - Oracle Corporation
  - Rockefeller Foundation

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Thank you

Imadoff@promedmail.org
@Imadoff
http://promedmail.org
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<td>THE IMPACT OF CATHETER ASSOCIATED URINARY TRACT INFECTION</td>
<td>Prof. Brett Mitchell, Avondale College of Higher Education, Australia</td>
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<td>Prof. Anne-Gaelle Venier, Centre Hospitalier Universitaire de Bordeaux, France</td>
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