Lee Memorial Health Systems:
Increasing Patient Satisfaction &
Growing Margins through Business Intelligence

Executive Summary

As a leading not-for-profit community-owned healthcare provider, one of the primary aims of Lee Memorial Health System (LMHS) is to be a vital asset to the Southwest Florida community by providing high quality, cost effective services. This commitment to community goes beyond the facility's walls and the millions of dollars in uncompensated care that is provided to those unable to pay. To achieve this, senior executives at LMHS have an ongoing initiative to increase patient satisfaction, the key driver of profit margins, enabling them to give back more to their community. By partnering with Dimensional Insight (DI), LMHS is able to:

- Increase patient satisfaction by reducing patient waiting time and providing exceptional nursing care.
- Reduce operating costs by increasing bed utilization, and optimizing labor costs.
- Increase revenues by maximizing reimbursements.
- Continually improve its business efficiency by spending more time on intelligent analysis of data and less time waiting for detailed analysis of summary data.

About Lee Memorial Health System

Lee Memorial Health System (LMHS) runs 3 acute care hospitals comprising nearly 1,000 beds, trauma services, obstetric and children services, physician offices, nursing homes and rehabilitation centers throughout Fort Myers and Cape Coral, Florida. More than 5,700 staff, including 830 physicians provide patient care with the support of 2,500 volunteers and auxiliaries.

LMHS has excelled, winning numerous awards – ranking among the best hospitals in the nation for cardiac, orthopedic, strokes, and obstetrics. But, it does face some unique challenges. For instance, it provides care in one of the fastest growing metropolitan areas in the US[1]. Plus, the region has two other unique patient demographics. Firstly, the population almost doubles in the winter months, due to an influx of retirees and sun-seekers. Secondly, it cares for a larger than average - and growing – fraction of the local population dependent on Medicare, Medicaid, or charity. Consequently, LMHS can only thrive by providing the most cost-effective care and maximizing revenue from reimbursement. Dimensional Insight (DI) enables it to do both.

> "Dimensional Insight will help us make decisions on data that we were never able to get to and never able to see before."
>
> *- Jeff Ward, Manager, General Financial Systems, LMHS*

Why Lee Memorial Needed Dimensional Insight

As a thought-leader in non-profit healthcare in the United States, LMHS is always striving to improve patient care and the operational efficiency of their business. Dimensional Insight enabled this by tapping into years of accumulated clinical and financial data, providing new and timely insights into the operation of the business. Many different applications have been developed by a LMHS/DI partnership to empower executive decision makers.

But, why did LMHS turn to Dimensional Insight? Very simply, no other tool it had found would allow it to get true business information to executive decision makers in real-time – and anything other than real-time is a lost opportunity to grow revenue or manage costs. Like most healthcare providers, Lee Memorial has a large number of disparate IT applications to manage both clinical and business operations, including some of the most popular in the industry:

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[1] Forecast magazine lists Fort Myers-Cape Coral 15th in its "Booming 25" ranking of the 25 fastest growing metro areas through the year 2005. The magazine uses population projections from Woods & Poole Economics, Inc.

• McKesson/HBOC Trendstar™ has been used for cost accounting at Lee Memorial for approximately 15 years. It has provided a very stable and robust system for transaction processing – accumulating a wealth of information on patient stays and treatments that can be used for cost analysis and budgeting. The platform supporting this application is a proprietary database on Open VMS.

• CliniComp™ is the clinical charting system that's been used for acute care on the Cleveland Avenue and HealthPark campuses for 12 years and more recently the Cape Coral campus. Highly configurable and extensible, the system allows clinicians to record an array of detail about any patient condition, virtually any data that they believe may be relevant. CliniComp™ is supported by both proprietary and Oracle databases and the Linux operating system.

• Siemens Invision™, part of the SMS product portfolio acquired by Siemens, is housed on an IBM MVS mainframe with a proprietary database. It supports all patient care functions. Daily downloads are taken from this system to support billing and to track patient movements.

• GEAC Enterprise Solutions™ M Series financials is implemented using VSAM on IBM MVS. This application provides conventional financial applications, such as a general ledger. Summary data from this suite is used for forecasting and planning, plus payroll and human resources applications.

