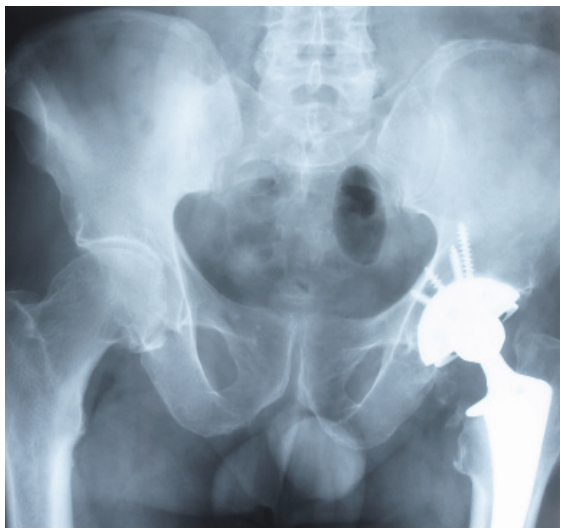

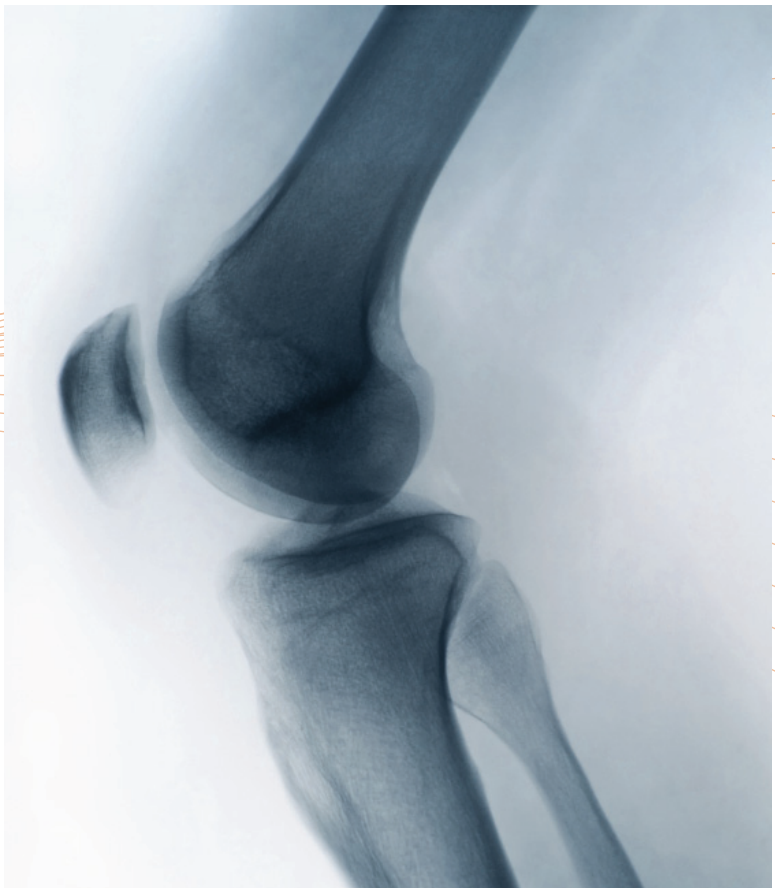

Data Quality Documentation for Users: Canadian Joint Replacement Registry, 2006–2007 Data, June 2010

Canadian Institute for Health Information
Institut canadien d'information sur la santé

Who We Are

Established in 1994, CIHI is an independent, not-for-profit corporation that provides essential information on Canada's health system and the health of Canadians. Funded by federal, provincial and territorial governments, we are guided by a Board of Directors made up of health leaders across the country.

Our Vision

To help improve Canada's health system and the well-being of Canadians by being a leading source of unbiased, credible and comparable information that will enable health leaders to make better-informed decisions.

