Lab data mining and analytics: A framework for business intelligence and decision making

It is widely recognised that laboratory data is at the heart of healthcare decisions. How do we harness the information generated in the lab for value-added healthcare delivery? Pathology databases can be considered a repository of established knowledge and a source for new knowledge from which to build a framework for business intelligence and clinical decision making.

> *"Clinical laboratories and their contribution to the future of healthcare can benefit greatly from adopting a data-centric mind-set and are beginning to tap into the enormous benefits of aggregating and analysing that data."*

Business intelligence to maximise the efficiency and quality of the lab operation

Enormous volumes of data flow through laboratory information systems each day. Orders are received, specimens are tracked, results are entered and verified and reports are sent back to the ordering clinicians. Most laboratories gain value from the transactional activity in these databases and the use of laboratory information systems to support daily lab testing and result delivery. For example,

- Lab testing turnaround reports with the ability to consolidate or split the various components, such as order › collection, collection ›receipt, receipt ›testing, testing › report. These splits can then be analysed by departments; individual test or test groups; hours or shifts; employee; patient location; clinics; providers etc.
- Lab utilisation reports. The LIS can provide appropriate real-time feedback on laboratory utilisation data to requesting providers. Utilisation can be analysed by provider; provider group; specialty; clinics; wards, patient types, diagnoses codes etc. to include test type, volumes, and costs per case. The utilisation patterns can be used to provide decision support on test ordering patterns.
- Capture of test costs, integrated with billing data facilitates operational decisions through business intelligence.

Clinical decision support

Pathology data can provide a means to identify clinical issues affecting specified populations, perform epidemiologic and public health studies, and provide decision support through clinical alerts and prediction. Diagnostic results are associated with demographic information and temporal data such as location, discharge status, age, date, gestation and the patient's clinical details. Looking at relational trends in the data can provide a wealth of intelligence for data mining potential to provide a framework for decision support and clinical alerts.

Standardisation in the lab - more than just refererence ranges continued ...

Common examples include:
- Patient outcome analysis using lab data-mining capabilities and clinical data extracted from the HIS. Examples of useful parameters to correlate with lab testing include mortality, morbidity, hospital length of stay and cost of care.
- Patient susceptibility using data from the HIS and the LIS to support clinical decisions which will aid treatment of the patient. Alerts can be generated if a patient(s) fails a number of defined vulnerability rules.
- Using data for clinical prediction. According to a recent study at Austin Hospital in Melbourne, lab results can provide real time statistical information about patient risk presenting vast opportunities for better patient care. The study looked at death predictions over a 24 hour period using aggregate scores from lab tests.

Analytics in your LIS

Clinical laboratories and their contribution to the future of healthcare can benefit greatly from adopting a data-centric mind-set and are beginning to tap into the enormous benefits of aggregating and analysing that data. There are different ways to approach advanced analytics in your LIS:

- Developing an analytics module within the LIS;
- Integrating the LIS reporting database with third-party lab analytics specialist solutions;
- Integrating the LIS reporting database with third-party generalist analytics solutions.
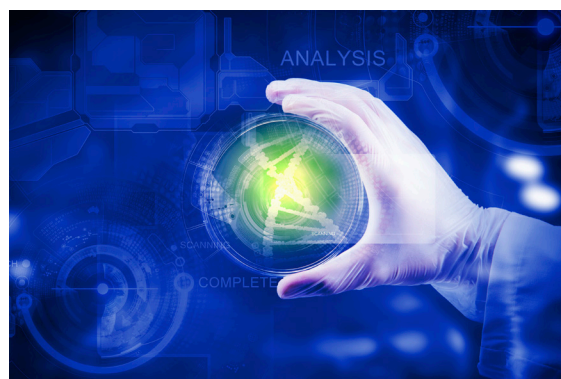
Product cost and return on investment in terms of business benefits and clinical outcomes are key determinant of the right approach.

In summary, your laboratory's data is captured in its most detailed form. Mining and analysing this data can be used to answer a number of questions and track clinical trends. This information can be applied in research and clinical decisions and to support business process. This enables improved laboratory management and enhanced clinical support.

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