Disease surveillance systems for sensitive population groups

T.Botsis[a, i], J.G.Bellika[a], G.Hartvigsen[a]
a) Department of Computer Science, University of Tromsø, Norway

OBJECTIVE

The aim of this study is to reveal the need for developing disease surveillance systems for sensitive populations.

BACKGROUND

Disease surveillance systems are currently used for the early detection of disease outbreak before diagnosis is confirmed in order to mobilize a rapid response [1]. The fear of epidemics or bioterrorism resulted in the development of systems for the general population [2]; however research efforts for sensitive population groups are missing. Sensitive groups could be considered patients suffering from chronic diseases (such as diabetes and renal failure), elderly people and infants. It is well known that these groups are quite susceptible to diseases that can be easily spread under certain circumstances e.g. in a dialysis room where patients with renal failure receive their regular treatment. In addition to that, several diseases seem to affect them more. Therefore, the development of disease surveillance systems for sensitive population groups is an issue that should be addressed.

METHODS

The surveillance process includes the data collection and analysis, the interpretation of results and their dissemination [3]. Our proposed methodology respects this process and sets focus on two aspects: the time point of data capture and the type of collected data.

Regarding the first aspect we consider that it is important to collect data during the incubation period. This period initiates when the subject is exposed to a disease agent and ends by the first symptom onset [2]. Its exact duration differs per case. For some diseases the incubation period is the most contagious phase (influenza) in the disease cycle. So, if an alteration to the health status of a subject could be identified anytime during this period it would be possible to shield the patient, but also prevent the spread of infections for some diseases. A physiological indicator could be used to indicate such an alteration. This is the second main aspect of our methodology; we propose the exploitation of certain physiological indicators that are probably altered when a subject is exposed to infections. An example is blood glucose that can be easily measured and has been shown to be elevated in case of infections. Some patients like diabetics measure their blood glucose on a daily basis. At this phase of our study we investigate the potential correlation of diabetics' blood glucose fluctuations in response to infections.

The system will employ biological sensors for collecting the data that will be transmitted to the data repository. A mathematical model will analyze the incoming values in respect to each subject's profile and will trigger alarms if necessary.

RESULTS

The first results of our study indicate that there is correlation between blood glucose and infections in diabetics. However, the exact mechanism and the further exploitation of results e.g. in other sensitive groups is still under investigation.

CONCLUSIONS

The existing disease surveillance systems are using a variety of data such as symptoms, hospital emergency admissions, over-the-counter and prescription pharmacy sales and worker absenteeism which are collected either manually or automatically depending on the system architecture [4]. Generally, data acquisition follows symptoms onset but precedes medical evaluation. Our approach proposes the collection of physiological indicators' values during the incubation period.

It is obvious that the appropriate indicator for each sensitive group should be investigated in depth. For this purpose other indicators such as body temperature, heart rate and urea levels will be examined as well.

These indicators could also be applied to other groups with special interest in early detection of infections. For instance, high competence athletes are extremely interested in early detection of an infection that could affect their performance. These groups could be considered 'sensitive' as well. The outcomes of our study could be applicable for the general population as well.

REFERENCES

[1] Henning KJ. What is syndromic surveillance? MMWR 2004 Sep; 53(Suppl): 5-11.

[2] Mandl KD, Overhage JM, Wagner MM *et al.*. Implementing syndromic surveillance: A practical guide informed by the early experience. J Am Med Inform Assoc 2004; 11: 141-150.

[3] World Health Organization. Report on technical discussions at the twenth-firstworld health assembly on national and global surveillance of communicable diseases. Geneva: World Health Organization; 1968.

[4] Heffernan R, Mostashari F, Das D *et al.*. New York City Syndromic Surveillance Systems. MMWR 2004 Sep; 53(Suppl): 23-27.

[i] This work was carried out during the tenure of an ERCIM "Alain Bensoussan" Fellowship Programme.