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Introduction

Maintaining and enhancing the quality of incoming data is essential to CIHI's mandate to produce high-quality health information. CIHI's data quality program ensures the continued regular improvement of the quality of CIHI's databases and registries to meet changing and expanding user requirements and expectations.

CIHI's Data Quality Framework provides a common way to assess data quality across CIHI databases and registries; within that, the CIHI data quality assessment tool helps users identify priority issues for quality by assessing databases and registries along the five broad dimensions of accuracy, comparability, timeliness, usability and relevance. The framework implementation is part of the larger quality cycle in which problems are identified, addressed, documented and reviewed on a regular basis. It also standardizes information on data quality and helps to identify priority issues, which in turn leads to continuous improvements. The by-product of the assessment tool is twofold: to highlight the strengths (processes that work well) and to identify areas where existing practices can be improved.

The purpose of this document is to provide information from the user's perspective to assess the fitness for use of the data.

Purpose of the Report

The primary intent of this document is to provide users with sufficient information to assess whether the quality of the information presented by the Canadian Joint Replacement Registry (CJRR) fits their intended use. This document contains information on coverage, data limitations, comparability, major changes and revisions and their impact. It is restricted to the known limitations of the CJRR for 2006–2007 (surgery dates from April 1, 2006, to March 31, 2007).

Canadian Joint Replacement Registry

The CJRR is a national registry, based on voluntary data submissions by orthopedic surgeons, that collects clinical, demographic and administrative information on hip and knee replacement procedures performed in Canada.

The CJRR was formed as a collaborative effort between CIHI and the orthopedic surgeons of Canada. The goals of the registry are to collect, process and analyze data on hip and knee replacements performed in Canada; to support evidence-based decision-making to improve the quality of care for joint replacement recipients; and to conduct analyses pertaining to orthopedic devices and surgical techniques. The hip and knee data collection forms and a list of the main data elements can be downloaded from the CIHI website at www.cihi.ca/cjrr.

Orthopedic surgeons submit information on a voluntary basis, with consent obtained from patients prior to or at the time of surgery. Patient consent is mandatory for all submissions—if patient consent is not completed, minimal data is captured in the CJRR.

In 2006–2007, CJRR supported two different modes of data submission:

- Paper data collection forms from surgeons; and
- Electronic submission from surgeons' coordinators and clients.

The 2006–2007 CJRR database was composed of Oracle data sets that supported entry of paper forms and submission of electronic files. Paper forms were entered directly into the database via an internal web-based interface by CJRR data entry staff at the CIHI office in Toronto, Ontario. Electronic data was submitted directly from the physicians' coordinators or vendors, who submitted data on behalf of surgeons. Electronic data was submitted via the electronic Data Submission Service (eDSS), based on pre-defined CJRR specifications. From the 2006–2007 data, a total of 30,008 records were processed for the annual report, of which 7,502 records (25%) were submitted electronically and 22,506 (75%) were submitted via paper forms.

Dissemination

An annual report produced by CJRR provides epidemiological, clinical and surgical analyses on hip and knee replacement procedures across Canada. The registry also responds to data requests from participating surgeons, government, researchers and the general public. These data requests require conducting new analyses on surgical or clinical data, in the form of aggregate-level data and/or graphical summaries or by record-level data extractions. All data requests are responded to in adherence with the CIHI privacy and confidentiality guidelines.

