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A qualitative evaluation of clinically coded data quality from health information manager perspectives

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Abstract

Background: It is essential that clinical documentation and clinical coding be of high quality for the production of healthcare data. **Objective:** This study assessed qualitatively the strengths and barriers regarding clinical coding quality from the perspective of health information managers. **Method:** Ten health information managers and clinical coding quality coordinators who oversee clinical coders (CCs) were identified and recruited from nine provinces across Canada. Semi-structured interviews were conducted, which included questions on data quality, costs of clinical coding, education for health information management, suggestions for quality improvement and barriers to quality improvement. Interviews were recorded, transcribed and analysed using directed content analysis and informed by institutional ethnography. **Results:** Common barriers to clinical coding quality included incomplete and unorganised chart documentation, and lack of communication with physicians for clarification. Further, clinical coding quality suffered as a result of limited resources (e.g. staffing and budget) being available to health information management departments. Managers unanimously reported that clinical coding quality improvements can be made by (i) offering interactive training programmes to CCs and (ii) streamlining sources of information from charts. **Conclusion:** Although clinical coding quality is generally regarded as high across Canada, clinical coding managers perceived quality to be limited by incomplete and inconsistent chart documentation, and increasing expectations for data collection without equal resources allocated to clinical coding professionals. **Implications:** This study presents novel evidence for clinical coding quality improvement across Canada.

Keywords (MeSH)
clinical coding; data quality; quality improvement; health information management

Supplementary keywords
health data; administrative data; qualitative research

Background and significance

Administrative data are collected during patient encounters in the healthcare system (Cadarette and Wong, 2015). This includes (but is not limited to) primary care, inpatient and outpatient care, long-term care, pharmacy prescriptions and electronic medical record (EMR) data. The International Classification of Diseases (ICD) system is used to code hospital data (i.e. hospitalisations, emergency department visits and day surgery) to produce health data used for research and reporting (World Health Organization, 2018). Currently, Canada uses the Canadian version of the 10th Revision of ICD to code health data (ICD-10-CA). Clinical coders (CCs) extract health information from inpatient charts daily, to generate administrative health data (including hospital discharge abstract data) (CIHI, 2018). It is imperative that clinical coding be of high quality, in order to produce accurate healthcare data for patient safety and quality of care assessment, research, surveillance, hospital administration and resource allocation purposes.

There is a limited understanding of the facilitators and barriers to producing high-quality coded data in Canada.

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A study assessing chart quality and administrative data found that poor documentation resulted in a decline in the quality of administrative data (So et al., 2010). Similarly, in a recent study aimed to understand barriers to clinical coding quality from the perspective of CCs, the investigators identified three themes of clinical coding challenges (Tang et al., 2017). The three challenges included (i) issues with documentation of clinical events (e.g. issues in terminology discrepancies, where the terminology used by the physician was not the same as used by ICD, and therefore the CC could only assign non-specific or inaccurate codes); (ii) hospital chart organisation; and (iii) clinical coding practices (i.e. variability in clinical coding standards). Further, many asymptomatic or secondary conditions are under-coded (e.g. hypertension, obesity) and do not accurately reflect the current prevalence and incidence of disease in the population (Martin et al., 2014; Quan et al., 2008). To identify ways to strengthen coded data quality, further investigation of the processes and systems that organise clinical coding work and management in health information departments is needed.

Managers provide resources for clinical coding work and must ensure the regulatory expectations for quality data collection are met. Managerial and institutional practices that support clinical coding work may illustrate what is happening in health information departments that supports or detracts from the quality of coded data. This study used a qualitative approach to examine the system-wide factors that affect clinical coding processes from the health information manager perspective. We explored key coded data quality issues, potential systemic influences and strategies to improve the quality of data coding.

Methods

Research design

We blended two qualitative methods (institutional ethnography [IE] and directed content analysis) to explicate the work of clinical coding. An IE approach uses empirical description of peoples' work and analysis of intersecting organisational processes that direct how the work is done (Smith, 2003). These may include texts such as standards and guidelines, equipment, tools, budget constraints and human interactions. We used this IE lens to trace what actually happens in CC's everyday work and the broader institutional processes that influence their clinical coding practices. Directed content analysis enables researchers to identify categories from qualitative descriptions when some prior knowledge of the topic exists, to enrich or challenge a pre-existing understanding of what is actually happening (Hsieh and Shannon, 2005). Earlier research involved interviews conducted with hospital CCs, where findings revealed that issues affecting clinically coded data quality were systemic and beyond the local setting where clinical coding work took place (Tang et al., 2017). As such, we developed interview questions based on what was known from this prior study, and sought further description from the clinical coding managers' standpoint.

