



THE COMPUTERWORLD HONORS PROGRAM

CASE STUDY

ORGANIZATION:

Emergency Medical Associates

PROJECT NAME:

Biosurveillance Dashboard

Summary

As diseases continue to mutate and news headlines make the likes of SARS, West Nile and Avian Flu causes for widespread public concern, a healthcare surveillance infrastructure capable of tracking disease outbreaks reduces fear and builds confidence in the general population. Since the attacks of September 11, 2001, federal, state and local governments have invested millions of dollars building such an infrastructure. During this same time, a private medical group of emergency physicians, Emergency Medical Associates (EMA), in New Jersey was adapting its existing data warehousing system for bio-surveillance. Using historical data starting in 1996, which included data for more than 3 million emergency department visits, EMA partnered with the CDC, Department of Defense and the New York City Department of Health & Mental Hygiene in 2003 to develop and validate the algorithms that could be used for “syndromic” or “bio” surveillance. Without any external funding and by applying business intelligence solutions from Business Objects, EMA created the first fully functional bio-surveillance system in northern and central New Jersey. While tracking over 3,000 emergency department visits per day, the system detects unusual syndromic activity that could indicate the early stages of an outbreak, epidemic, or bio-terrorist attack, then automatically alerts doctors across the EMA physician/hospital network, as well as state and local authorities in New Jersey and New York. In the case of the 2004/2005 flu vaccine shortages, the bio-surveillance system helped authorities determine whether provision of the flu vaccine on high-risk patients actually impacted the spread of the disease in New Jersey and New York. As it turned out, the number and percentage of patients with flu like symptoms declined from 2004 to 2005 in the area serviced by EMA.

Introductory Overview

EMA is a group of over 220 board-certified physicians that staff and manage 17 emergency rooms. In 2000, EMA embraced business intelligence solutions from Business Objects to improve emergency department (ED) operations in hospitals where EMA is responsible for physician staffing. Subsequently EMA expanded its use of Business Objects technology to include management of emergency room operational, financial, and customer satisfaction data. The system is known as the Emergency Medicine Analysis and Reporting System (eMARS).

LOCATION:

Livingston, New Jersey, United States

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2006

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EMA built distinct dashboards for its hospital EDs to understand diagnosis trends and emergency room effectiveness, tracking everything from patient turnaround times to patients who left without being seen to the number of patients holding in the emergency department. Having moved to a web-based user access system in 2004, each site-specific dashboard draws information from the organization's Oracle-powered data warehouse, which in turn pulls data from multiple data sources, such as patient management and tracking, clinical documentation, physician work hours, physician satisfaction, and payroll. The system currently tracks data from more than 700,000 ED patient encounters annually.

After the September 11, 2001, terrorist attacks in New York City and Washington D.C., with the medical community on high alert preparing for biological attacks, and the threat of new diseases, such as SARS and West Nile virus increasing, EMA realized that the solution it was building to improve operational efficiency could be used to create a bio-surveillance system that would search for patterns in patient data to track disease outbreaks.

The custom dashboards used for bio-surveillance cross reference patient complaints with a set of disease grouping algorithms developed by the New York City Department of Health. Based on key words used by patients in articulating their symptoms to ED nurses, patients are placed into these disease groupings (also known as syndromic groupings) by eMARS. Daily results of the number of patients in each grouping are then compared with statistical norms. Classic symptoms, such as respiratory distress or chest pains, are tracked as groups. Unusual levels or trends of symptoms could indicate the early stages of an outbreak. In response, the system emails alerts to key emergency physicians across the EMA physician/hospital network, as well as state and local authorities in New Jersey and New York.

Benefits

In the face of the 2004/2005 flu vaccine shortages, EMA used the bio-surveillance dashboard to detect flu-like symptoms of patients coming into emergency rooms. The dashboard provided the first early-warning to the nation's physicians that cases of the flu were on the rise, and ultimately helped emergency rooms plan for an increase in treatment and the number of doctors needed for a potential epidemic.

Because it is based on trends in patient symptoms, the bio-surveillance system can be used to track the spread of any outbreak or potential epidemic or bioterrorist attack. The information from the bio-surveillance system is shared with the national bio-surveillance infrastructure, increasing the comprehensiveness and accuracy of the system.

The development of the bio-surveillance system led to surveillance projects with the CDC, DOD, NYC Department of Health, and the NY State Department of Health.