Users

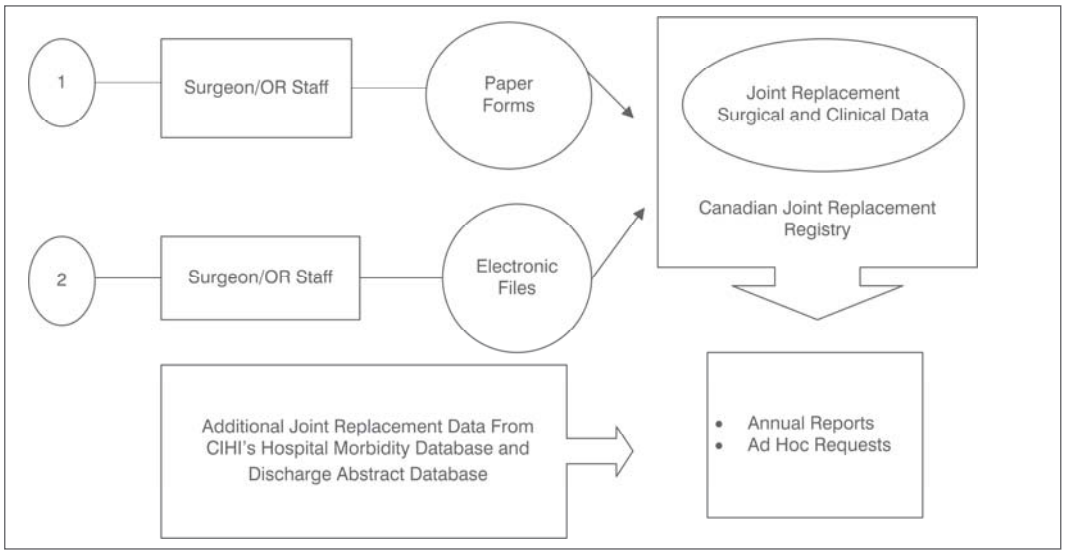
Primary users of CJRR data include orthopedic surgeons, health policy-makers, CJRR Advisory Committee members and health care administrators. Secondary users include allied health care clinicians, researchers and the general public.

1 Concepts and Definitions

1.1 Mandate/Purpose

The CJRR collects data from across Canada for all hip and knee replacements performed in the country. Through the CJRR, CIHI is providing information for orthopedic surgeons and health care managers to evaluate clinical procedures and monitor the progress of joint replacement recipients over time. Figure 1 shows the flow of data collection into the CJRR database.

Figure 1
Canadian Joint Replacement Registry Data Flow Diagram



1.2 Core Data Elements and Concepts

The registry includes information on patient demographics, type of replacement (primary or revision procedure), surgical approach, fixation modes and implant types. CJRR includes information on only hip and knee joint replacements. Primary (initial) and revision procedures—mostly elective—are included for the purposes of analysis and reporting. The registry receives information from surgeons who are eligible to participate. Eligibility is determined based on whether the surgeon is currently performing hip and knee replacements.

Reporting province refers to the place or facility where the procedure was performed, which may not always be the province of residence for the patient. Bilateral procedures are recorded on two separate hip or knee forms indicating a different (right or left) side location—each is counted as a separate procedure.

For a list of data elements collected by CJRR, see http://secure.cihi.ca/cihiweb/en/downloads/services_cjrr_e_elements.pdf.

1.3 Populations of Reference and Interest

The population of *reference* (population one wants to investigate) is all elective hip and knee replacement procedures that were performed in acute care and private facilities during 2006–2007 in Canada by surgeons registered with CJRR.

The population of *interest* (ideal population, or gold standard) is all hip and knee replacement procedures performed by all surgeons in Canada, in acute or private facilities.

For the purpose of this data quality documentation, CJRR data for 2006–2007 (patients' surgery dates from April 1, 2006, to March 31, 2007, inclusive) were reviewed.

1.4 CJRR Frame

The frame for the 2006–2007 CJRR includes all knee and hip replacement procedures performed in Canada between April 1, 2006, and March 31, 2007, by orthopedic surgeons in Canadian acute care facilities who are eligible to participate in the registry. CJRR includes all primary replacements and revisions for hip and knee procedures submitted on a voluntary basis.