The major data sources that feed into the DI applications are shown in Figure 1.

Figure 1: Major Data Sources at Lee Memorial Health System
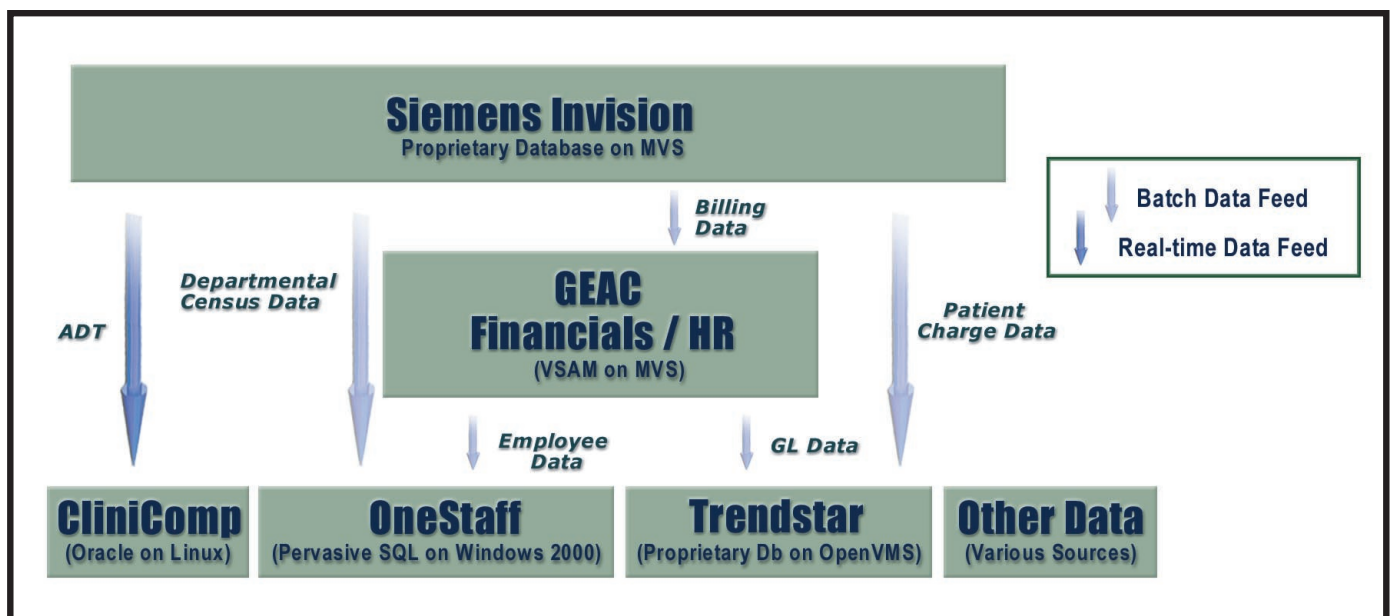
Like many of their peers, LMHS struggled to deliver timely information to decision makers. With over 200 standalone, best-of-breed solutions introduced over many years, distilling the knowledge needed to make strategic business decisions became increasingly difficult. While each individual application may be outstanding at recording the transactions necessary for a given medical or business function, many were conceived before the need to have a truly holistic view of a business was recognized. Many were not designed to share information easily with other applications and are based on several different platforms — including legacy systems such as VSAM and IMS.

In fact, Lee Memorial was so concerned at its inability to garner business intelligence from some operational systems that they were planning to spend several million dollars to replace them. Dimensional Insight has eliminated this capital expense through a key competitive advantage: The ability to weave multiple disparate data sources — from any application or platform — into coherent knowledge to enable executive decision making.

