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THE ADVANTAGES AND DISADVANTAGES OF SYNDROMIC SURVEILLANCE METHODS

(KEUNGGULAN DAN KELEMAHAN DARI METODE SURVEILAN SINDROMIK)

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ABSTRACT

Syndromic surveillance is surveillance methods which has the potential to detect diseases outbreak in the early stages. The systems used existing data of disease syndromes which generally appear at the beginning of infection to provide immediate analysis. Additionally, the method may identify the disease outbreak earlier than the conventional surveillance which commonly requires a longer time to determine the cause of the outbreaks. Although many experts believe that syndromic surveillance is a good method for early detection of disease outbreak, some of them also believe that this system has several drawbacks.

Keywords: syndromic surveillance, early detection system, animal health system

ABSTRAK

Surveilan sindromik merupakan metode survei kesehatan hewan yang berpotensi mendeteksi kejadian epidemi suatu penyakit pada tahap awal. Metode ini menggunakan data sindrom penyakit yang biasanya muncul pada awal kejadian penyakit yang selanjutnya diolah secara cepat untuk memperoleh hasil interpretasi akhir yang lebih awal bila dibandingkan dengan metode surveilan konvensional yang memerlukan konfirmasi laboratorium sehingga memerlukan waktu relatif lama. Beberapa ahli menyatakan metode surveilan sindromik memiliki beberapa keunggulan dalam mendeteksi kejadian suatu penyakit pada hewan, namun metode ini mempunyai beberapa kelemahan yang juga perlu dipertimbangkan sebelum penerapannya.

Kata kunci: surveilan sindromik, sistem deteksi awal, kesehatan hewan

BACKGROUND

Livestock and poultry play an important role for the human population in the world (Jordana et al., 2003). However, emerging and reemerging animal diseases are continuing to threaten the animals which can also impact on the human population. The animal health authorities in the world have been trying to find a better way to prevent and control diseases (Morens et al., 2004). Nevertheless, almost all of the control methods have positive and negative effects either to the animals and communities themselves. The control of livestock and poultry diseases depends on the cause of the diseases, their transmission, and a clear understanding of the disease present (Krieger, 1994). The understanding of the diseases present is a basic requirement for gathering information in surveillance and providing decision makers with tools for

making and planning policy. The tendency of the policy to decide the effective surveillance methods depends on the goal of the investigations (Salman, 2003). One of the surveillance methods which can reveal the real situation in the community and is relatively cheap to be applied is syndromic surveillance. In general, most surveillance data rely on laboratory confirmation, which provides information to identify disease clusters (Hope et al., 2006).

Recently, a new method on animal disease surveillance, called syndromic surveillance has been developed for earlier warning system. This surveillance is a type of passive surveillance which is concerned of signs or group of signs that are associated with disease infection in order to detect and report of the diseases. Buehler et al, (2003) and Durrheim and Speare (2004) believe that syndromic surveillance may overcome the weakness of traditional surveillance as it can detect animal disease outbreak faster.

Syndromic surveillance is a surveillance method which can potentially detect the disease outbreaks in the early stages (Miller et al., 2004). The systems used data of disease syndromes, which generally appear at the beginning of infection and then analyzing by programs in a relatively short period of time. Thus, the method may identify the disease outbreak earlier than the conventional surveillance which commonly requires a longer time to determine the cause of the outbreaks (Wagner et al., 2001).

The application of syndromic surveillance in human health is highlighted by the public health system since the anthrax attack in 2001 and the recent outbreak of severe acute respiratory syndrome (SARS) which reveals the chance for the threat of bioterrorism attack (Bravata et al., 2004). Recently, in the USA, many new human infectious diseases have been recognized by examining illnesses without identifying the cause of the diseases (Vourc'h et al., 2006). Furthermore, The New York City Department of Health and Mental Hygiene has established a syndromic surveillance system which is capable to provide data in electronic format and can detect human disease outbreaks from emergency department visits (Heffernan et al., 2004).