1.4.1 Frame Maintenance

The following frame maintenance procedures were in place during 2006–2007 to ascertain surgeon participation and submission rates on a regular basis as part of routine CJRR activities:

- A master list of all participating and non-participating surgeons who performed hip and knee replacements annually was maintained.
- Inactive orthopedic surgeons (those who moved to another country, retired or no longer performed total hip and knee replacements) were identified and excluded from the list of surgeons eligible to participate in the CJRR.
- A list of acute care institutions that performed hip and knee replacements was maintained separately. These institutions typically submit to the Discharge Abstract Database (DAD) and the same institution numbers were used in the CJRR, where possible.

The frame maintenance process helped to monitor the participation rate and thereby evaluate the extent of over- and under-coverage across the country. Feedback was obtained from orthopedic surgeons on the CJRR Advisory Committee to determine the number of surgeons eligible for the CJRR. The CJRR will be working closely with the Canadian Orthopaedic Association in future for frame maintenance.

2 Data Limitations

This section discusses the issues users should note when interpreting and using CJRR data.

2.1 Data Coverage

Coverage for CJRR has been defined as the percentage of all hip and knee replacements performed in Canada during the reporting period as recorded in the Hospital Morbidity Database (HMDB) and DAD, which are actually submitted to (captured in) CJRR—the number of cases captured in CJRR divided by the number in the HMDB and DAD.

The HMDB is a national data holding that captures administrative, clinical and demographic information on hospital inpatient events. Discharge data is received from acute care facilities and select chronic care and rehabilitation facilities across Canada. The HMDB is populated by a subset of DAD (non-Quebec data), and Quebec data is appended to this to form the HMDB. Typically, HMDB data is used in CJRR reports. However, for 2006–2007, data submission to the HMDB was delayed for Quebec, so the CJRR reports used data from DAD for this year and the HMDB for any analyses of prior years. Throughout this document we will refer to DAD, as this report focuses on 2006–2007 data.

DAD captures a finite set of administrative, clinical and demographic information on hospital inpatient events, including primary and revision joint replacement procedures, and is recognized as the only database that is comparable to CJRR for validation purposes. Using 2006–2007 data, the distribution of various elements was compared between CJRR and DAD, including patient age, gender, postal code of residence, type of joint replacement (type of intervention) and reason for primary joint replacement. The distribution of the elements was found to be comparable between the two databases. Other CJRR elements that are comparable to those in DAD are health card number, health card issuing province, procedure date and date of birth.

2.1.1 Over-Coverage

Procedure Over-Coverage

There is minimal over-coverage in the CJRR data, although the potential exists for over-coverage of hip and knee replacement procedures due to the possibility of duplicate records entered into the CJRR database. Duplicate entries result when multiple forms for a single patient for the same procedure are submitted either by various institutions where surgeons are found to practise or by surgeons themselves.

The CJRR system routinely identifies potential duplicate records in the database. Edit checks were implemented in the new relational CJRR database (effective April 2005) to prevent duplicate entries. Records that are not flagged as duplicates when accepted into the database are flagged as potential duplicates in the data quality reports through nine data elements: patient date of birth, patient gender, patient health card number and issuing

province, joint involved (hip or knee), surgery date, side of replacement (left or right), if the replacement was unilateral or bilateral, and the status (primary or revision). A procedure is considered a true duplicate if all nine data elements are the same.

Only eight records were identified as true duplicate procedures in CJRR in 2006–2007. There were 102 records identified as potential duplicates by reason of miscoding (Table 1). Hence, over-coverage can be estimated as minimal.

Table 1
Number of Duplicate Records by Reason, CJRR, 2006–2007

Records	Count	Percentage
True Duplicates	8	0.03%
Primary/Revision Miscoding	0	0%
Unilateral/Bilateral Miscoding	24	0.08%
Duplicates (Potential)	102	0.34%
Total Hip and Knee Records	**30,008**	

Surgeon Over-Coverage

Surgeon over-coverage is not an issue in the CJRR database. Prior to submitting data, all surgeons must first register with CJRR. Only registered and practising orthopedic surgeons are included in the population of reference. Further, information on surgeons who move, retire or cease to perform hip or knee replacements is tracked.