> **"Not only will we get a return on investment on DI, but we hope to get a return on investment from our other operational systems too."**
>
> *- Jeff Ward, Manager, General Financial Systems, LMHS*

The Dimensional Insight Applications

Lee Memorial started building business intelligence applications with Dimensional Insight in November 2002. Numerous applications have already been deployed and some of the most significant are described below.
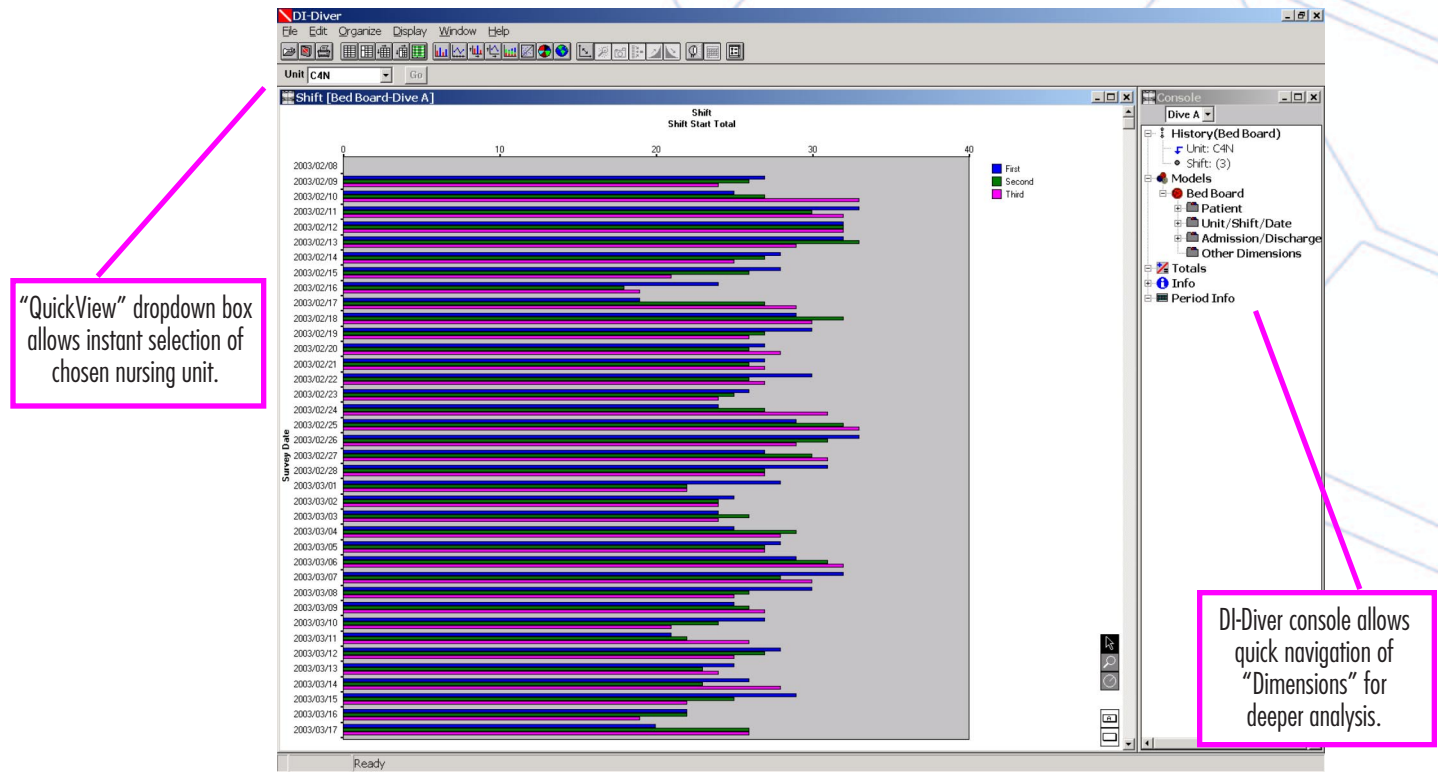
Reducing Operating Costs & Minimizing Capital Expenditure

One high-profile DI application at LMHS is "Bedboard", an executive level view of bed utilization across all 3 acute care hospitals. Adoption of this tool has been driven directly by the VP of Patient Care Services, Davy Crockett, with the objective of maximizing the use of existing facilities — with a resulting reduction in capital expenditure and staffing costs. The data needed to drive this application is sourced primarily from CliniComp™, providing raw data on admissions, discharges, and transfers (ADT). Other data on staffing is sourced from the OneStaff™ staffing and productivity application.