The Importance of Technology

Modern database and business intelligence technologies are essential to effective bio-surveillance, which relies on information being collected, analyzed and shared very rapidly. The EMA bio-surveillance dashboard was built using business intelligence solutions from Business Objects for its query, analysis, and reporting capabilities. The dashboard works atop the following infrastructure.



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The system infrastructure consists of MS Windows 200x-based servers, Oracle 10g, and TOAD 8.6 (a front-end to Oracle). The system draws data from the following sources:

1. Patient Management and Tracking: EMA-developed Emergency Department Information Manager (EDIM) that interfaces with and integrates data from several hospital systems, including Registration, Laboratory, X-ray, etc.
2. Clinical Documentation
3. Physician Billing: Interfaces with and integrates data from several systems
4. Physician Work Hours
5. Physician Extender Work Hours (Nurse Practitioners, etc.)
6. Patient Satisfaction files from multiple vendors
7. Payroll (ADP/excel files)
8. Summary Financial Data (EPICOR/excel files)

Except as noted above, data sources were written or created in COBOL, MS Visual FoxPro, MS Access databases, SQL 2000 databases, MS Excel spreadsheets, and flat files.

For data integration, EMA uses a combination of solutions, including MS-SQL, Pervasive.SQL, COBOL, and Freehand SQL. For data quality, EMA uses Pervasive.SQL and Oracle's PLSQL.

Originality

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The eMARS bio-surveillance system is the first such system developed by a private healthcare organization, and the first bio-surveillance system to use business intelligence for analysis and reporting.

Success

Most recently, on March 14, 2006, EMA noted a dramatic increase in pediatric volume at one of its contracted sites for March 13, 2006. The surveillance system allowed for a drill-down on



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the information, and the investigation enabled EMA to alert the site's ED nurse manager as well as the county epidemiologist's office about the reason for such a large increase. This knowledge saved resources, time, and money for both the hospital and the state. The anomaly lasted only one day.

Beyond the bio-surveillance benefits, eMARS continues to be used to manage each EMA contracted ED as well as other sites that use eMARS as their analytics solution (currently 3 non-EMA sites use eMARS). The system has exceeded expectations in all key areas including the following:

- EMA physicians experienced a growth in per-hour income in both 2004 and 2005.
- EMA added three new profitable hospital contracts in 2004 and 2005, resulting in an increase in total 2005 revenue of 15% over 2004. Contract growth was partially attributable to business intelligence capabilities.
- Total business and clinical intelligence expenses declined by .14% of total company revenue in 2005 versus 2004.
- Emergency department metrics for contracted EMA sites have shown great improvements, especially for new contracts. At one such contract, the "left without being seen percentage" (the percent of patients who leave before being seen by a doctor) declined from over 6% when EMA began the contract to under 3% as of January 2006.

The system also saves each EMA contract site at least \$35,000 per year (equivalent to 1.0 FTE per site) based on business intelligence they receive from the system. Additionally, EMA contracts use eMARS to justify additional ED beds, reallocate ED staff, determine patient satisfaction, monitor performance, understand patient throughput, and analyze ED metrics to support Joint Commission on Accreditation of Healthcare Organizations (JCAHO) surveys.

With Business Objects, users can easily access information, dashboards, scorecards, and real-time alerts using EMA's web-based BI portal or have it "pushed" to them. Dashboards and scorecards shift the burden for analysis from humans to the system, making the analysis more accurate and efficient while reducing overall labor costs. Using this innovative approach, EMA was able to grow from 583,000 visits in 1999 to 701,000 last year, without increasing its DM/BI team.

Difficulty

Without the drive and passion of EMA's director of data management and two of EMA's top research physicians for using EMA's business intelligence infrastructure for syndromic surveillance, very little beyond one or two studies would have been completed. Because syndromic surveillance work has generated little direct income for EMA, these passionate individuals needed to constantly reinforce with management the importance of using the EMA data for a non-profitable endeavor. Still, many business managers within EMA continued to ask questions about the business value of a private medical group doing syndromic surveillance instead of leaving this job to state and federal authorities.

It was difficult to win over these business managers, but the successful results of this project—getting articles published in prestigious healthcare clinical and technical magazines, getting recognition from government agencies—allowed the few drivers of this endeavor to persevere



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and overcome its detractors. Today, all EMA business decision makers see the value of our syndromic surveillance. Although the monetary return for work invested in building this capacity is less than the investment, it has proven invaluable to New Jersey and New York.

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