In animal health, syndromic surveillance is a relatively new system of surveillance, although it has been applied for animal health investigations, especially in the developed countries. For example: in theUSA, the system is called the Rapid Syndrome Validation Project – Animal (RSVP-A); Veterinary Practitioner Aided Disease Surveillance (VetPAD) inNew Zealand; and inFrance, there is "Emergences". All of these systems are based on the syndromes of animal diseases with the notification of specific clinical cases (Vourc'h et al., 2006).

Syndromic surveillance is an alternative way which may potentially overcome the recent limitations in the reporting method system. The surveillance system is using data based on the investigation of the farmers or livestock owners when their animals experience illnesses.

Furthermore, the farmers or the livestock owners then make reports directly to the department of husbandry and inform about their sick animals. Self reporting by farmers on their sick animals, the small number of investigative staff and more representative data could be achieved from the application of syndromic surveillance for controlling animal disease. In fact, when there is an outbreak of animal disease, further responses can be decided earlier because the determination of the outbreak which is based on the disease clinical signs without laboratory confirmation In addition, syndromic surveillance can develop the traditional knowledge on disease animal management as it has similar basic concept to participatory approach surveillance which is gathering the data based on the community. The knowledge of the farmers about management of their animal health commonly comes from sharing information between farmers. In fact, the information is originally inherited by the earlier experience from previous members of their families (Palmer et al., 2009). Nevertheless, regardless of the efficiency of the knowledge, the farmers generally do not know how to prevent the spread of animal diseases on their farms due to a range of constraints. The inability of the farmers to identify diseased animals in early stages and the delayed report of the diseased animals to the authorized health animal care are two examples of the limitations. These factors are necessary to be considered and need to be improved in order to build a good basic surveillance especially surveillance by using data collection based on the farmer's report.

Eventhough syndromic surveillance systems are still relatively a new approach, many public health agencies have already begun to develop and implement this system. From the application of the system, the strengths and weaknesses can be examined, including how the systems fit into the public health system.

This article reviewed the advantages and disadvantages of syndromic surveillance methods based on some related literatures. It then can be evaluated whether syndromic surveillance is an alternative for animal health surveillance system, as well as how the benefits of this system outweigh the drawbacks.

The Advantages of Syndromic Surveillance

1. Syndromic surveillance systems potentially can be used for surveillance of bioterrorism-related diseases.

Concerning of bio-terrorist attacks has raised, the question of the timeliness of

diagnosis-based public health surveillance has increased. Public health needs new approaches which may detect bioterrorism earlier. When the anthrax attacked in 2001, animals have been shown to be effective for human hazards. By utilizing an animal health database to augment national efforts in bio-terrorism detection, a companion animal veterinary medical disease surveillance of syndromes (VMD-SOS) system is being developed to alert public health and national security officials to the presence of man-made or naturally occurring hazards (Moore et al., 2004). Indeed, in the USA most human patients with bioterrorism-related diseases who initially present syndromes with influenza-like illness, acute respiratory distress, gastrointestinal symptoms, febrile hemorrhagic syndromes and febrile with either dermatologic or neurologic findings are detected by U.S. Department of Health and Human services to be analyzed and reported as surveillance data for bioterrorism related diseases (Rotz et al., 2002).

2. Syndromic surveillance may support public health situational awareness.

Syndromic surveillance methods can monitor the effectiveness of epidemic responses and characterizing affected populations. Despite obstacles to implementation in resource-limited settings, the tools and strategies of syndromic surveillance hold promise for improving public health management (Chretien et al., 2008). For example, CDC's Bio Sense Initiative is an internet based software system for collecting, analyzing and visualizing human health data which are weekly reported from local and state monitoring public health system and anomaly investigation data. The data is not only based on sources and time of human health, but also the syndromes. Department of defense military treatment facilities, Department of veteran affairs and Laboratory cooperation of American are three data sources where Bio Sense has implemented. The all data are using*International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) diagnosis codes which based on syndromes (Bradley et al., 2005).