At the highest level, Bedboard provides a summary of bed occupancy at the nursing unit level, showing utilization by shift or by time of day, as well as other metrics. From here, a user can interactively dive through the data, right down to the patient level, identifying who occupied a bed at what time

and accessing all related clinical information. This rich picture is updated 3 times a day. Typically, Bedboard is used by nursing managers, the Vice President of Nursing, and the Chief Nursing Officer - in addition to other administrators and decision support staff. An example from Bedboard data is shown in Figure 2.

Figure 2: Patient Census for Chosen Nursing Unit in "Bedboard"

"QuickView" dropdown box allows instant selection of chosen nursing unit.

DI-Diver console allows quick navigation of "Dimensions" for deeper analysis.

Prior to Bedboard being implemented, optimizing bed utilization was almost impossible. Executives had only a paper report generated from disparate, manually generated data extracted from various sources. By implication, any concerns highlighted in the report have already been ongoing for weeks before being recognized by senior management. Additionally, this report provided no view of utilization across multiple disciplines within an entire hospital. Further, the report was highly summarized — and being paper output, it clearly lacked drill-down functionality to access more detailed data. Hence, if more detailed information were required to investigate any apparent trends or issues, additional projects and reports would be required from the decision support group and nursing staff, incurring days of additional delay.

> "We used to rely on month end reporting that was then loaded into another system to perform analysis. With Dimensional Insight, we can now do the analysis on a real-time basis, not just at month-end."
>
> *- Jeff Ward, Manager, General Financial Systems, LMHS*

In short, decisions on asset optimization were based on old, coarse-grained information. This powerful Dimensional Insight application has, however, taken just a few days work to build and deploy. Yet, executives at LMHS have already gained powerful insights into ways that bed utilization could be tuned by reworking their patient discharge process. With further enhancements planned, it will be possible to obtain real-time snapshots of patient flow throughout the hospital, ensuring that patients are being treated in a timely manner. Not only will this optimize bed usage, but eliminate unnecessary waiting for patients will make a valid contribution to improving patient satisfaction.

> "Dimensional Insight will take the power of information and decentralize it for all departments that need it, without them having to come to decision support to get it."
>
> *- Richard Senicola, Senior Decision Support Analyst, LMHS*

An Executive Dashboard

The Chief Financial Officer and Chief Operating Officer, as well as department directors, all have access to "Daily Monitor", an executive dashboard. Very simply, Daily Monitor pushes the key indicators for the business onto the computers of the most senior executives in LMHS. The key information in Daily Monitor provides both daily and monthly snapshots, including:

- Financial information: Revenue vs. budget - month-to-date, year-to-date, compared to the previous year — for example. Inpatient and outpatient revenue is also reported separately.

- High level performance metrics: Admissions, discharges and transfers, OB days, newborn days, ER admissions, etc.

