Data Quality Evaluation of the Canadian Joint Replacement Registry (CJRR)

Fiscal 2004–2005 Data

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Introduction

This document describes the assessment of the Canadian Joint Replacement Registry's (CJRR) operations and database, for 2004–2005, against the CIHI Data Quality (DQ) Framework. The purpose of the CIHI DQ Framework is to systematically assess, improve and document the status of data quality as per the five dimensions of DQ. These five dimensions include—accuracy, timeliness, comparability, usability and relevance. The byproduct of this assessment is two fold: to highlight the strengths—i.e. processes that work well and to identify areas of opportunities in order to improve existing practices. This assessment also includes a number of recommendations for each characteristic that CJRR will, in future, or is currently striving to implement.

The CJRR is part of the Clinical Registries department of the Health Services Information. The CJRR is a national registry that collects clinical, demographic and administrative information on hip and knee replacement procedures performed in Canada.

For the purpose of this assessment, from CJRR, hip and knee replacement procedures conducted on patients in 2004–2005 were selected based on surgery date (in those cases where surgery date was not available, admission date was used to supply the missing information).

Structure of the Canadian Joint Replacement Registry

Background

The CJRR database is comprised of Oracle data sets that supports electronic and manual data entry submission. Paper forms are entered, via an internal web-based interface, directly into the database by the CJRR data entry staff at CIHI offices in Toronto.

Collection

Orthopedic surgeons submit information on a voluntary basis, with explicit consent obtained from each patient prior to, or at the time of surgery. Patient consent is mandatory for submission to the CJRR—if patient consent is not completed, patient and procedure data is not captured in CJRR.

In fiscal year 2004–2005, the CJRR supported two different modes of data submission:

- Paper forms from surgeons and facilities.
- Electronic submission from facilities and provincial registries.

Dissemination

An annual report produced by the CJRR, provides epidemiological, clinical and surgical analyses on hip and knee replacements conducted in Canada. Analysis in Brief provides further analysis on focused theme within the context of joint replacements. The registry also responds to both internal and external ad hoc requests from CIHI departments, participating surgeons, government, researchers and the general public. These ad hoc requests require conducting new analyses on surgical or clinical data. Data requests are fulfilled by generating aggregate level data and/or graphical summaries, or by record-level data extractions.

Users

Primary users of CJRR data include orthopedic surgeons, health policy makers, CJRR Advisory Committee members and health care administrators. Secondary users include allied health care clinicians, researchers and the general public.

Data Quality Assessment

1. Accuracy Dimension

1.1 Coverage

The CJRR spans its data collection across Canada for all hip and knee joint replacements. For the purpose of this DQ framework assessment, data for 2004–2005 is evaluated. The population of interest is stated in the methodology section of the 2006 CJRR annual report as well as in all releases such as the COA bulletin, data requests, analysis in brief, and poster presentations from CJRR.

For the CJRR, coverage is defined in two ways:

A. The percentage of all hip and knee replacements performed in Canada during the reporting period, compared to those that were actually submitted to the CJRR.

B. The percentage of surgeon participation in the CJRR compared to all eligible surgeons (i.e. active or practicing) performing hip and knee replacement procedures.

Coverage of Hip and Knee Replacement Procedures

Over Coverage of Hip and Knee Replacement Procedures

In terms of hip and knee replacement procedures reported to CJRR, there is a potential for over-coverage due to duplication in the CJRR data sets.

For both paper and electronic data submissions, duplicate records were identified if there was identical information for example, joint type, hospital province, provincial health card number, gender, birth date, surgery date and or admission date, type of replacement and side location of joint replacement, etc.

Table 1 shows the overall percentage (0.12%) of duplicate records for both hip and knee procedures during 2004–2005 in the CJRR. For the electronic submissions data, the overall percentage of duplicates was 0.17%, which is significantly lower than the 0.53% in the previous year. For the data submitted in paper format, the overall percentage of duplicates dropped from 0.23% to 0.08%.

