Garvan Institute

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INDUSTRY

- Life Sciences

KEY BENEFITS

- Merges patient information with lab research information to generate reports that lead to identifying efficacious treatments
- Empowers researchers to run database queries without help from IT resources
- Permits easy creation of stored procedures
- Requires minimal IT administration—even while running more than 30 separate databases

SYBASE TECHNOLOGY

- Adaptive Server® Enterprise (ASE) 15

To maintain its standing as an internationally-recognized leader in gene-based medical research, Garvan Institute needed to generate detailed reports that merge lab research with information on patients suffering from a variety of diseases such as cancer, diabetes and osteoporosis. The institute also needed an information architecture that would allow researchers to easily query databases—providing data for published journal articles. To solve the challenge, Garvan Institute turned to Sybase ASE 15, serving as its reliable platform for more than 30 separate databases. Garvan researchers now easily build research reports from ASE-generated data to author journal articles with information that helps relieve human suffering and improve quality of life.

IMPROVING THE QUALITY OF LIFE

The Garvan Institute of Medical Research began as a small research department of St Vincent's Hospital in Sydney, Australia. Today, the institute remains a member of the St Vincent's and Mater Health Campus and is affiliated with the University of New South Wales. For more than 40 years, Garvan researchers have dedicated themselves to medical research that relieves human suffering and improves the quality of life. The organization's work encompasses a range of diseases that affect people from early childhood throughout adulthood, including cancer, neurodegenerative disorders, diabetes, osteoporosis, arthritis and obesity. Garvan is now one of Australia's largest medical research institutions with more than four hundred scientists, students and support staff.

A key driver of Garvan's success is the ability to compile and analyze research data. The more accurately Garvan's researchers produce results, the more precise they can be in their research findings. Researchers then share their data and findings via journal articles for prestigious medical journals such as the New England Journal of Medicine. In the long-term, this research leads to a better understanding of disease-management therapies as well as the establishment of the institute as an internationally-recognized leader in gene-based medical research.

DEVELOPING QUERIES TO MERGE PATIENT INFORMATION WITH LABORATORY INFORMATION

As Garvan Institute sought ways to help researchers compile and analyze data, information technology director Jim McBride realized that the way in which the organization designed its information architecture was the key element. "We needed a database platform that would help us merge two key components of information," McBride says. "This includes patient information, such as symptoms, demographics, surgery results, and after-surgery results as well as information collected from lab research."

Garvan needed both sets of information to reside in a single database that would also provide the ability to easily write stored procedures that access the combined information for researcher queries. "It was critical that we deploy a database platform that would allow us to create simple query systems that researchers could access on their own," McBride says. "We didn't want to force researchers to have to tap into the IT staff for help in generating reports. That method is more costly, and if researchers can run queries on their own, they are more likely to run additional queries that enhance the research findings."

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SYBASE ASE: THE PERFECT DATABASE SYSTEM ARCHITECTURE

To take on this challenge, Garvan Institute turned to Sybase Adaptive Server Enterprise (ASE), a database noted for its reliability, low total-cost-of-ownership and superior performance. By deploying just one single instance of Sybase ASE, Garvan has been able to develop and deploy 25 separate production databases and 12 test databases on one Sun SPARC server. The databases combine specific patient information with lab research data, and Sybase ASE makes it easy to create stored procedures that merge the information together. Using these query responses, researchers can then draw reliable conclusions such as the impact of a gene activity on diseased tissue and how it influenced the survival-rate of patients. "Sybase ASE has given us the perfect environment that makes this type of research possible," McBride says.

Currently using ASE version 15, researchers interact with the databases using and in-house application to build queries that run against the database. The researchers can then easily e-mail these queries to other researchers to share results. "The system lets researchers easily browse and see information," McBride says. "The data model also allows them to drill down further into the data."

Researchers access data through a security model that protects personal patient information while allowing access to general patient data. The Garvan IT team does not have to intervene since Sybase ASE creates an easy-to-use connection between the data and the researcher queries. "We created the research query builder with the Realbasic programming language, and when the query builder is connected to ASE 15, it easily accesses information," McBride says. "Researchers just use a point-and-click tool that lets them query tables. Using a meta-data architecture allows the query builder application to build queries against any database that the user has access to. They simply run the query and then they can easily paste results into customized spreadsheets."

Because of how well Sybase ASE performs, the user-demand for query services has grown steadily over the years. And with queries becoming more sophisticated as researchers realize the flexibility of the system, Garvan is now considering adding a second database server or upgrading the current server. The need for a second server is also due to the amount of pedigree information in Garvan's databases. Many illnesses impact multiple generations of families across grandparents, parents and grandchildren. A pedigree diagramming tool is helpful in analyzing family relationships and genes to diseases, but the method of pulling this information is complex.