Previously, reports containing similar summary information were produced daily, with an individual responsible for collating the information and re-entering it into a simple database application. Now, by using DI, LMHS can tap the source data in real-time and upper management will be able to dive into the data at will. As an example, it will be very quick and simple for executives to discover which doctor has admitted the most patients on any given day, using the total number of admissions as the starting point. Further, Dimensional Insight's software has automated the process of updating the reports and posting them to the intranet at LMHS overnight. In this way, new intelligence is immediately available to executives at the start of each business day. The data needed to drive this application is sourced primarily from Siemens Invision™, GEAC Enterprise Solutions™ M Series financials and Microsoft Access™ databases.
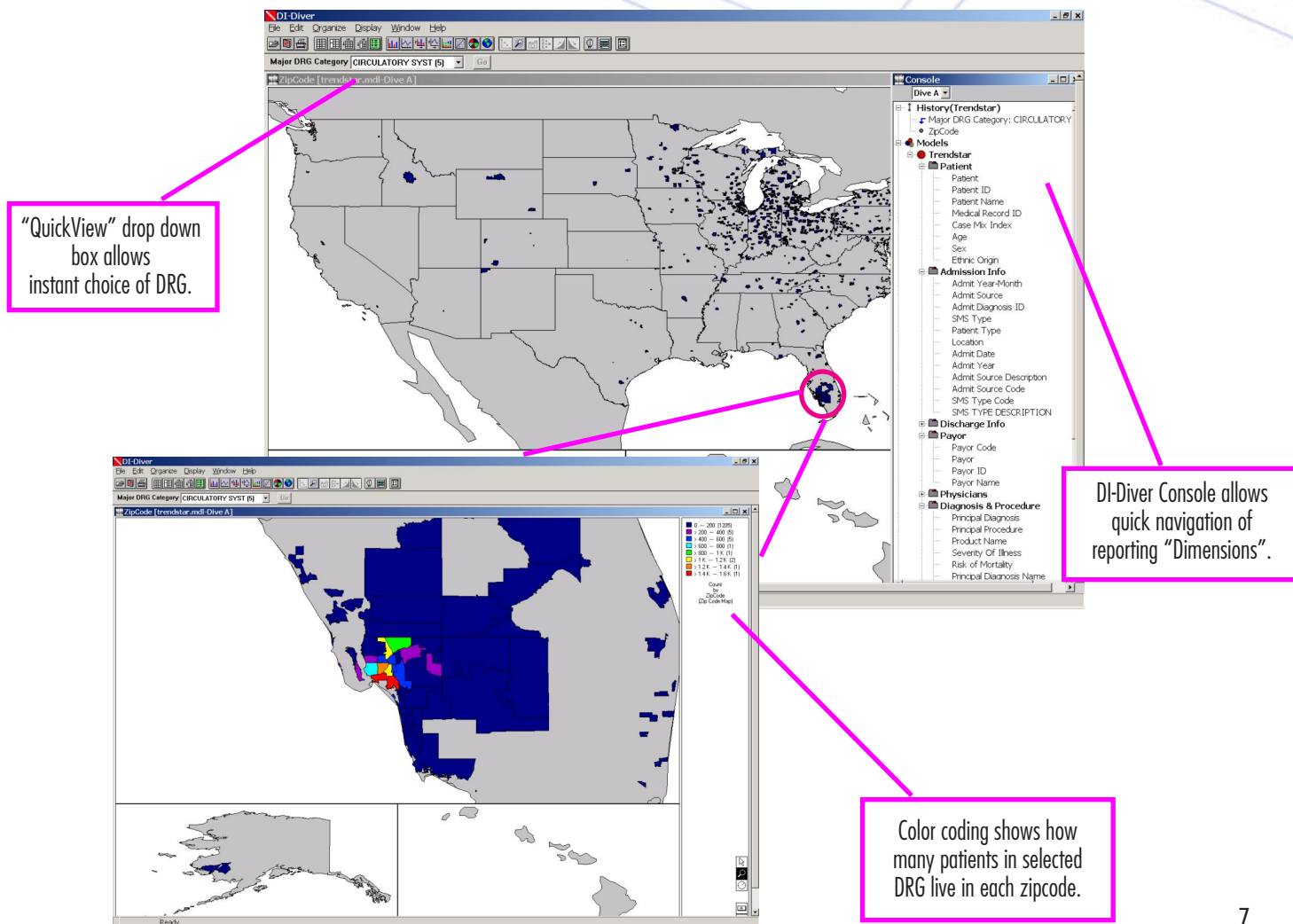
The potential is clear. Without Daily Monitor, executives could not measure or manage financial performance against budget to any degree in real-time, as the reports they used completely lacked the depth and flexibility attainable with DI. Now financial performance can be reviewed daily, enabling immediate corrective action to minimize costs and maximize revenues.

Maximizing Reimbursement Revenues

One project still under development is aimed at growing income by maximizing reimbursement for treatments – while still providing the best possible patient care. Currently, LMHS managers work with reports generated from Trendstar™ to show which treatments were given to specific patients. That treatment data originates from the Siemens Invision™ application and is uploaded into Trendstar™ about 3-4 weeks after month end. With this situation, there is the potential for lost revenue. For example, suppose that a doctor had been prescribing a particular drug for a patient, yet that drug was not eligible for reimbursement by Medicaid (though other similar drugs were). With the current reports, that behavior could continue for as long as eight weeks (6 weeks on average) before it was recognized with the current reporting system.

By using DI's ETL technology, Data Integrator, it will be possible for LMHS to build their first analytical application that directly combines data from both CliniComp™ and Trendstar™. In this way, they will be able to standardize treatment, identifying situations where treatments that are fully reimbursable may be substituted without jeopardizing patient welfare. Ultimately, this application will draw data directly from Siemens Invision™, reducing cycle times still further.