Participants and sampling

We interviewed managers of CCs to explore and describe local and systemic factors that influence and organise clinical coding work. Snowball sampling was used to identify managers of CCs across Canada (Heckathorn, 2011). Participants were recruited from within the Canadian Health Information Management Association (CHIMA), the national body that regulates health information management professionals and supports health information management education. First recruiting took place at the biannual CHIMA conference. We then followed up with snowball sampling to locate additional managers who were not in attendance at the conference. Professional contacts provided further suggestions for participants in an effort to increase representation across Canada. Participants were included if they had direct supervision of CCs in a manager, supervisor or coordinator role, in an acute care hospital setting. Written consent was obtained prior to scheduling interviews.

Data generation

Semi-structured interviews were conducted. Questions were directed towards discovering manager responsibilities, perceptions of data quality (facilitators and barriers), workload and financial issues, training and continuing education, suggestions for quality improvement and barriers to implementing changes. The study team conducted telephone interviews lasting approximately 60 minutes with each participant. All researchers kept field notes during the interviews. Interviews took place between October 2016 and February 2017 and were recorded, anonymised and transcribed.

Data analysis

Interview transcripts were read by each researcher, and were analysed by all three researchers together, to ensure clear description without interpretation. Analytic software was not used. Directed content analysis was used for the initial review of the transcripts. Themes from prior research on clinical coding work formed initial categories to sort and compare the data (Tang et al., 2017). We independently printed, read and highlighted text that appeared to represent institutional rules and processes that a CC followed. In-group sessions with all three researchers were then used to further refine themes within the highlighted passages. Uncategorised sections of text were assigned a subcategory or a new category heading (Hsieh and Shannon, 2005).

A secondary approach to the analysis was informed by an IE lens. We were interested in a deeper understanding of the social organisation of CC's work, from the manager's standpoint. During this second review, we paid closer attention to the clinical coding instructions, policies and procedures. As we read the transcripts, we questioned how clinical coding work is coordinated and how it intersects with the work of others (physicians who document, directors who set budgets, managers who set quotas and

deadlines, policymakers who set the clinical coding standards) (McCoy, 2006). The data provided a map illustrating factors influencing CC's work. Notes were taken highlighting the intersections between institutional rules and regulations that coordinate how clinical coding work was done. With our IE lens, new categories emerged. Consensus was reached among the researchers on significant factors influencing clinical coding work, categories of data and illustrative quotes.

Ethics approval

The study was approved by the University of Calgary Conjoint Health Research Ethics Board (REB15-1245_MOD4). Informed consent was collected prior to all interviews.

Results

Characteristics of participants

Characteristics of the health information managers have been summarised in Table 1. In total, 10 health information managers and coding quality coordinators who oversee CCs were recruited from 9 provinces across Canada to participate in this study. All participants were health information management certified CCs with advanced clinical coding experience, in a variety of leadership roles. Some participants had experience in analysis, data quality auditing, and some held graduate degrees in healthcare leadership. The average number of years of experience in the health information management field was 21.6 years, and job duration ranged from 2 years to 10 years in the various roles.

Chart quality affects clinical coding work and recommendations for process improvement

As illustrated in Box 1, several recommendations were made by the participants to address the facilitators and barriers to quality of coded data.

Most clinical coding managers indicated poor chart documentation as an underlying cause of low clinically coded data quality. Poor physician documentation was described as lack of specificity (e.g. documenting diabetes but not type I, type II), missing documents (e.g. no discharge summary) and illegibility. Inconsistent terminology was also an issue. One manager emphasised:

> We even have two surgeons, orthopedic surgeons do the same procedure, but because we get physicians from all over the world ... they just talk differently ... for the same thing. And so a good CC might pick up on it, but a new CC might not. (Participant 3)

Clinical coding managers put various suggestions forward. First, managers recommended that documentation and dictation should be embedded within medical school training. Second, they suggested health information management departments could provide information sessions to physicians for continuing education on chart documentation for clinical coding purposes. Third, managers proposed that interaction and communication be encouraged between health information management department teams and physicians for clarification on coding issues (e.g. terminology), and that "having that collaboration with coding and physicians would really benefit to increase quality" (Participant 4). One scenario was described by a participant to illustrate this point:

> (The CC) really was at a loss. But she knew the man [physician] and he came and he actually talked to her and he said "you need that kind of information?" and she said, "yes." And we found ... she found, that after they had this discussion regarding that patient, he realised that she needed more detail. Being able to go back to the physicians and explain. A lot of them don't even know what a CC does or what they're gathering. Too many of them have no idea. (Participant 2)

Fourth, managers suggested that medical terminology be standardised nationally. Regular communication from the Canadian Institute for Health Information (CIHI) to physicians could provide updates and documentation expectations (e.g. palliative care can be termed either "discontinue all medications" or "comfort care," but only one term should be used). Fifth, managers advised that templates or standardised formats for both hospital charts and discharge summaries could facilitate chart completion, organisation and consistent use of terminology. With hybrid charts, managers noted that CCs are "coding without summaries, without [OR reports] sometimes, and we cannot put those aside because we have those tight deadlines" (Participant 5). Several participants stated that this could be achieved by transitioning from paper and hybrid charts to electronic charting, suggesting "hybrid records just add a whole other level of complexity to it" (Participant 8).

Managers expressed that information missing from hospital charts, due to (i) hybrid charts and (ii) unclear or incomplete chart documentation, also results in under-coding. Some participants noted the value of using a chart complete with nursing notes, ancillary and support staff charting, to gain additional insight into the patients' medical history. As stated by one clinical coding manager, "unless it's spelled out by the physician, we can't put it in" (Participant 6). For example, dysphagia for stroke patients cannot be clinically coded if the physician does not document it, even though the patient experienced it.

Participants also described factors affecting data quality that led to over-coding and under-coding. Over-coding was commonly reported for two reasons: (i) CC experience and (ii) unclear guidelines or expectations. Regarding experience, one respondent noted that more experienced CCs coded more out of habit. Over-coding also may occur "because [inexperienced CCs] get nervous and they will code everything and anything ... over time as they get more experience, more confidence, which kind of goes away" (Participant 3). Managers mentioned that inexperienced CCs sometimes code symptoms rather than diagnoses. Loss of more experienced CCs (i.e. through retirement; burnout)

Table 1. Demographics of clinical coding managers.

			Manager responsibilities			
Participant	Job title in health information management	Overall job role	Number of sites managed	Number of CCs/ staff supervised	Budget	QA
1	Director	Oversees data collection (clinical coding work), staffing, registration, records management, transcription, access and disclosure	13	25	Sets budget for a provincial zone	Sets QA programmes
2	Manager	Manages data collection, budget, staffing, transcription, health records, registration and switchboard	3	5	Manages within a set budget	N/A
3	Professional practice lead	Manages data collection and transcription	6	49	Manages within a set budget	Oversees coder CC meetings related to CIHI re-abstraction studies and QA issues
4	Manager	Manages data collection	8	100	Manages within a set budget	Oversees creation and implementation of data quality plan that includes orientation, education, audits, data quality edits, data quality initiatives, training and resources
5	Clinical coding supervisor	Oversees coded data quality	6	7	Manages within a set budget	Runs 600 monthly audits, responds to CIHI corrections, oversees monthly meetings with CCs to review standards and improve efficiency
6	Supervisor	Oversees coded data quality and health information, ensures resources are available, writes reports to provincial leaders	N/A	7	Contributes to setting budget for staffing	Responds to ministry reports monthly to correct errors in data, monitors the clinical decision units for data quality comparison to other hospitals.
7	Director	Manages ambulatory care, admitting, health records, transcription, release of information, data collection and analysis, privacy, conducts research	N/A	N/A	Sets budget for all HIM services	N/A
8	Manager	Manages data collection and data analysis	1	21	Manages within a set budget	N/A
9	Health information specialist	Produces and reports on HIM initiatives, statistics, supports quality measurement and analysis	N/A	N/A	Not responsible	Supports six data quality teams (indicators and surveys), evaluates various quality initiatives, represents province for CIHI and other provincial committees for QA.
10	Data quality coordinator	Oversees quality assurance, auditing, generating reports, training and data re-abstraction.	9	39	Not responsible	Provides feedback to staff on clinical coding standards from audits.