Table 1. Number of Duplicate Records in CJRR 2004–2005 Data Set by Source of Submissions

A. Hip Replacement Procedures				
Source	**Total Number of Submissions**	**Number of Duplicates**	**% Duplicates in 2004–2005 Data**	**% Duplicates in 2003–2004 Data**
e-submissions	6,107	13	0.21%	0.62%
Paper	8,202	6	0.07%	0.21%
B. Knee Replacement Procedures				
Source	**Total Number of Submissions**	**Number of Duplicates**	**% Duplicates in 2004–2005 Data**	**% Duplicates in 2003–2004 Data**
e-submissions	8,505	12	0.14%	0.45%
Paper	10,366	9	0.09%	0.24%
C. All Replacement Procedures				
Source	**Total Number of Submissions**	**Number of Duplicates**	**% Duplicates in 2004–2005 Data**	**% Duplicates in 2003–2004 Data**
e-submissions	14,612	25	0.17%	0.53%
Paper	18,568	15	0.08%	0.23%
Total	**33,180**	**40**	**0.12%**	**0.35%**

Recommendations

- Duplicate records in the 2004–2005 data set were investigated and removed.
- The CJRR system should routinely identify potential duplicate records in the database. Routine identification and prevention of duplicates was facilitated with implementation of edit checks in the new relational CJRR database.

Under Coverage of Hip and Knee Replacement Procedures

Patient information in CJRR is based on voluntary submission by CJRR participating orthopedic surgeons. All Canadian active orthopedic surgeons are not CJRR participants. As well, some participating surgeons may not submit information on all performed surgeries because of missing patient consent. Hence, all performed joint replacement surgeries are not represented in the CJRR.

Although increase in surgeon participation rate in CJRR is relatively steady, discrepancy remains between the numbers of procedures performed across Canada and the number of procedures actually reported to CJRR. This discrepancy is illustrated through comparisons of reported procedures in the Hospital Morbidity Database (HMDB) to CJRR.

Tables 2 and 3 compare overall capture of the hip and knee joint replacement procedures for 2004–2005, between the HMDB and CJRR at provincial levels. The HMDB contains all hip and knee replacement procedures performed at acute care facilities across Canada (but excludes those done in private institutions). Counts for CJRR are done by surgery date while counts for HMDB are done by admission date. Also, in CJRR procedures are reported by province where the surgery was performed, while in HMDB, procedures are reported by the patient's province of residence.

The comparative analysis shows evidence of under coverage in CJRR—43% for hip replacements and 44% for knee replacements.

Table 2. Compares Numbers of Hip Replacements in CJRR and HMDB by Province* in 2004–2005

Province	Number of Hip Replacements in CJRR	Number of Hip Replacements in HMDB	Hip in CJRR as % of HMDB
Newfoundland and Labrador	140	319	43.89%
Prince Edward Island	1	148	0.68%
Nova Scotia	1,003	907	110.58%
New Brunswick†	525	537	97.77%
Quebec	1,705	4,129	41.29%
Ontario	5,547	10,711	51.79%
Manitoba	782	928	84.27%
Saskatchewan	797	976	81.66%
Alberta	1,671	2,481	67.35%
British Columbia	2,113	3,906	54.10%
Territories and Yukon	23	51	45.10%
Canada‡	**14,307**	**25,124**	**56.95%**

* Counts in CJRR are based on the province where the procedure was performed. Counts in HMDB are based on the patient's province of residence.
† One region in 2004 New Brunswick data was excluded due to missing data submission.
‡ National counts include the procedures excluded from New Brunswick.