Figure 3: Mapping Patients by Zipcode using Trendstar & CliniComp/GDR

"QuickView" drop down box allows instant choice of DRG.

DI-Diver Console allows quick navigation of reporting "Dimensions".

Color coding shows how many patients in selected DRG live in each zipcode.

Increasing Patient Satisfaction

Dimensional Insight is assisting LMHS to join the Magnet Recognition Program[2] by demonstrating sustained excellence in nursing. By becoming a "nursing magnet", LMHS will be able to reap several mutually-reinforcing benefits:

- Increase patient satisfaction: The Magnet Recognition Program incorporates the highest quality nursing care, rigorously enforced by standards and measurable quality indicators. To date, only 63 hospitals in the United States have attained Magnet status — and those that aspire to it almost inevitable need to improve their standard of care in some way. Raising care quality increases patient satisfaction.

- Attract and retain the very best nursing staff: Increasing patient satisfaction will assist LMHS to face a growing challenge - a shortage of key skilled labor. Nursing magnets are better able to attract and retain the very best nurses. Naturally, a higher quality nursing staff is intrinsically linked to patient satisfaction.

- Increase profit margins: It's been empirically proven that customer satisfaction is directly linked to profitability and return on investment. In addition, knowledgeable consumers will seek out hospitals that have achieved Magnet status, sure in the knowledge that they will receive the finest nursing care. Higher profit margins provide more cash to be reinvested in care facilities and to finance charity care.

DI's initial role in the Magnet Recognition Program is to enable LMHS to report on one of the defined quality indicators, the prevalence of pressure ulcers. To fulfill this quality indicator, Lee Memorial must submit a report once every quarter on the incidence of pressure ulcers within all inpatient facilities. Historically, this has been an incredibly arduous task. On a designated day in the quarter, every patient must be visited and examined for pressure ulcers - that's 700-800 beds all told . For any ulcer found, 10-12 attributes needed to be recorded. Altogether, a very labor intensive — and intrusive — process.

But, surely Lee Memorial routinely logs pressure ulcers in their clinical systems every day? Yes it does — the frustration was, that despite 12 months of trying, it had never been able to extract the data and build the report it needed. The cause of the frustration was the complexity of the data structures created within the clinical recording system. While allowing clinicians the crucial flexibility to record every relevant detail on patients, it also allowed different nursing units to extend the application in different ways. Reporting on that data was problematic, since related data could not easily be pulled together in a systematic way.

Fortunately, Dimensional Insight's Integrator features a powerful set of manipulators to transform data extracted from multiple sources. In this case, the key was to unrotate the source data. Simplistically, this allows a number of records (say 50) to be manipulated into a single record with 50 fields.

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[2] A national nursing recognition program, recognizing quality patient care and nursing excellence, managed by the American Nurses Credentialing Center.

Ultimately, a report that LMHS had been unable to build in a year was constructed using DI's toolset in less than 2 days.

The benefits were immediate. The first time this application was used, it was executed in parallel with the existing reporting method so that results could be validated. As fate would have it, the existing paper report raised concerns about care quality in a particular nursing unit. Ordinarily, this would have required further extensive investigation. However, managers were quickly able to verify the concern using the DI application and then immediately dive down through the data to establish the root cause of the problem.

