FROM DOCTOR SHOPPING TO DATA WAREHOUSING TO IMPROVE HEALTH OUTCOMES

John Trabinger
Health Insurance Commission.
DISCUSSION

- Health Insurance Commission
- Doctor Shopper Project
- Data Warehouse
- Data Quality Framework
- Dynamic Web Delivery
Health Insurance Commission

- 1974  HIC created to administer Medibank
- 1976  Medibank Private created
- 1984  Responsibilities to administer Medicare
- 1985  Responsibilities for fraud/overservicing
- 1989  Administration of PBS
Health Insurance Commission

- 1994 Commonwealth Childcare Rebate Scheme
- 1996 Australian Childhood Immunisation Register
- 1996 Compensation Case Management System
- 1998 30% rebate for private health insurance
Health Insurance Commission

- Processes over 330 Million transactions each year
- Paying over 9 Billion dollars each year
Health Insurance Commission

- Since 1975
- Processed 7,126,600,000 transactions
- Payed out $112,612,200,000 dollars
Health Insurance Commission’s Purpose

Improving Australia’s health through payments and information
HIC’s Strategy

HIC Mission
“To improve Australia’s health through payments and information”

Role 1
Claims Assessment and Payment Processing

Role 2
Clinical Enablement

Role 3
Health Care Information Provision

Generate automated claims assessment, enquiries, and payment transactions with online capabilities from Role 2.

Establish a trusted environment

Analyse and deliver health care information, and measure benefits.
Doctor Shopper Project

- Commenced 1 January 1997
- Hard-core shoppers are drug dependent
- Aim was to attain improved health outcomes
- UK Dr shopping
Doctor Shopper Project

- 15 or more GPs in a single year
  - More than 30 Medicare consultations
  - More prescriptions than clinically necessary
Doctor Shopper Project

- Most determined shopper
  - 881 doctors in a single year

- Most active 25%
  - see doctors 200 days a year
Doctor Shopper Project

- Just 5,100 doctors
  - write 82% of all Dr shopper scripts
Access of Information

- Real-time data critical
- Dr shopper project teams
- Appropriate decisions essential
- Improve health outcomes
Situation Before DSIMS

- Report generation five to ten working days
- Dissatisfaction by Dr shopper project teams
- Data not current enough
Objective of the DSIMS

- Integrated information
- Produce required reports real-time
- Provide value added reports (MDDB views)
- Evaluate the software
Why DSIMS

• Data the right size
• Good knowledge of existing data
• A view that the SAS software would integrate into current architecture
Piloting the DSIMS

- Project with SAS Institute Australia’s Canberra office
- Software
- Hardware
- Human resource
Structuring the Data

• Majority of time and effort
  – Data extraction (mainframe based)
  – Duplicating what was already there
  – Developing the multiple dimensions
Data on the Server

- Developing the reports with the intranet software relatively simple
- Because of the data pre-processing
- Able to generate geographical dimensions
Satisfied Project teams

- Real-time data
- Current data
- Improved health outcomes
- HR redeployment
Interventions do Work

- Studies show that interventions do work
- Real-time information is crucial
Statistics

- Decrease in Dr shoppers since 1997
  - 5,000

- Savings
  - $12 million
Leveraging DSIMS Data Mart Knowledge
Data Stores

- VSAM, TAPE
- Transaction databases
- Lack of summarised information systems
- Access to data costly and time consuming
Data Quality

• Data quality problems can result from many factors including:
  – data that is fragmented across multiple legacy systems and platforms;
  – extensive data redundancy between different application systems;
  – inflexible IT infrastructures;
Data Quality

• Data quality problems can result from many factors including:
  – inconsistent business rules;
  – lack of corporate data standards;
  and
  – inaccurate processing.
Data Warehouse

“In the context of the HIC, a data warehouse is an organised data store that has consistency, integrity and quality that can be readily accessed by HIC staff and the health sector”.
Data Warehouse

- Aligning information strategies with business strategies
- Iterative approaches
- Data that can be accessed quickly, seamlessly and delivered in the right format and by the right media;
- Data that can be integrated, from both internal and external sources;
Data Warehouse