Table 3. Compares Numbers of Knee Replacements in CJRR and HMDB by Province* in 2004–2005

Province	Number of Knee Replacements in CJRR	Number of Knee Replacements in HMDB	Knee in CJRR as % of HMDB
Newfoundland and Labrador	248	410	60.49%
Prince Edward Island	–	176	0.00%
Nova Scotia	1,152	1,214	94.89%
New Brunswick†	829	820	101.10%
Quebec	1,965	5,123	38.36%
Ontario	8,237	15,085	54.60%
Manitoba	1,022	1,271	80.41%
Saskatchewan	1,264	1,435	88.08%
Alberta	1,944	3,119	62.33%
British Columbia	2,173	4,828	45.01%
Territories and Yukon	37	76	48.68%
Canada‡	**18,871**	**33,590**	**56.18%**

* Counts in CJRR are based on the province where the procedure was performed. Counts in HMDB are based on the patient's province of residence.
† One region in 2004 New Brunswick data was excluded due to missing data submission.
‡ National counts include the procedures excluded from New Brunswick.

Recommendations

- Continue annual comparative analysis between CJRR and HMDB.
- Continue efforts to increase surgeon participation and reporting of all procedures in CJRR.

Over Coverage of Surgeons

In the CJRR, over-coverage of surgeons is less of a concern, as all participating CJRR surgeons are included in the population of reference. The likelihood of a non-practicing surgeon (i.e. not performing surgeries) to report information to the CJRR is non-existent.

The CJRR maintains a master list of all participating and non-participating CJRR surgeons who perform hip and knee replacements annually. Surgeons who have moved to another country, retired, or have ceased to perform hip and knee replacements are tracked as well.

For the purpose of accuracy, the CJRR Advisory Committee provincial representatives and site leaders are consulted on the master list.

Recommendation

- Maintain tracking practices to ensure all non-participating surgeons are recruited in a timely manner.

With the availability of relevant information to CJRR, HMDB is recognized as an external database for comparative analysis. Comparative analysis between the CJRR and HMDB is done annually. Another opportunity may be to explore comparative analysis with selective provincial ministries that collect comparable information to CJRR.

Recommendation

- Explore opportunities to perform comparative analysis with provincial ministries that collect comparable information to CJRR to ascertain enhancement opportunities to the CJRR frame.

1.2 Capture and Collection

The following procedures and practices exist to minimize response burden:

Paper forms

- CJRR staff provides client support and advice regarding paper form submissions on an ongoing basis.
- Pre-paid/self-addressed express mail envelopes are supplied to participating surgeons to facilitate the return of completed data collection forms in a secure manner.

Electronic submission

- CJRR releases updated e-submission specification documents annually, which include changes to database structure or to manual forms.

Recommendations

- Update electronic submission specifications and hold external vendor meeting to review revised and proposed specifications annually.
- Explore the implementation of web-based data submission application to promote paperless participation and minimize response burden.
- Investigate a potential of acquiring a confidential fax line for paper forms transaction.
- Publish quarterly updates containing information on CJRR operations and activities including information on paper form submissions to facilitate data submission processes. This was implemented in November 2006.
- Implement edit checks to reflect selection of mandatory data to ensure data completion.

The following practices exist to supports participation from orthopedic surgeons:

- CJRR, in collaboration with the Royal College of Physician and Surgeons of Canada, offers CJRR participating surgeons professional credits (1 credit for the submission of 6 records) each calendar year.
- CJRR releases analytical products that demonstrates CJRR value and encourages continued support for CJRR participation.

- CJRR presents at the Canadian Orthopedic Association (COA) and provincial Orthopedic sponsored conferences to encourage eligible non-participating CJRR surgeons to sign-up with the registry.
- CJRR collaborates with the Advisory Committee members and fosters consensus building on strategies and new business.
- CJRR-sponsors Research and Development meetings, twice per year, to discuss improvements in the CJRR, answer questions related to analysis and potential analytic areas of focus.
- CJRR-disseminates analytical reports and bulletins at no cost to participating surgeons.
- CJRR responds to ad hoc data requests and report requests for the purposes of research and presentations at professional conferences and symposia in a timely manner.
- CJRR complies with the CIHI privacy and confidentiality policy and procedures to assure stakeholders that privacy and confidentiality is practiced.