2.1.2 Under-Coverage

Procedure Under-Coverage

The CJRR's participating orthopedic surgeons voluntarily submit joint replacement information. Since not all surgeons participate, only a proportion of all hip and knee replacements are captured. As well, records lacking patient consent (a mandatory field) are not reported in the CJRR. In 2006–2007, there were 64 forms (0.2%) submitted without patient consent (out of 29,767 total), and 2.9% had missing consent and required follow-up.

Although the increase in surgeon participation in CJRR is relatively steady, a discrepancy remains between the number of procedures performed across Canada and the number of procedures actually reported to CJRR. This discrepancy is illustrated by comparing reported procedures in DAD to those in CJRR. A provincial comparative analysis by replacement type is shown in tables 2 and 3.

Table 2
Hip Replacements in the CJRR and DAD by Jurisdiction, 2006–2007*

Jurisdiction	Hip Replacements in the CJRR	Hip Replacements in DAD	Hip Replacements in the CJRR as Percentage in DAD
British Columbia	1,701	4,656	36%
Alberta	2,119	2,469	85%
Saskatchewan	987	1,131	87%
Manitoba	1,111	1,302	85%
Ontario	3,313	12,494	26%
New Brunswick	587	651	90%
Nova Scotia	910	831	109%‡
Prince Edward Island	14	147	10%
Newfoundland and Labrador	255	336	76%
Territories†	38	56	68%
Total	**11,035**	**24,253**	**45%**

Notes
* Quebec is not included because data was not available for 2006–2007.
† Territories include the Yukon, the Northwest Territories and Nunavut.
‡ Nova Scotia's figure for the CJRR may be higher due to potential duplicates in the CJRR.

Table 3
Knee Replacements in the CJRR and DAD by Jurisdiction, 2006–2007*

Jurisdiction	Knee Replacements in the CJRR	Knee Replacements in DAD	Knee Replacements in the CJRR as Percentage in DAD
British Columbia	2,461	6,446	38%
Alberta	2,971	4,003	74%
Saskatchewan	1,490	1,620	92%
Manitoba	1,175	2,202	53%
Ontario	4,128	20,742	20%
New Brunswick	866	968	89%
Nova Scotia	1,035	1,126	92%
Prince Edward Island	8	232	3%
Newfoundland and Labrador	355	518	68%
Territories†	38	86	44%
Total	**14,527**	**37,943**	**38%**

Notes
* Quebec is not included because data was not available for 2006–2007.
† Territories include the Yukon, the Northwest Territories and Nunavut.

Ontario's capture rate fell 38% between 2003–2004 and 2006–2007, largely due to the transition following the end of the Ontario Joint Replacement Registry in 2005. It remains low compared to other jurisdictions. Promotion of CJRR is ongoing, with a focus on jurisdictions with low capture rates.

Surgeon Under-Coverage

Participation in CJRR is voluntary and not all surgeons participate. However, only estimates of the number of orthopedic surgeons that perform hip and knee replacements exist in the orthopedic community. As a result, it is difficult to obtain the denominator for participation rates. Estimates are shown in Table 4 below, and range from 33% in Ontario to 100% in Nova Scotia, New Brunswick, Manitoba and Saskatchewan.

Table 4
CJRR Estimated Surgeon Participation by Jurisdiction, as of March 31, 2007

Province	Estimated Number of Participating Surgeons	Estimated Number of Eligible Surgeons*	Percentage of Participation
British Columbia	75	97	77%
Alberta	52	54	96%
Saskatchewan	26	26	100%
Manitoba	26	26	100%
Ontario	79	241	33%
Quebec	102	193	53%
New Brunswick	28	28	100%
Nova Scotia	28	28	100%
Prince Edward Island	2	3	67%
Newfoundland and Labrador	13	15	87%
Yukon	0	0	N/A
Northwest Territories	2	2	100%
Nunavut	0	0	N/A
Total	**433**	**713**	**61%**

Note

* To be eligible, the orthopedic surgeon must be actively performing hip or knee replacement surgery. Surgeons are deemed to be participating if they submitted in 2003–2004 through 2006–2007, or signed up within the period.