3. Syndromic surveillance is potential surveillance methods for developing countries

Although syndromic surveillance systems have been used in high-income countries generally, these systems are useful to be applied in developing countries. In general, laboratory confirmation is more likely difficult to be done or is not routinely used in developing countries. By using syndromic surveillance methods for public health monitoring and control in those countries, the laboratory diagnostic test is not become a major prerequisite for surveillance (Chretien et al., 2008). For instance, the Early Warning Outbreak Recognition System (EWORS) inIndonesiauses syndromic-

based surveillance for disease outbreak inIndonesia. The EWORS program was developed to complement the existing disease surveillance and provide a simple, flexible surveillance system that detects disease outbreak early after their onset based on the syndromes without laboratory confirmation. The program complements the existing reportable disease surveillance conducted by the Surveillance Directorate of the Indonesian CDC, which used manual, paper-based system to collect data from provincial and district health offices (Siswoyo et al., 2008). Another potential contribution of the syndromic surveillance field to developing countries is approaches for detecting unusual morbidity trends, which could strengthen monitoring syndromes, diagnoses, and other health-related. This approaches usually involve the entry of patient data into a computer by periodic application of statistical logarithms and comparing between the data for a period of time and visualize (Chretien et al., 2008).

4. Syndromic surveillance can detect clinical emerging issues.

Not like most surveillance programs which deal with a restricted set of known diseases, syndromic surveillance can identify outbreaks that do not fall into pre-established diagnostic categories and it also has an essential capability for prompt control of new or changing diseases (Chretien et al., 2008) or even detecting emerging animal diseases (Vourc'h et al., 2006). The emergence of Nipah virus disease in 1998 inMalaysiaandSingaporewhich affected swine and human had been identified by the syndromes of the disease. For example: in pigs, acute fever, respiratory signs and neurologic signs, where as in human experienced encephalitis (Wong et al., 2002).

5. Syndromic surveillance is supported by recent technology on collecting and analyzing data.

The information and technology can significantly improve public health practice. The using of technology, for example: computer with internet connection, PDA, mobile phone, as communication systems can help public health professional to report suspicious cases quickly and efficiently. In addition, it is easier for epidemiologists to manage their database systems in an investigation of an outbreak. Those advanced technology can be applied for syndromic surveillance data capture and transmission especially in remote areas (Chretien et al., 2008). The tools are also really useful for sustainability of data collection, making the surveillance team easier to input data without additional burden on massive data collection. Indeed, that technology can keep data records, as well as keep historical data to preserve availability of baseline data (Mostashari and Hartman, 2003).

6. Syndromic surveillance systems can detect disease outbreaks rapidly

Syndromic surveillance can respond to outbreaks earlier than conventional surveillance which relies upon confirmation by laboratory tests. In this method, syndromes are the indicator for the earlier detection of the disease incidence in population (Berger et al., 2006). In New York, a fully functional hospital which uses spatial, temporal and space-time scan statistic software (SaTScan) automated analyses the outbreak based on syndromes and the result can be showed virtually within 24 hours after data submission (Das et al., 2003).

7. Syndromic surveillance system may use existing data

One of the benefits of syndromic surveillance system is that the opportunity for using existing data. The data is generally from public health services records, for example patient medical report in clinic or hospital, emergency department, or from laboratory (Mostashari and Hartman, 2003). Additionally, Berger, Shiau and Weintraub (2008) assert syndromic surveillance systems may provide information which would allow public health departments to predict outbreaks earlier than by using traditional surveillance by retrospective evaluations. The investigators do not have to do survey which is time consuming in order to get the data. Thus, it is relatively more efficient than active surveillance (Berger et al., 2006).

8. Syndromic surveillance is a low-cost surveillance method.

The syndromic surveillance techniques are developed because they provide a relatively inexpensive and practical approach gathering the information required for effective animal disease control (Heffernan et al., 2004, Sloane et al., 2006). Davies, et al (2007) believe that although this method is rather a new approach surveillance which needs to be more developed, some research demonstrate syndromic surveillance techniques have the ability to significantly improve the collection and management of animal health information in low-cost expenditures, yet demonstrable value to animal livestock (Davies et al., 2007). In comparison with active surveillance, syndromic surveillance requires lower cost for investigation. For example, in data collection, syndromic surveillance generally uses available data, which is at a lower cost than by undertaking a survey (Mostashari and Hartman, 2003).