"You have to traverse the pedigree through the database with a well-written stored procedure, and you need to exhaustively traverse the pedigree to make sure you haven't missed any family relatives," McBride says. "The system also needs to store the data in a format that a pedigree diagram tool can read. The diagram itself helps show the relationship between generations. We needed an SQL database with stored procedures that allows our researchers to run them on their own. ASE lets us build stored query procedures, release them and then get out of the way of the researchers."

The efficiency of ASE 15 has also helped Garvan maintain a lean IT staff. The organization uses just three full-time equivalents to manage the server and all the database applications running on ASE 15. Another key feature to ASE 15 is that it allows for much larger varchar (variable character field) data types in stored procedures. This gives Garvan the flexibility to create complex queries that meet the specific needs of researchers.

EASY MIGRATION TO ASE 15

When Garvan Institute upgraded to ASE 15, the transition process went smoothly.

"With over 30 distinct databases, every single table in ASE is associated with a well-defined script that recreates the table whenever we need to," McBride says. "Over a single weekend, we tested the process using BCP rather than dump-and-restore. We then exported the data, upgraded to ASE 15, recreated all database and imported the data. Our users were never impacted—they logged in that Monday and were able to perform all of their normal functions without a glitch. The entire migration to ASE 15 was completely seamless for us, and transparent to our users."

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McBride added that it helped that his IT staff knew what every table looked like and where the schemas were located that defined each table. "This let us easily export databases, recreate them from scratch, and then re-import them," McBride says. "We know the metadata well, we know where everything was stored and how it was scripted so we could easily create shell scripts."

The upgrade to ASE 15 has allowed Garvan to take advantage of its multi-CPU server so that queries now run faster. ASE 15 also helps IT track down application deadlocks. "We can tell if a particular SQL query caused a problem." McBride says. "ASE 15 truly helps us understand what happens when we troubleshoot an application, and its integrity-checking feature has helped us identify issues before they become problems, which has helped keep our system up and running consistently."

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THE IMPORTANT END RESULTS: HELPING PEOPLE WITH DEBILITATING DISEASES

ASE 15 has become the foundation on which Garvan builds its information architecture for researching cures to debilitating diseases. The organization built one such system about 10 years ago to help with the research of osteoporosis. Garvan collected information from osteoporosis patients and has since followed-up to the present with updates on patient situations every two years.

"We measure the bone density of participants, and we interview them to collect information such as how they are eating and sleeping," McBride says. "We also test their physical strength." With the application Garvan built on Sybase ASE, researchers can input the information to answer detailed questions such as the cost of the osteoporosis disease to a community, the relationship of bone density to muscle strength, and even the propensity of a person to fracture a bone if they fall.

By collecting blood from each participant every two years, Garvan is also able to conduct genetic research to understand the relationship of genes to osteoporosis, which can lead to possible therapies and interventions that mitigate the disease or reduce its impact. "We have researched genes, gene products and the onset of the disease across approximately 7,000 participants," McBride says. "From each visit, we collect approximately 600 data items that go into Sybase ASE." And with the research that has come from the osteoporosis study, Garvan has created an online software program that the worldwide general public can use as a predictor for whether someone is likely to incur a fracture due to osteoporosis.

Another example of how Garvan has used Sybase ASE is the institute's prostate cancer information system. Garvan runs tests on cancerous prostates while also collecting background information on patients, their surgeries, whether chemotherapy or radiation was administered, and the health of patients after their treatment protocol. "The ASE database that we have developed for 10 years has become a useful tool to analyze how a particular gene product impacts prostate tissue," McBride says. "It is also helping us understand how patients respond to chemotherapy versus radiation."

The prostate research tool produced by Garvan has been adopted by a national collaboration research group in Australia, APCC which has adopted the Garvan research tool for information modeling. Four distinct databases are now used to collect information from four states. This brings information on a broader group of cancer patients into one database that researchers nationwide can query. "Collaborating with other states is helpful because the more patients we study, the more reliable the statistical analysis becomes," McBride says. "This leads to a greater likelihood of valid conclusions."

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NEXT STEPS FOR GARVAN INSTITUTE AND SYBASE ASE 15

Looking ahead, Garvan may add a new Sybase ASE 15 database server to manage the institute's testing facility where Garvan tests treatments on various animals, such as mice. Garvan is also getting ready to build new cancer center for day-patient treatment and consulting.

"Having patients nearby will help with long-term research data collection, but the big key is finding a way to integrate information from the patient treatment facility with our existing research facility." McBride says. "Patients will literally be right next door to our researchers, so we also need to bring the information together. Sybase offers the perfect database engine to allow us to do this."

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