3 Collection and Non-Response

This section provides a summary of the data collection, processing and quality control activities undertaken by CJRR and how they may affect an external user's analysis.

3.1 Data Collection

The following procedures and practices were in place in 2006–2007 to minimize response burden.

Paper Forms

- CJRR staff provided clients with regular support and advice regarding paper submissions.
- Pre-paid, self-addressed express mail envelopes were supplied to CJRR participating surgeons to facilitate the return of completed data collection forms in a secure manner.
- Standard procedures existed for manually sorting, storing and entering data collection forms.

Electronic Submissions

- Client support was available for electronic submission by CIHI and CJRR staff.
- CJRR released updated e-submission specification documents annually to clients who submit electronically. These included changes to the database structure or to manual forms.
- The electronic data submission specifications were circulated as per CIHI standards, ensuring that lead time for clients was accommodated.

The following CJRR practices were in place in 2006–2007 to encourage new, and to continue existing, participation and to enhance the awareness of CJRR.

- Professional development credits were offered as an incentive to CJRR participating surgeons, in collaboration with the Royal College of Physicians and Surgeons of Canada. One credit was issued for every six submitted records per calendar year.
- Analytical reports and Analyses in Brief were distributed at no cost to participating surgeons.
- Presentations were given at national and provincial orthopedic conferences.
- Advisory committee meetings took place twice in the year, to foster consensus-building through collaboration.
- CJRR staff responded to data requests from participating surgeons or data suppliers via centralized email.
- 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 or other studies.
- Specialized reports were produced for research and presentation at professional conferences.

- CIHI's privacy and confidentiality policies were adhered to.

Note that as of 2009–2010, CJRR's Web-Based Data Submission and Reports Tool was released as an additional mode of data submission with real-time reporting capacity. Web-based data submission will continue to encourage new and ongoing participation in the CJRR.

3.2 Data Quality Control

The following quality control measures were applied to CJRR 2006–2007 data.

- Of the total paper forms entered for 2006–2007, data entry verification was done on 100% of the data.
- Data was entered into the CJRR database according to pre-established data entry rules.
- Data entered into all fields in the data entry program was subjected to automated logic edits to ensure completion of mandatory fields and logic conditions.
- For records that failed the edit checks, appropriate validation notes were attached to the respective records and remained with the record until the error had been updated; this measure was necessary for data quality purposes.
- Two types of errors were generated if a record failed an edit check: warnings and severe errors. Warnings occurred when optional data elements were missing from a record. An error log was produced at the end of the record displaying each field that had the error and the description of the error. Severe errors occurred when mandatory data elements were left blank or the format of the data was invalid. Whenever this occurred, a pop-up message appeared on screen to alert the user to the nature of the error. Records with severe errors could not be saved into the database.
- Files submitted electronically were tested for compliance with the data entry rules, and errors were generated as above in a submission report. Errors were reported back to the clients for correction and re-submission in accordance with CIHI's privacy and confidentiality policies.
- Data quality reports were produced to identify potential duplicate patient and/or procedure records, as discussed in Section 2.1.1. True duplicates were then deleted.

3.3 Non-Response

3.3.1 Unit Non-Response

In CJRR, unit non-response is defined in two ways: 1) the number of active CJRR participating surgeons in 2006–2007 who submitted data, divided by the total number of surgeons who registered to participate; and 2) the number of joint replacement procedures received by CJRR, divided by all joint replacement procedures performed in Canada as per DAD in 2006–2007.