- Mechanisms that meet HIC security guidelines for storing data;
- An environment that provides flexibility;
- Data that provides historical information;
Data Warehouse

• Data that is accurate and can be validated by a single point of reconciliation (current and up-to-date);
• Information that can be customised to serve customer needs (data marts or customer centric data sets) and;
• Information that will improve health related decision making
HIC5 -OS/390 Server
OS/390 2.5
Web Sphere
TCP/IP 3.4
SAS 6.09 TS470
SAS V8
SAS/IntrNet
SAS/Share
SAS/Connect
SAS/MDDB Server

Mainframe data stays on OS/390 utilising the Performance, Reliability and Scalability that HIC legacy applications enjoy.
1227 MIPS
6 Terabytes DASD
200 Terabytes on Tape

Clients access data from a browser
Dynamic Web Reports
Drill Down
Transparent access to the power of the SAS System on OS/390 when required.

Developers access data via PC SAS or TSO

Internet & Intranet
NT Servers
Prod, Dev & Test
SAS 6.12 & V8
SAS/IntrNet
SAS/Connect
SAS/Warehouse Administrator
SAS Enterprise Miner
SAS AppDev Studio

Client / Developer
Browser
SAS 6.12 & V8
SAS/Connect
TCP/IP
Network Client

LAN File and Print Servers
NT & OS/2
SAS 6.12 & V8
Demonstration...

**Dynamic Web Delivery**


Dynamic reporting with MDDB enhancements available by July 2000
Thankyou
HIC Staff
FROM DOCTOR SHOPPING TO DATA WAREHOUSING TO IMPROVE HEALTH OUTCOMES

Introduction
This paper provides an overview of the work the Health Insurance Commission (HIC) has undertaken over the last two years in the development of web based health information products.

About the Health Insurance Commission
The HIC is a Commonwealth statutory authority, committed to improving Australia's health through payments and information. Working closely with the Commonwealth Department of Health and Aged Care, the HIC has responsibility for administering:

- Medicare (MBS – universal health insurance);
- Pharmaceutical Benefits Scheme (PBS – pharmaceutical subsidy);
- Repatriation Pharmaceutical Benefits Scheme (RPBS – pharmaceutical subsidy for veterans);
- Australian Childhood Immunisation Register (ACIR);
- Commonwealth Childcare Rebate; and
- Federal Government 30% Rebate on private health insurance.

The HIC also manages:

- Practice Incentives Program (provides general practitioners with incentive payments, based on meeting best practice guidelines);
- General Practice Immunisation Incentives Program;
- Compensation Program;
- the processing of claims and payments for Hearing Services Australia; and
- the processing of claims and payments for Veterans’ Affairs Treatment Accounts.

A number of other government functions have been transferred to the HIC because of its proven ability to efficiently administer Australia's universal health scheme. These include:

- maintenance of the Vocational Register of General Practitioners;
- administration associated with the licensing of pathology specimen collection centres and laboratories; and
- administration of various Ministerial and Statutory Committees.
In administering these programs, the HIC has a role in promoting its health information as a resource for the community and health sector, especially in the areas of best practice and better decision making.

**Australian Health Industry overview**

With a declining death rate, increasing life expectancy, and a low rate of life threatening diseases Australia is one of the healthiest countries in the world. The cost of health care is currently running at 8.5% GDP (approximately 48 billion Australian dollars spent annually). Despite this stability there is little disagreement that the Australian healthcare system will over the next 20 years come under significant funding pressure from the increasing costs of technology and the growth in the number of aged people.

Reliable information on the determinants of health, the causes of ill-health, and the patterns and trends of health and illness in populations is critical for developing health information products to help doctors make more informed decisions. Effective health information will also provide consumers with knowledge on treatments and side effects and in particular better knowledge on the state of their own health.

**Doctor Shopping Information Management System**

The HIC’s Doctor Shopping Information Management System is an excellent example of a reliable and accessible health information product.

In early 1997, the HIC began tackling the complex social and medical issue of doctor shopping (*NOTE: In Australia there is no patient enrolment to a specified general practitioner, instead people have complete liberty to choose the general practitioner of their choice*).