Within the constraints of privacy and confidentiality guidelines, surgeons may request a return of their own submitted data to assist with reviews of their surgical practices.

Recommendation

- Continue collaborative efforts to maintain ongoing rapport with external stakeholders, and comply with the CIHI privacy and confidentiality guidelines.

In order to give support to our data suppliers, the following practices exists:

- Provide contact information and e-mail addresses of key registry support staff via external documents and the Internet.
- Administrative support for manual data submission, advice on completion of data collection forms and supply of pre-paid return envelops.
- CIHI and CJRR staff provide client/vendor support for electronic submission.

The CJRR staff addressed ad-hoc requests from participating surgeons or data suppliers via centralized email; the turnaround time for response is 48 hours.

The following data submission forms and procedures existed in 2004–2005.

- The 2003 version of the hip and knee data collection forms were used during fiscal 2004–2005.
- The 2004–2005 version of the electronic data submission specifications were released electronically.
- Standard processes exist for all provinces for manually sorting, storing and entering data collection forms.

The following data quality control measures existed for the 2004–2005 CJRR data set.

- The CJRR data entry application program incorporated logic intelligence to assess completeness.
- For records that showed failing edit checks, appropriate comments are attached to respective records and logged for future reference for quality control purposes such as identification of missing fields (termed incomplete) versus non-missing fields (termed final).

For manual data entry, verification was done on approximately 80% of the data. The CJRR does not hold unique surgeon identifying number. Hence, an area of opportunity is to structure surgeon names by assigning unique identifiers in the database system in order to automate capturing and correction of duplicate names or misspelled names of surgeon. In 2004–2005, manual screening was done to identify duplicates or misspellings; surgeon names for most of these cases were corrected.

Recommendations

- Build a method that automates assignment of a unique surgeon identifier. This method has been implemented in the CJRR 2005–2006 database.
- Develop robust edit checks to ensure permeation of only valid data in the database and to ensure timely correction of errors by the providers. This feature has been implemented into the new CJRR system and will significantly increase data quality for CJRR on a go-forward basis.

1.3 Unit Non-Response

In relation to CJRR, unit non-response is defined as the number of CJRR participating surgeons in 2004–2005 who submitted data (the numerator) divided by the number of surgeons who signed up to participate (the denominator).

Table 4 shows estimates of the response rate among participating surgeons in 2004–2005. The overall response rate was 70% and non-response rate was 30% for all provinces; this has been documented in the CJRR 2006 annual report.

Table 4. Response Rate by Province for Hip and Knee Replacement Procedures

Province	Submitting Surgeons	All Registered Surgeons	Response Rate
British Columbia	58	97	60
Alberta	47	54	87
Saskatchewan	23	25	92
Manitoba	22	24	92
Ontario	195	241	81
Quebec	85	193	44
New Brunswick	27	27	100
Nova Scotia	27	27	100
Prince Edward Island	1	3	33
Newfoundland and Labrador	12	15	80
Northwest Territories	2	2	100
Total	**499**	**708**	**70**

Primary CJRR data suppliers are the orthopedic surgeons, followed by clinical institutions and ministries.

- Data collection forms, received from surgeons, were checked regularly for invalid or missing values (for e.g. patient consent) and follow-up was done monthly to correct inconsistencies in reporting. Invalid or missing values in the paper forms were manually tracked by CJRR quality assurance staff, while SAS program was used for detection and monitoring of anomalies in the electronic submitted data.
- Since "date of submission" is not captured electronically, tracking of submitted forms is done manually. The following were tracked on a monthly basis:
  - Total number of forms submitted to the CJRR by surgeon.
  - The total number of forms received with incomplete patient consent. (Submitted forms with missing consent are returned to surgeons for completion).
  - The number of forms that were returned to surgeons, as well as those that were corrected and returned.
  - The total numbers of forms that were received with patient consent refusals.

