Practical usage of computer-supported outbreak detection in Europe

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Outline

• Short background
• Computer-supported outbreak detection
  – Denmark
  – England, Wales and Northern Ireland
  – Germany (Lower Saxony and the national level)
  – The Netherlands
• CASE (Sweden)
• Recommendations on integration in work flow
Sharing knowledge in Europe

• Contact with *Basic Surveillance Network*, September 2006
  “Does your institute currently use any form of electronic outbreak detection or have any information on the issue to share with us?”

• Workshop on *presenting and interpreting automatic outbreak detection signals*, May 2007

• Second workshop, November 2008

• Paper on its way ...
Why computer support?

1) to find outbreaks earlier
2) to find outbreaks that would (probably) not have been found otherwise
3) to highlight problematic increases in incidence already in the pre-outbreak phase
Computer-supported outbreak detection
All laboratories report person identifiable information on cases found positive for pathogenic gastrointestinal bacteria
Algorithm developed by Farrington et al, SAS implementation, since 2001
Results evaluated by epidemiologist and communicated by e-mail or discussed at weekly inter-institutional outbreak meetings
A useful surveillance tool, particularly for salmonella
http://www.germ.dk
Health Protection Agency, England, Wales and Northern Ireland

- Laboratories send details of all organisms isolated to HPA
- Algorithm by Farrington et al is used weekly, since 1993
- For organisms with an exceedance plots are produced showing the time series and the distribution of cases by age group and region or district
- Results are posted on the intranet and e-mailed to national and regional epidemiologists
Governmental institute of public health, Lower Saxony, Germany

- Freeware tools
- Case counts aggregated by disease (for salmonella also by serotype), week of notification, and 46 administrative districts, since 2002
- Algorithms:
  - Stroup et al (http://www.r-project.org)
  - Farrington et al (R-package surveillance)
  - SaTScan spatial scan statistics (http://www.satscan.org)
- Time series and maps presented on website
- Results vary between diseases due to their different epidemiological characteristics
Robert Koch Institute, Germany

- ~ 60 pathogens are reported by laboratories or GPs to local health authorities. Anonymised case information is transferred to the national level via the state health department.
- Runs weekly using a slightly modified version of the algorithm by Stroup et al, applied to subsets of data (such as region, age group, gender, country of infection).
- Aberrations are written to Excel spreadsheets.
- A trained administrative clerk screens the signals and notifies the epidemiologist in charge when needed.
National Institute for Public Health and the Environment, The Netherlands

• For the notifiable diseases – except salmonella and campylobacter – method by Stroup et al, since 1998
• Algorithm by Farrington et al on salmonella (>700 serotypes and phagetypes), since 1996
• Prototype available on intranet, showing period above tolerance, and if cases are significantly clustered in space or demographically deviate from expected
• Maps automatically generated for significant clusters
• Results evaluated by epidemiologist and communicated by e-mail and discussed weekly together with other signals
• Numerous small and large outbreaks and other problems with salmonella have been brought to the attention
Swedish institute for infectious disease control, Sweden

• CASE: Computer Assisted Search for Epidemics
• A framework for Computer Supported Outbreak Detection
• Developed at SMI
• Runs every night on selected notifiable diseases
CASE: algorithms

- Supports an arbitrary number of statistical algorithms
  - Algorithm by Farrington et al
  - OutbreakP (Frizén et al)
  - SaTScan Space-Time Permutation
  - Threshold
CASE: settings

• One or more algorithms can be applied to each disease
• The parameter settings for each algorithm can be different for the diseases, also on the type level
• When an aberration is detected, an e-mail is sent to the persons listed for that particular disease
CASE: availability

- Source code licenced under GNU General Public Licence
- Runs on Linux and Windows
- https://smisvn.smi.se/case
- Contact: case@smi.se
Recommendations

• Signals and alerts are presented in a way that works well for the receivers
• The output is user friendly, preferably in a graphical format
• The system is tightly integrated with the database, giving easy access to the case reports
• People in charge for handling signals can subscribe to their favourite diseases
Recommendations (ii)

• Feedback to the public health workers at the local level, laboratories etc. is part of the process
• Feedback from the receivers of the alerts is continuously incorporated, to allow for future analysis and improvement of the system as well as of the algorithms
• Algorithms can easily be tuned and be applied to subsets of data
• Algorithms can be scheduled as needed, as well as run on an ad hoc basis
• Alerts can be linked to reported outbreaks
Recommendations (iii)

• Routines for investigating if follow-up on signal is needed
• Routines are well documented, including holiday replacement strategies
• Evaluation strategy is defined and regular evaluations are scheduled (including usefulness and acceptance of system)
• Sufficient support and maintenance of the hardware and software are provided, and routines are documented
Conclusions

• The electronic systems are a central part of the outbreak detection process

• The different algorithms used have in practice shown their ability to detect outbreaks that otherwise would have been detected later or maybe even remained unnoticed

• Output used in several complementary ways; e.g. raise awareness and for communication purposes

• Provide further evidence
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References