The HIC considers doctor shoppers to be those people who in any one year see 15 or more different general practitioners, have 30 or more Medicare consultations and obtain more PBS (government subsidised) prescriptions than appears to be clinically necessary.

Apart from issues of quality use of medicines, doctor shoppers place a cost burden on the Medicare program and the PBS. Also, with prescription drug abuse and trafficking increasing around the world, the social costs to the community are immense.

Many hard-core doctor shoppers in Australia are drug dependent, but it is recognised that a small element obtains drugs to sell.

The figures are startling. Australia’s most determined doctor shopper saw 881 different doctors in a single year. The most active 25 per cent of doctor shoppers see doctors on about 200 days a year, travelling widely and seeing many different practitioners on a single day. A minority of doctors writes the majority of scripts for doctor shoppers, with just 5,110 doctors writing 80 per cent of all doctor shopper scripts. Some 82 per cent of doctor shoppers shop for benzodiazepines, codeine combinations and narcotics.

Visiting many medical practitioners is usually part of a strategy to obtain more PBS medication than any one practitioner will prescribe. With the active support of the wider medical community, the HIC is working to reduce doctor shopping by providing a number of important services for both patients and medical practitioners.
Doctor Shopping Project teams in each state visit medical practitioners and patients to address doctor shopping activities. Through a range of counselling, education and information strategies the HIC Doctor Shopping Project aims to:

- improve health outcomes;
- reduce the number of unnecessary and inappropriate visits to doctors;
- reduce the amount of PBS medications obtained in excess of therapeutic need; and
- refer matters for investigation where there is evidence of criminal activity.

**Data Imperative**

To effectively manage these strategies it is imperative that information is easily accessible and that the required reports are available real-time. Also, the information has to be structured in meaningful ways to assist the doctor shopping project teams in their decision making.

**Situation before the Introduction of SAS/IntrNet and SAS/MDB Server Technology**

The Doctor Shopping Project teams, usually pharmacists, requested particular Doctor Shopper information reports in writing. These requests were sent to the HIC’s central office, where they were responded to in order of priority along with other information requests. More than 15,000 requests for information were received each year. The data was extracted from the HIC mainframe using SAS, both as an extraction tool and data manipulator. The final report was produced and sent to the requestor.

On average the turn around time for the Doctor Shopper information reports was five working days. It has been known, however, for some reports to take up to two weeks to complete, and this was considered unsatisfactory for a project where lives were potentially in danger.

**Requirements for the New System**

The old system was too slow. The Doctor Shopping Project teams complained that delays led to ill-health and even death.

Doctor Shopping Project teams must have the capability to produce the required information real-time. The information is needed to either assist in the rehabilitation of heavy drug users or to identify if there is any illegal activity after the drugs have been supplied to the patient (that is black market trade or overseas drug smuggling).

**Pilot**

Because of unsatisfactory time delays in producing Doctor Shopper reports, a pilot project was developed with the Canberra staff of the SAS Institute Australia. The following SAS software was used:

- Base SAS Software
- SAS/GRAPH Software
- SAS/IntrNet Software
- SAS/ACCESS Software
- SAS/CONNECT Software
- SAS/FSP Software
- SAS/EIS Software
The hardware platform comprised a Pentium II NT 380 Server, with 256 MB of RAM and 20 GB of hard disk. Also included was a PC workstation (clients) for each team member (supporting 25 workstations).

The object of the pilot was to provide an integrated Doctor Shopper Information Management System (DSIMS) that produced the required reports real-time to Doctor Shopper Project teams throughout Australia.

It aimed to minimise waiting times for the reports, (from anything up to two weeks down to as little as 30 seconds), and so improve productivity and health outcomes.

The objectives were to:

- speed up report production;
- minimise waiting time for reports;
- optimise current reports available;
- provide further value added reports using the MDDB viewer to drill down through the data (providing OLAP capabilities).