Recommendation

➢ Automate tracking of monthly submissions by surgeons and by provinces.

1.4 Item (Partial) Non-Response

For *item non-response* in CJRR, the following was considered:

- Where surgery dates were missing, the admission date, if available, was used for analysis.
- Values of "2", "N" or blank were considered as valid and used as "no" answers. Thus, it is impossible to differentiate between a non-response and a "no" answer.

Tables 5 and 6 show the distribution of non-response fields—64% of the items had response rates of >95% and 36% had response rates of <95%.

Table 5. Percentage of Response for Items in the 2004–2005 Data Set for Hip Joint Replacements

% Response	Number of Items	% of Total Number of Items
>99%	5	6%
96–99%	45	58%
90–95%	11	14%
86–89%	3	4%
80–85%	2	3%
<80%	11	14%
Total	**77**	**100%**

Table 6. Percentage of Response for Items in the 2004–2005 Data Set for Knee Joint Replacements

% Response	Number of Items	% of Total Number of Items
>99%	5	6%
96–99%	45	58%
90–95%	2	3%
86–89%	3	4%
80–85%	3	4%
<80%	19	25%
Total	**77**	**100%**

Recommendations

- Educate stakeholders on the importance of completing CJRR joint replacement forms thus influencing increase in item response rate.
- Implement built-in edit checks to ensure completion of the mandatory fields.

1.5 Measurement Error

In preparation for the 2006 CJRR annual report, various variables were investigated for validity. Several types of errors were identified through this investigation and these include:

- Disarray in chronological order with surgery and admission date.
- Use of non-standardized date formats with items such as birth, surgery and admission dates. This resulted in difficulty in deciphering between month, day and year.
- Inconsistency with spelling of surgeon's first and last name routinely. SAS code was used to detect misspelling and enable corrections. Often the logic intelligence built in the CJRR system accepted invalid variables.
- Estimated overall error rate is 15%.

Recommendations

- Enhance SAS code for edit checks and activate it in the application at point of data entry (manually or electronic submissions).
- Implement edit checks around chronological sequence to ensure surgery date follow admission date.
- Ensure format alignment between e-submission specifications and the paper form layout. Relevant modifications made for 2005–2006 data submissions.

Date of birth and number of cases reported by province in the CJRR versus the HMDB was examined to gauge a level of bias in the CJRR data set. These two variables were picked because misreporting of age (month or date of birth can be displaced) or number of cases by province (case may be reported by postal code for patience residence instead of for hospital) may influence interpretation of analytical findings.

Table 7 illustrates the potential bias in the CJRR data when compared to HMDB data. For example, P.E.I. has one record in CJRR as opposed to 324 in HMDB.

Furthermore, counts for Ontario and Quebec raise questions as well. Therefore, bias cannot be ruled out because the reporting criteria for postal code in CJRR and HMDB are different.

Table 7. Number of Hip and Knee Replacements Reported in CJRR vs. HMDB* (2004–2005)

Province	Hip and Knee Replacements in CJRR	Hip and Knee Replacements in HMDB	Reporting in CJRR vs. HMDB (%)
Newfoundland and Labrador	388	729	53.2
Prince Edward Island	1	324	0.31
Nova Scotia	2,155	2,121	101.6
New Brunswick†	1,354	1,357	99.8
Quebec	3,670	9,252	39.7
Ontario	13,784	25,796	53.4
Manitoba	1,804	2,199	82.0
Saskatchewan	2,061	2,411	85.5
Alberta	3,615	5,600	64.5
British Columbia	4,286	8,734	49.1
Territories and Yukon	60	127	47.2
Canada‡	33,178	58,714	56.5

* Counts in CJRR are based on the province where the procedure was performed. Counts in HMDB are based on the patient's province of residence.
† One region in New Brunswick was excluded due to missing data submissions.
‡ National counts include the procedures excluded from New Brunswick.