Syndromic surveillance does not require the cost for the diagnostic kits which are commonly expensive. In surveillance the diagnostic of disease from clinical symptoms have already been determined, the laboratory confirmation is not a compulsory.Consequently, there is no cost for laboratory materials.

9. Syndromic surveillance is possible to be an attractive option for poorly-resourced veterinary services.

In some areas, especially in developing countries, the availability of veterinary service is often limited. The limitation of veterinary service is important when undertaking active surveillance. In participatory epidemiology, veterinarians are needed to undertake surveys related to the animal health community by performing meetings or interviewing. The veterinarians generally lead the meeting and at the same time lead the interviews in the community (Hussain et al., 2005).

As with the participatory approach which is based on interaction with the farmers, syndromic surveillance does not require a high number of veterinarians. The presence of veterinarians is not at the first line because in this method the farmers are encouraged to identify and report their sick animals not only to veterinarian but also to the head of village, or department of animal health.

10. Syndromic surveillance builds on farmers own knowledge and skills in disease surveillance and control.

Previously, community based surveillance was more focused on pastoral communities whose livelihoods were dependent on livestock and who had limited information on modern veterinary medicine. Since then, the approach has been more specific to a diverse range of communities, and one of them is surveillance based on farmers.In syndromic surveillance, the primary assessment of data comes from farmers and livestock owners on identifying the range of their animal diseases. Furthermore, they can also indicate their disease status on their areas.

11. Bias in syndromic surveillance is minimized by cross-checking of the input data.

Reports from farmers or livestock owners should not be processed directly that is not entered directly as data. The data need to be validated by cross-checking, either by using multiple techniques or expert veterinarians. This process is really important to ensure the syndromes are really showed a particular disease. In participatory approach surveillance this process is called triangulation. It is a basic assumption when the investigators cannot fully anticipate the priorities and problems of the disease in communities where they study. This assumption can also help to avoid many biases associated with other conventional epidemiology approaches. Indeed, the process may empower the stakeholders, since they are the ones who identify and describe the problems (Jost et al., 2007).

The Disadvantages of Syndromic Surveillance

1. Syndromic surveillance is not suitable for large outbreaks.

Even though syndromic surveillance systems seek to minimize the amount of data collected from each case, the main drawback is the heavy reporting load and requirement for disciplined reporting of recognized case data (Vourc'h et al., 2006). This situation is more likely to

happen when the input data is done manually and there are limited staffs for entering data at the same time.

2. The accuracy of the data is likely to be less representative because of lack of supporting data.

Diagnosis of animal disease cases based on clinical signs is less accurate (Bravata et al., 2004). This may impact on the low sensitivity and specificity of the method which may affect the ability to facilitate decision making. Salman (2004) believes that diagnostic of animal diseases based on a clinical reporting system is only the first step to determine the etiology of the diseases. In spite of laboratory confirmation, there are other key roles for determining the etiology of the disease, such as: description of animal diseases from expert clinicians or veterinarians, necropsy findings, immunologic screenings, and focused epidemiologic study (Salman, 2004). By adding such factors to the diagnostic based on clinical signs, the accuracy of diagnose may increase, as well as the sensitivity and specificity and also undoubted for decision makers on the disease control and prevention.

Eventhough the sensitivity of surveillance will give a positive outcome and shows that disease is present, there are many factors influences the sensitivity of syndromic surveillance as a passive surveillance, such as the probability of infected animals that showing detectable syndromes, the responsible person for reporting of diseases, and the sensitivity of the diagnostic test application (Martin et al., 2007). Therefore, it is difficult to estimate and objectively quantify the probability of detecting cases and to evaluate the contribution of the method in general surveillance (Hadorn et al., 2008).

3. Syndromic surveillance is potentially ineffective for surveillance.

The efficacy of syndromic surveillance has not been proved widely and the likelihood of false alarms is high. The collected information is not specific enough to enable timely outbreak detection or disease control activities (Berger et al., 2006). Additionally, A typical case detection is limited by practitioners' experience, knowledge, vigilance and willingness to report findings (Cuenot et al., 2003). In fact, scientific evidences are scarce to deploy the method to guide clinicians or public health officials (Bravata et al., 2004).