The DSIMS was a major success. It was found that the right information could now easily be accessed real-time by the doctor shopping project teams, a major productivity process improvement. DSIMS has produced taxpayer savings of $12 million since its introduction, and its contribution to productivity in Australia's public sector was recently recognised by HIC's receipt of a Gold Award at the Government Productivity Awards Ceremony.

Data warehouse
With the success of the DSIMS the HIC has recently embarked on developing further health information products. This has been achieved through the re-construction of its data warehouse.

**In the context of the HIC, a data warehouse is an organised data store that has consistency, integrity and quality that can be readily accessed by HIC staff and the health sector.**

The re-construction work of the HIC data warehouse directly focussed on:

- aligning the data warehouse with the organisation’s health information business strategy;
- utilising a robust architecture; and
- enlisting iterative approaches that emphasise the use of customer centric data sets that can be designed and implemented at a rapid rate for each individual customer.

The data warehouse high level functional requirements were developed in consultation with both internal and external stakeholders. The main requirements have been articulated as follows:
data that can be accessed quickly, seamlessly and delivered in the right format and by the right media (web and non-web);
data that can be integrated, from both internal and external sources;
mechanisms that meet HIC security guidelines for storing data;
an environment that provides flexibility;
data that provides historical information;
data that is accurate and can be validated by a single point of reconciliation (current and up-to-date);
information that can be customised to serve customer needs (data marts or customer centric data sets); and
information that will improve health related decision making

**HIC data stores**
The volume of data that the HIC must manage is growing at an exponential rate. Massive amounts of data are generated (over 330 million transactions each year) from disparate sources throughout the organisation, ranging from the MBS and PBS payment processing systems to computerised human resource management and accounting systems. New types of data such as multimedia and three-dimensional graphics have also altered the way information can be shared and used.

The issue is how well can the HIC harness all this critical information to empower and boost the productivity of its staff and the viability of its future. To ensure a competitive advantage it is crucial that the HIC manages its enterprise data well. Strategically, it is also important to be able to quantify the costs associated with poor quality data and the risks to the organisation of having poor quality data.

**HIC data quality**
As HIC data are integrated from multiple sources and made accessible to business users, their reliability becomes a crucial factor.

Data quality problems can result from many factors including:

- data that are fragmented across multiple legacy systems and platforms;
- extensive data redundancy between different application systems;
- inflexible IT infrastructures;
- inconsistent business rules;
- lack of corporate data standards; and
- inaccurate processing.

**Note:** A data warehouse solution will not fix HIC data problems inherent in the source transaction systems. Therefore, it is important that quality management processes be integrated into the management of the data warehouse solution. In conjunction with the data warehouse project the HIC has also established a data quality project. This project focuses on providing:

- a foundation for a total quality approach to data management that creates a rigorous, structured and repeatable process (data that is reproducible and consistent);
the ability to identify and rectify data quality problems and business rules violations that can be detrimental to “building confidence in the HIC”; and

the empowerment of all HIC staff to audit, monitor, improve and certify data quality at key points throughout the data transaction lifecycle.

Pioneering dynamic information delivery
With the ability to develop customer centric data sets that can be accessed quickly from the data warehouse, the HIC has established the capacity to present this information via the Internet. In fact, the HIC was one of the first organisations in world to use the new SAS Institute dynamic web page technology, which gave clients the ability to customise the information they view and download from the Internet.

The customised data sets have been developed from the data warehouse and the use of the SAS Institute’s multi dimensional database (MDDB). By using an MDDB solution it is possible to store data in hierarchical layers, providing customers with the ability to drill down through different levels of the data and generate reports at any hierarchical level.

In response to client demand, the HIC is working to increase the scope of the dynamic web pages and extending the range of MBS and PBS health information that can be created. The HIC is also looking to create reporting options that will focus on the specific needs of clients such as doctors, pharmacists and health consumers.

The initial development of the DSIMS was deployed on a Pentium II NT 380 Server. However, with the increasing demand for health information, the HIC is in the process of migrating the above software technology to its IBM mainframe web server (Web Sphere). This will provide the necessary processing power required to meet the increased customer demand for health information. The following diagram illustrates the IT infrastructure the HIC has employed.
Mainframe data stays on OS/390 utilising the Performance, Reliability and Scalability that HIC legacy applications enjoy.