Recommendations

- Explore the feasibility of conducting a re-abstraction study.
- Develop a manual of standards to define context for all CJRR data elements.
- Educate stakeholders on formats for data submission and emphasize standard approach to date of birth reporting.

There may be some degree of inconsistency, for example, in what is considered as a revision procedure by one surgeon may be considered as a simple repair by another reporting surgeon. Another example is reporting of primary versus secondary diagnosis in the CJRR. The opportunity is to emphasize reporting of only Primary diagnosis. Inconsistencies may also occur due to differences in defining techniques or procedures (e.g. defining minimally invasive surgery in relation to body size or defining a procedure as bilateral when performed under one anesthesia or during one hospitalization, add component story).

Recommendations

- Consult with the advisory and research and development committee members to define common techniques and procedures used for hip and knee replacements to reduce inconsistency in reporting (from surgeons).
- Define reporting of variables clearly and publish a standard CJRR manual.
- Examine retrospective records by procedures or by primary diagnosis to assess consistency in use of definition. CJRR manual will have standard definitions of variables.

1.6 Edit and Imputation

All variables in the data captured in the 2004–2005 data set have been subjected to the CJRR database logical, range, and consistency checks.

All the core (mandatory) variables in the 2004–2005 data set were checked for validity using SAS programs, before they were used for any analyses, such as the 2006 annual report.

Prior to analysis, additional logical edits and imputation functions were executed in SAS code to correct for some of the errors. These were only temporary imputations and relating to:

- Incorrectly classified records according to hospital province, hospital institution and submitting surgeons.
- Inconsistent surgeon names.
- Missing or inconsistent admission dates.
- Records with admission dates or surgery dates not in chronological order.

Recommendation

- Make the temporary imputations permanent and apply to CJRR data during the historical migration phase of the CJRR Expansion project.

Results from edit checks are stored in the free form text "comments" field of each record, making it neither simple nor convenient to assess the precise status of an individual record or to perform error analysis by using searches or queries on the "comments" field.

Around 74% of the records in the 2004–2005 data set are classified as draft or incomplete.

Recommendations

- Produce more readable and accessible edit reports for internal and external use.
- Create SAS programs to enable calculation and reporting of item non-response rates specific to CJRR data elements, and to support future data quality assessments.

Prior to any data analyses, all editing and temporary imputations were conducted on 2004–2005 data sets through SAS codes.

1.7 Estimation and Processing

- A data entry manual has been prepared for internal use only.
- A master list is maintained housing information on surgeons' participation as well as their data submission.
- Electronic data submission specification documents are updated every year for the process of electronic data transfer.
- All the technical notes related to query and programming issues are documented every year.
- All edits, imputations and revisions applicable to the 2004–2005 data set are maintained in SAS programs. These programs indicate the objectives, directory of the programs, data source used for the programs, criteria used in the programs and the reasons why the programs are modified or updated.
- Documentation of data validation and logical edit checks for 2004–2005 data sets have been prepared and maintained in the CJRR network common drive.
- Data dictionary is available, starting from 2002–2003, for CJRR hip and knee data sets.

The data for 2004–2005 was closed in February 2005 and verified for quality assurance. The modifications were documented.

- The raw data submitted electronically by participating institutions, are saved in Oracle data sets on CIHI's Oracle server.
- Rights to amend or delete records are restricted to the CIHI Information Technology Operations department staff only.
- The 2004–2005 SAS data subset, which was used for CJRR 2006 annual report, has been saved as a permanent SAS data file in the CJRR common directory.
- Access to the CJRR common directory is restricted to department managers and CJRR staff only.

CJRR analytical work does not require studying of specific sample sizes. Rather the analysis is very descriptive in nature. However, the challenge remains with measuring representation of CJRR data in terms of all the hip and knee joint replacement procedures conducted in Canada.