Table 5 shows the number of active surgeons who submitted data as a percentage of those who signed up to submit data (that is, participate in the CJRR). The overall response rate was 74% among all voluntary participating surgeons. Some provinces had a 100% response rate for 2006–2007.

Table 5
Response Rate by Jurisdiction for Hip and Knee Replacement Procedures, CJRR, 2006–2007*

Jurisdiction	Submitting Surgeons	All Registered Surgeons	Response Rate (Percent)
British Columbia	58	97	60%
Alberta	47	54	87%
Saskatchewan	23	25	92%
Manitoba	22	24	92%
Ontario	62	106	58%
New Brunswick	27	27	100%
Nova Scotia	27	27	100%
Prince Edward Island	2	3	67%
Newfoundland and Labrador	12	15	80%
Northwest Territories	2	2	100%
Total	**282**	**380**	**74%**

Note
* Quebec is not included because data was not available for 2006–2007.

CJRR captured 45% of hip replacement procedures and 38% of knee replacement procedures conducted in public facilities as reported in DAD (see tables 2 and 3). The proportion of procedures conducted in private facilities captured by CJRR is unknown, as private facilities do not report to DAD.

Several procedures were in place in 2006–2007 to minimize unit non-response, including the following:

- Standard procedures permitted tracking on a monthly basis of the following:
  - The total number of forms submitted to CJRR;
  - The total number of forms received with incomplete patient consent and other mandatory fields; and
  - The total number of forms that were received with patient consent refusals.
- CJRR client support staff were responsible for tracking invalid and missing values for paper form submissions over time.
- For data submitted electronically, SAS programs were used to detect and monitor missing and invalid values and incomplete mandatory data fields.

3.3.2 Item (Partial) Non-Response

With the introduction of mandatory fields in the relational CJRR database at the beginning of April 2005, the completeness of the database improved significantly. Mandatory elements could not be saved into the database unless they were completed.

Data collection forms submitted by surgeons were checked regularly for invalid or missing values, and follow-up was done on a regular basis to correct inconsistencies in reporting.

In the newly developed CJRR Web-Based Data Submission and Reports Tool, introduced in 2009, all the mandatory fields are indicated with an asterisk, and the record cannot be saved unless all such fields are completed. Health card number, a key variable, is flagged if it is entered but is invalid. More than 50% of the data elements are mandatory (100% completion upon entry into the database) and strong edit checks are functional, contributing to an increase in CJRR data quality. See http://secure.cihi.ca/cihiweb/en/downloads/services_cjrr_e_elements.pdf for a list of mandatory and optional data fields.

3.4 Adjustment for Non-Response

Corrections were made throughout 2006–2007 to records based on the feedback received from surgeons and their offices. For example, missing or inconsistent admission dates (such as the surgery date being earlier than the admission date) were updated as necessary, upon receiving surgeon feedback.

3.5 Measurement Error

Variables used in 2006–2007 were screened for validity, and several different types of errors were identified. The main error identified was the use of a non-standardized date format with submission of items such as data of birth, surgery date and admission date. For example, one date may have been in the format mm/dd/yyyy, whereas another might have been dd/mm/yyyy or yyyy/mm/dd. This resulted in difficulty differentiating between month, day and year.

3.6 Issues of Bias and Reliability

The extent of bias in the CJRR is unknown; however, there are several types of bias possible, such as surgeon and procedure selection bias. There may be some degree of inconsistency; for example, what is considered a revision procedure by one surgeon may be considered a simple repair by another surgeon. Inconsistencies may also occur due to differences in defining techniques or procedures (for example, defining minimally invasive surgery in relation to body size or defining a procedure as bilateral when performed under one anesthesia or during one hospitalization).