Figure 4: Ulcer Prevalence by Nursing Unit

DI-Diver Console enables rapid diving for detailed analysis.
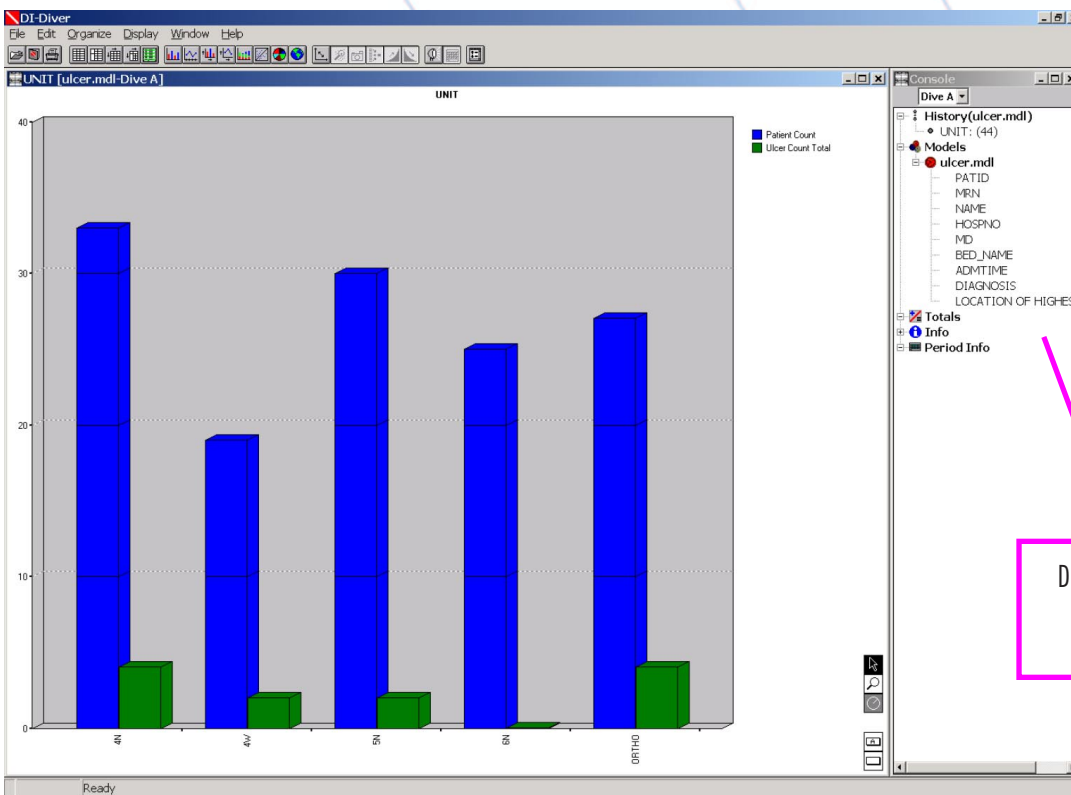
Although the ulcer prevalence report need only be submitted once every quarter for the nursing magnet program, Lee Memorial is so thrilled with how easy DI is to use that it will execute it daily. In this way, staff will be able to identify any potential problems sooner, quickly determine the root cause and take any necessary action. That can only increase patient satisfaction.

> "The bottom line is improving patient care and improving efficiency of patient care. I'm excited that DI-Diver will play a role in that."
>
> - *Barbara Pretasky, Business Systems Analyst, LMHS*

About Dimensional Insight

Established in 1989, Dimensional Insight (DI) is a privately held company specializing in the development and marketing of multidimensional data visualization, analysis, and reporting software. DI's products are designed to enable decision-makers across all levels and functional areas of an organization to access and analyze data quickly and intuitively. Dimensional Insight is privately held and consistently profitable with no debt and no venture capital.

The Dimensional Insight product family provides an integrated data visualization, analysis, and reporting solution that delivers information throughout the enterprise with unparalleled speed, simplicity, and flexibility. Lee Memorial's analytical solutions are built using the DI-Atlantis suite. The dataflows that support the DI applications are shown in figure 5 below.