Recommendation

- ➢ Establish a standard process for the verification of data collection forms, for the purpose of quality assurance.

2. Timeliness Dimension

2.1 Data Currency at the Time of Release

CJRR annual analytical report presents information retrospectively. For example, the 2006 CJRR annual report was released to external users in October 2006 and the reference period (for data) is 2004–2005. Reporting in delay of one year is reflective of the availability of the HMDB data set. According to CIHI Data Quality Framework, a one-year delay is considered reasonable.

The official date of release was announced in advance of the release on October 25, 2006.

The official (final) date of release was met and accompanied by a media release on October 25, 2006.

For the 2004–2005 CJRR database, three new variables were added. These included: submission date (hip and knee forms), Tibial monoblock (knee form) and modular femoral stems (hip form). These were included to improve efficiency for assigning CPD credits and for evaluating use of new medical technologies.

Recommendations

- A cut-off date for all paper form submissions must be strictly enforced to avoid delays for data preparation for the annual report.
- Develop features to assist with data entry process, and facilitate data quality checks and analysis.

2.2 Documentation Currency

The 2006 CJRR annual report contained detail level of methodological notes (including data limitations) for both data sources: the Hospital Morbidity Database and the CJRR database.

There was a two-month delay in releasing the CJRR 2006 annual report. Factors contributing to the delay were uncontrollable due to unavailability of the complete set of HMDB.

The analytical bulletin was released as per schedule.

Recommendations

- Use DAD data set to run preliminary analysis and append provincial analysis for Quebec when HMDB is available.
- Mitigate any potential risks associated with production cycle.

3. Comparability Dimension

3.1 Data Dictionary Standards

Since CIHI's data dictionary pilot study is still in progress, there were no data dictionary standards available for conducting comparisons with CJRR data elements.

3.2 Standardization

In the CJRR database, demographic, clinical and surgical information are captured at the finest level of detail as is practical and appropriate to the registries' user needs.

Demographic data captured include:

- Date of birth
- Patient's first, middle and last names
- Patient's home postal code
- Hospital name and hospital institution number

Clinical and surgical details of the procedures include:

- Admission and surgery date
- Diagnoses
- Surgical approaches
- Details on the surgical components used

Consultations are held periodically with the advisory committee members to improve clinical data capture, and to record all relevant information regarding hip and knee replacement procedures.

There are no derived variables in the CJRR Oracle data set. However, for analytical purposes, variables are manipulated using SAS programming. The derived variables created in SAS data sets include:

- Age (using date of birth and surgery or admission date)
- Fiscal year (using surgery date or admission date)
- Source (to indicate paper or electronic submission)
- Joint (hip or knee, in case of a combined data set)
- Body Mass Index (BMI derived using patient's height and weight information)

The original variables, such as the date of birth, the surgery and admission dates, and patient's height and weight are maintained in the main CJRR database.

3.3 Linkage

Variables such and full patient postal code and province where surgery is performed are captured in the CJRR data set, which can be used to derive standard geographical classifications. Additional information on patient residence is also collected on institution addressographs affixed to data collection forms, though this is not captured electronically. For reporting purpose, CJRR uses information on provinces to define geographical parameters.

CJRR data by fiscal periods is available for comparative purposes.

Unique institution numbers in the 2004–2005 recorded in CJRR are the same as those defined in the Discharge Abstract Database (DAD).

The CJRR captures patient identifiers such as health card number, gender, date of birth and postal codes. However, CJRR does not use systematic generated codes to uniquely identify persons.

Recommendation

- Develop a unique patient identifier to support encryption policy and privacy and confidentiality practices at CIHI. This recommendation was implemented with enhancement to the CJRR relational database starting April 2005 when a "patient profile" data set was introduced.

3.4 Equivalency

There are no ICD-10, CCI or CMG codes used in the CJRR database. Therefore crosswalks/ conversions relating to this type of information is not within the business scope at this time.