Clients access data from a browser
- Dynamic Web Reports
- Drill Down
- Transparent access to the power of the SAS System on OS/390 when required.

Developers access data via PC SAS or TSO

Internet & Intranet
- NT Servers
  - Prod, Dev & Test
  - SAS 6.12 & V8
  - SAS/IntrNet
  - SASConnect

SAS/Warehouse Administrator
SAS/Data Miner
SAS/Appdev Studio

Client / Developer
- Browser
  - SAS 6.12 & V8
  - SAS/Connect
  - TCP/IP
  - Network Client

LAN File and Print Servers
- NT & OS2
  - SAS 6.12 & V8

HIC5 - OS/390 Server
- OS/390 2.5
- Web Sphere
- TCP/IP 3.4
- SAS 6.09 TS470
- SAS V8
- SAS/IntrNet
- SAS/Share
- SASConnect
- SAS/MDDDB
Publishing HIC Statistics via Dynamic Information Delivery

The deployment of health information using dynamic web page technology will play a valuable role by helping:

- consumers of health services to make their own decisions;
- doctors make decisions in consultation with consumers of health services;
- researchers evaluate treatments or therapies; and
- policy makers assess initiatives to improve Australia’s health.

Currently dynamic web pages deliver customisable statistical reports relating to programs the HIC administers. From the HIC web site, users can generate statistical reports and charts online, using aggregated data from either the MBS, the PBS or the RPBS.

Users can customise both the content and the format of their reports. The online charting facility means that trends in data can easily be identified, and if necessary, data can be downloaded into a spreadsheet and further analysed. While these pages are publicly available, they are of particular use to health professionals, researchers and journalists.

The HIC introduced its first dynamic web pages in October 1999, and they have been extremely popular. To date, over 7000 reports have been generated.

Many clients are now able to rapidly produce statistical reports without needing to make a formal request. Alternatively, clients can use the dynamic web pages to explore data online before requesting more complex reports (See attachment 1, depicting a screen snapshot of a dynamic information report).

Health information reports are also available through the HIC Internet Feedback Reporting Facility. This facility allows GPs to confidentially access their MBS and PBS service utilisation profile, and compare this against the profiles of providers in similar geographic areas (See attachment 2, depicting a screen snapshot of a feedback reporting facility graphical report).


The HIC Internet Feedback Reporting Facility is available at www1.hic.gov.au/general/prdfiprghome

**Conclusion**

The HIC has a major role in providing health information to the Australian community and health sector and will continue to work with organisations such as the SAS Institute to develop effective and innovative methods of storing, accessing, and presenting its health information.
Attachment 1  A screen snapshot of a dynamic information report

<table>
<thead>
<tr>
<th>Item</th>
<th>NSW</th>
<th>VIC</th>
<th>QLD</th>
<th>SA</th>
<th>WA</th>
<th>TAS</th>
<th>ACT</th>
<th>NT</th>
<th>Total Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>25,794,795</td>
<td>18,238,958</td>
<td>13,871,453</td>
<td>6,151,043</td>
<td>6,558,540</td>
<td>1,729,735</td>
<td>1,094,267</td>
<td>398,913</td>
<td>74,826,615</td>
</tr>
</tbody>
</table>

- This page is best printed in landscape mode.
- The figures in the report include only those services that are performed by a registered provider, for services that qualify for Medicare Benefit and for which a claim has been processed by the HIC. They do not include services provided by hospital doctors to public patients in public hospitals or services that qualify for a benefit under the Department of Veteran’s Affairs National Treatment Account.
- Services per capita (ie. per 100,000 population) is calculated by dividing the number of services processed in a month by the number of people enrolled in Medicare at the end of that month.
- State/Territory is determined according to the address (at the time of claiming) of the patient to whom the service was rendered.
Attachment 2          Screen snap shot of the feedback reporting facility graph

Pathology Services per Patient
Remote Centre

Total Services per Patient
Remote Centre

1 January 1998 to 31 December 1998