Additionally, there is no standard definition for syndromic surveillance. Thus, there are many difference and limitation on definitions of a syndrome between one to other institutions which are using the method for surveillance, even in the same clinical signs (Bravata et al., 2004). This situation may lead to complexity of the standard definition of syndromes and finally, may cause confusion for surveillance systems when the systems try to gather or combine the data.

4. Difficult to determine the cause of disease outbreaks because of similarity of the clinical signs with other diseases.

Diagnosis of diseases can somewhat be determined on the basis of clinical signs, however this could be misleading as clinical signs of the diseases are similar to each other. For example, highly virulent avian influenza and Newcastle disease in chickens, show almost the same symptoms such as edema and congestion on the comb, loss of appetite, depression, abnormal respiratory, etc (Swayne and King, 2003). Syndromic surveillance methods do not likely involve the specific confirmation of the disease presence as they are not confirmed by laboratory tests. This situation may affect the accuracy and quality of the data surveillance.

5. Syndromic surveillance may not detect subclinical diseases.

Another negative factor of syndromic surveillance which can also affect the accuracy and quality of data is the ability of the method to detect subclinical diseases. In Syndromic surveillance the data collection is based on the clinical signs which are showed when infection is occurred. However, in subclinical infection, the syndromes of the infection cannot be recognized. This is really important in order to determine the existence of the disease in certain areas, when the syndromic surveillance systems more likely will conclude free from disease but, in fact, the disease is really existed (Doherr and Audige, 2001). For example, Jembrana disease in crossbreed cattle between Balicattle and *Bos indicus*, and in Friesian cattle do not show any clinical signs when they are infected with Jembrana disease virus. The infection of Jembrana disease on those cattle can only be detected from serological tests (Soeharsono et al., 1995).

6. Syndromic surveillance requires professional clinicians which are limited and difficult to be found.

Syndromic surveillance needs special clinicians who have better capability at recognizing the early symptoms of diseases in order to get the real data collection. This is special requirement for collecting data, particularly for the animal surveillance, where the clinicians have to recognize well as a confirmation to the syndromes of the animal diseases before the data is being input. Eventhough these people have already been trained before involving in the disease surveillance, not all of trained team becomes totally expert. In syndromic surveillance on animal health, expert people are needed to support the surveillance system to make rapid detection of the diseases (Carrico and Goss, 2005); however, they are limited and difficult to be found.

In the areas which specific infectious diseases have never been present or the last outbreaks are in the past years ago, there would be few or even no professional farmers or veterinarians with personal experience of the clinical signs

of the diseases. There might be difficult to perform syndromic surveillance when the people in certain areas do not have any experience regarding new emerging or re-emerging diseases. Therefore, maintaining adequate expertise people is needed to diagnose the diseases based on clinical signs have to be available in the event of outbreak (Salman, 2003).

7. The likelihood of few sick animals are not detected

Farmers may not report their sick animals when the number of sick animals is small. Even, they do not intend to go when the farmers have to report to the authorized animal health in long distance and there is no compensation for their sick animals. Stoto, et al (2004) argue that syndromic surveillance might not work in a case which involves only a few individuals such as the anthrax case episode of 2001. In the same way, Berger, et al (2006) stated that syndromic surveillance are less successful at identifying small counts or small increase in disease.

8. Syndromic surveillance can detect early syndromes but not specific diseases.

Syndromic surveillance is useful to detect clinical signs which mostly appear at the beginning of the infection. However, knowing the syndromes of diseases it does not mean that knowing the disease itself. In fact, there are many of similar syndromes in different diseases. Thus, it seems that syndromic surveillance does not have a specific disease identifying clinical features (Berger et al., 2006).

Considering the benefits and the drawbacks of syndromic surveillance, we can get ideas whether the method is suitable to be applied in a particular situation, including the impact that may occur when the method is being used.

CONCLUSIONS

Syndromic surveillance is an alternative way which may improve animal health information system. Syndromic surveillance is a potential surveillance method with the benefits may outweigh the drawbacks

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