Figure 5: Major Data Feeds for Dimensional Insight Applications
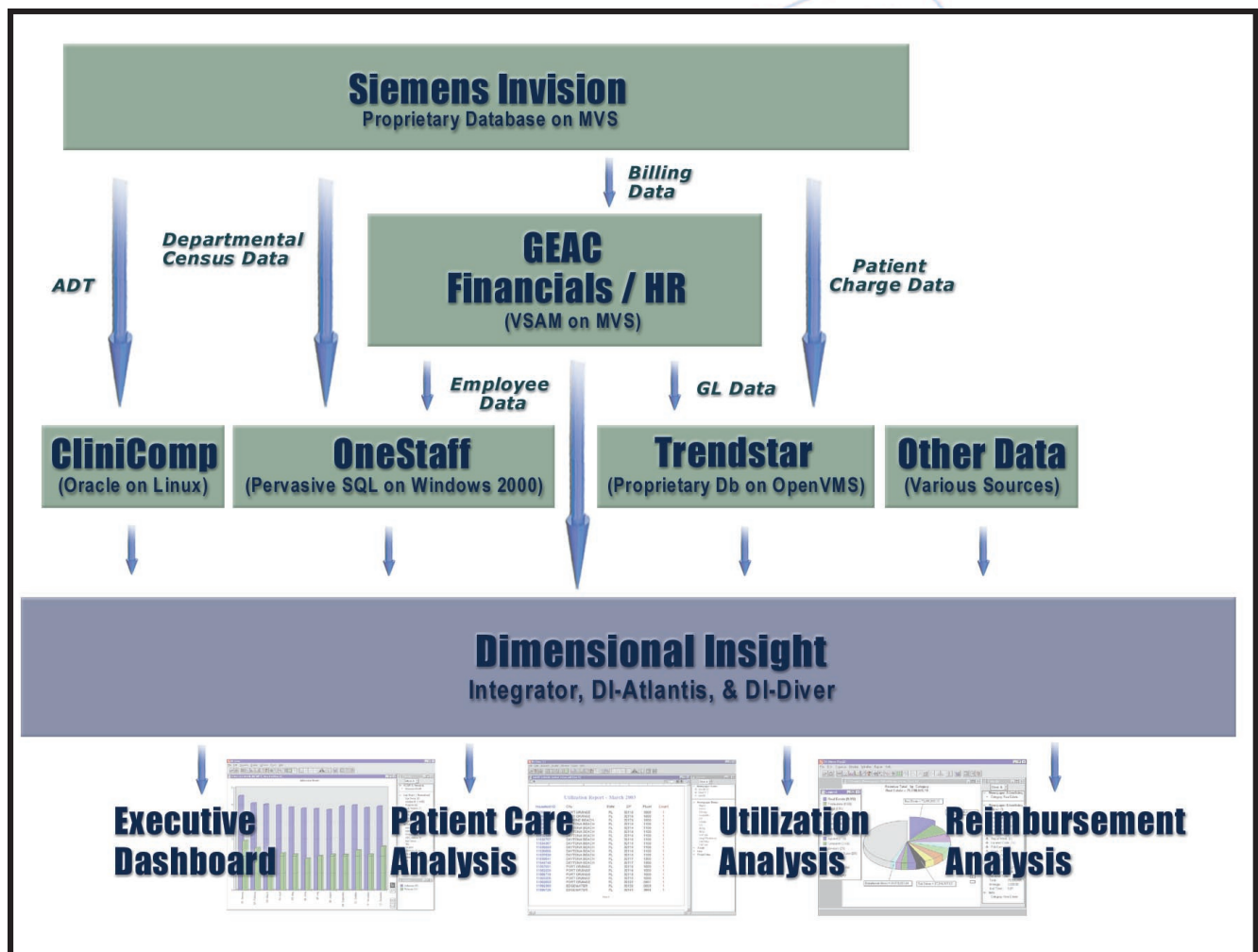
DI-Atlantis is a powerful multidimensional software package designed to transform data for intuitive access and analysis. It consists of the following tools:

- • Builder transforms data into a Model that is accessible by one of the Diver reporting and analytical products, such as DI-ProDiver used by LMHS. The Model has a special, proprietary database structure that allows fast access from a Diver. The Builder transforms the data by summarizing, indexing, and otherwise preprocessing it.

- • Data Integrator is a flexible tool that allows data to be preprocessed before it is used in the Builder. It provides a production environment so that data from various sources can be integrated, manipulated, and automatically fed into the Builder within a schedule that is defined by the user.

- • DI-DiveLine is Dimensional Insight 's high-powered server software component that enables flexible, scalable, centralized administration to diverse groups of users who access company data.

- • DiveMaster is a graphical tool that provides powerful capabilities for the manipulation and combination of existing data Models.

DI-ProDiver serves as the users' interface into the Models constructed by Builder. It allows the user to analyze the Model using several display modes, including tabular, line, bar, and scatter graphs, as well as pie charts and geographic maps. It also contains a fully integrated report writer. The user is able to save views created in DI-ProDiver, and recall those views.

"The biggest reason that Dimensional Insight was a frontrunner is not only the flexibility of the tool, but that the company was very open to suggestions and working with us to get us to the point of being successful with this product."

- Jeff Ward, Manager, General Financial Systems, LMHS