3.5 Historical Comparability

The 2006 CJRR annual report includes comparative analyses of surgical data between fiscal periods 2002–2003, 2003–2004 and 2004–2005 for some select data elements. Changes in concepts, definitions, variable names, data elements, and data submission specifications, etc. for the CJRR are currently not available in a single document.

Recommendation

- Develop a single document of historical changes and ensure the document is maintained with updates.

4. Usability Dimension

4.1 Accessibility

The edited 2002–2003, 2003–2004 and 2004–2005 data subsets, that were used for the 2006 CJRR annual report are saved as SAS data sets in the CJRR program area's shared directory for future reference, along with the SAS codes used to create them.

The original raw data are stored on the Oracle server and these are accessible by authorized internal (CJRR program area) users.

Since the inception of CJRR, aggregate tables are reported in annual reports. The 2006 CJRR annual report includes these standard tables as well as comparative tables to show trends over time.

The CJRR annual reports, media releases, and analyses in brief are posted on the CIHI's external website and printed copies are also disseminated to primary stakeholders.

Recommendation

- Continue to present CJRR data at organized events like Conferences and Symposia via poster and oral presentations to organizations (like hospitals, rehabilitation facilities Arthritis and Orthopedic societies etc.) to create more public awareness.

4.2 Documentation

Methodology, concepts and definitions and major data limitations are provided on annual basis with the release of annual reports.

Stand-alone external documentation release for 2004–2005 data is expected to be available in early 2007.

Methodology used for the CJRR 2006 annual report for internal purposes has been documented and stored in the CJRR program area's shared directory.

Appropriate caveats have been provided with every data release. Caveats were included with respect to the status of the data released in the annual report as well as the CJRR bulletins.

4.3 Interpretability

The CJRR Advisory Committee and Research and Development Sub-committee members review outlines and drafts of reports and bulletins and provide feedback before they are published.

The annual report includes CJRR contact information to facilitate external users to get in touch with the registry with questions or concerns.

Revised CJRR statistics for 2002–2003 and 2003–2004 were included in the 2006 annual report to incorporate data pertaining to the respective years, and data that were received after the data sets were assembled for the 2005 CJRR annual report.

Also, an errata was published and made available to external users in October 2006 after the report was released.

5. Relevance Dimension

5.1 Adaptability

CJRR has an Advisory Committee, and a Research and Development Sub-committee comprised of practicing orthopedic surgeons. Consultations are made with the committee members on clinical and surgical issues as often as required. Additionally the CJRR team:

- Contributes at least two or three articles to the quarterly bulletin of the Canadian Orthopedic Association, (COA).
- Makes presentations at annual provincial and national orthopedic association conferences.
- Has a booth at the annual COA conference.
- Attends health research conferences such as those organized by the Institute for Clinical Evaluative Studies (ICES) and the Association of Public Health Epidemiologists, (APHEO) and the Data user's conference.

The data elements captured in the registry database are revised every two years with the aim of keeping up-to-date with the changing information needs of surgeons and other major data users in the areas of hip and knee replacements. In 2004–2005, several new variables were added with minimal downtime to data processing.

5.2 Value

The mandate of the CJRR is to provide information that will ultimately improve the quality of care and outcomes for total joint replacement recipients in Canada. Clinical and surgical information on hip and knee replacements from the registry is available to the public, orthopedic surgeons and the research community.

While CIHI's administrative databases capture information on patient demographics and hospital utilizations, the CJRR strives to fill the information gap on clinical and surgical details while collecting administrative data on hip and knee replacement procedures.

- Ad hoc requests for information from researchers, surgeons and other data users are tracked in the ad hoc request database and reported at CJRR Advisory Committee meetings.
- Media reports and references relating to the information released in annual reports are monitored.
- Media reports regarding hip and knee replacements are constantly monitored.

Recommendation

- Conduct a satisfaction survey to solicit feedback systematically to determine stakeholder satisfaction and their expectations for the registry.