All variables in the 2006–2007 data set were subjected to CJRR database validity, logic, range and consistency checks. Validity rules pertaining to electronic submission specifications were documented in the CJRR electronic submission specifications for 2006–2007. Edit checks in the CJRR relational database were applied to minimize data entry and electronic data submission errors. Consistency checks were supported through pre-existing look-up tables containing surgeon, facility and patient information. Further, all core (mandatory) variables in the 2006–2007 CJRR data set were checked for validity using SAS programs before these core variables were used for any analyses.

Records containing patients outside of pre-defined age and weight ranges were flagged for follow-up. Records containing admission and surgery dates that were out of chronological sequence were manually verified and the appropriate corrections were applied once clarification was obtained from the surgeon's office.

4 Major Methodological Changes From Previous Years

4.1 Major Changes Compared to 2005–2006

No major changes were made between 2005–2006 and 2006–2007. In 2005–2006, mandatory fields were introduced in the relational CJRR database. This greatly increased the completeness of the database, as the fields had to be completed during data entry before progression to the next item was possible. This data quality measure benefitted the 2006–2007 data, and will continue to contribute to quality through future years of collection.

4.2 Historical Changes Affecting Longitudinal Comparisons

No changes were made to the CJRR data collection forms as of 2006–2007; however, significant changes were made to the forms as of 2005–2006. These included

- Collection of wait time information, such as surgery decision date, referral date and date of first consult;
- Operating room environment options, to reflect current practices in operating rooms; and
- Changes to surgical components and descriptions to reflect evolving practices and terminology.

4.3 Future Changes

The CJRR data collection will undergo periodic review in the future. Changes will be planned as necessary to take into account modifications in current orthopedic practices and expertise contribution from stakeholders.

5 Revision History

CJRR data is subject to revision if any corrections are received from the data providers. The CJRR continues to accept data beyond the reporting period deadline; thus historically there may be slight variations in reported data over time.

6 External Comparability

This final segment of the document explores the comparability of CJRR data with other relevant sources that contain similar or the same information on the basis of geography, facility, time and person.

6.1 Geography

The CJRR contains the patient's province of residence and postal code along with the submitting facility's province code. Every Canadian province is denoted by a distinct province code in the registry. A Postal Code Conversion File (PCCF) can be used to map the patient's postal code to more aggregated regions. An edit check for valid postal codes is built into the CJRR database. The first three digits of the postal code (the forward sortation area) are used to identify the patient's province of residence, where applicable, for analysis and reporting.

Note that release of information for geographic areas with very few counts is restricted for privacy and confidentiality reasons in conjunction with CIHI's privacy and confidentiality guidelines for all databases and registries at CIHI.

6.2 Facility

The hip and knee data collection forms contain the name of the facility where the replacement procedure was performed. Since hip and knee replacements are performed largely in acute care facilities, DAD serves as a good source for comparison with the CJRR and contains the acute care facility numbers and facility names.

6.3 Time

CJRR began to publish data based on fiscal year of surgery beginning with the 2004 annual report. The date variables in the registry currently include patient's admission date, surgery date and surgery decision date (if provided). These fields help to compare information across other databases, such as DAD. Inclusion of the surgery date helped enhance comparability (against time) with other databases and registries, both within CIHI and with other international registries.

6.4 Personal Information

CJRR includes patient demographic information, such as health card number and date of birth, which facilitates comparison of information with other databases. This information is not disclosed or released to external users under normal circumstances. For approved requests, age or age group is typically provided instead of date of birth and health card numbers are encrypted. A multi-step process of approval from CIHI's privacy and confidentiality team is required if there is a need to access these restricted data elements or if an internal or external group is interested in conducting database linkage studies.

For additional information, refer to CJRR's privacy impact assessment and the CIHI privacy policy on the CIHI website at www.cihi.ca.

6.5 External Source Validation

Other than DAD, there are no other known national external sources of published information on hip and knee replacements performed in Canada that can be used to validate information in the CJRR.

7 Contact Information

For more information, please contact the CJRR team at cjrr@cihi.ca.

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