CIHI: Canadian Institute for Health Information; QA: quality assurance; HIM: health information management.

was said to reduce clinical coding quality. Managers also reported over-coding from unclear guidelines or expectations about what to code (e.g. coding a disease that is a secondary diagnosis when it was a primary diagnosis). These issues can lead to a higher coding frequency of a particular disease or condition, hence over-coding the data.

Box 1. Facilitators and barriers of high-quality clinical coding practices as reported by clinical coding managers.

Facilitators: High clinical coding quality is supported when:

- Charts are completed, accurate and organised with all necessary data elements (i.e. clearly stated main condition)
- Charts include well-written discharge summaries, operative notes and progress notes.
- CCs are aware of standards and resources; they are resourceful, thorough, consistent and well-trained
- CCs have experience with little turnover in staff
- Teams work together well, with some specialists in certain areas of health (e.g. obstetrics)
- Feedback is provided regularly to CCs via re-abstraction studies (Canadian Institute for Health Information)
- Regular communication with physicians is promoted, to emphasise importance of thorough documentation

Barriers: High clinical coding quality is hindered when:

- Chart documentation lacks clarity, completeness and legibility, which can cause under-coding
- Communication with physicians is limited, which reduces ability to provide feedback or obtain clarification of conditions
- Resources are limited (i.e. staffing and budget) despite an ever-expanding workload (due to increasingly complex charts, programme expansion and additional projects)
- Technological issues (e.g. software updates) can delay CCs
- Hybrid charts (electronic and paper) reduce the ability to find all of the necessary information, and cause delays
- Lack of standardised hospital charts, terminology and discharge summary formats
- Limited opportunities for CCs training and continuing education

CC: clinical coder.

Box 2. Clinical coding managers' accounts of challenges related to financial resources.

- Increased workload and additional projects, yet budget and personnel resources remain static
- Additional projects and changing processes (e.g. not coding certain data, added variables) add time to clinical coding making it difficult to meet timelines
- Health information management departments have limited ability to request funds
- The hospital budget is usually allocated in response to programme needs other than clinical coding
- There is a lack of resources when needed, including overtime hours and additional staff
- For some provinces, CC directors struggled as they did not have a relief budget for staff who are on vacation or sick
- A tight budget threatens the availability of advanced CC training and educational resources

CC: clinical coder.

Resources affect clinical coding work

None of the clinical coding managers we interviewed set the budget; rather, the directors (Participants 1 and 7) at the provincial level set the budgets. All provinces work within a fixed budget for a specific fiscal year, with the exception of one province (where the budget was reported as situational and variable depending on needs of that period, such as replacement of staff). CCs are usually paid hourly, with hourly wages varying from province to province and by CC rank (wage range is $18–34 per hour).

Three managers indicated that their budgets remained relatively stable over time. There was one exceptional case in which funding for the health information management department has remained stable and experienced fewer cuts, even with money set aside for quality assurance and staff coverage. This correlated with the fact that in this province, information coded and reported by the health information management department is used for hospital fund allocation and clinical care quality assessment (i.e. Quality-Based Procedures reporting). This provides a good example of the association between comprehensive usage of clinically coded information in supporting healthcare decision-making and flexible funding for clinical coding work and the health information management department. Many managers expressed concerns over declining quality of clinically coded data when running on limited resources, as illustrated in Box 2.

We heard two recurring themes regarding resource implications: meeting quotas, and continuing education for CCs. First, clinical coding managers reported a variety of quotas (i.e. number of hospital charts to code within a time frame) and turnaround times (i.e. a time frame to submit clinically coded data to CIHI for efficiency targets). Although generally regarded as reasonable, managers reported that the quotas and time frames were still difficult to meet with the limited resources (e.g. funding, staff) available to health information management departments: "coding is taking more and more resources, but we are not getting more resources" (Participant 3). With high quotas and tight timelines, managers were concerned that quality of the data suffered: "there's a fine balance between keeping people motivated, and working towards a timeline and keeping up with their work, their quality, and their compensation for what they do" (Participant 4). Participants observed that productivity pressures from turnaround time and lack of resources resulted in a decline in the quality of clinical coding work as they have insufficient time to find the necessary information: "the pressures of productivity vs quality is always . . . when you have to keep the productivity up, you have to let something go" (Participant 3).

Second, training to become a CC in Canada includes the completion of a 2-year training certification programme. Currently, continuing education (i.e. webinars are provided through CHIMA, and credits are acquired through online courses offered by CIHI) is also required to ensure CCs remain updated on changes to clinical coding guidelines. Generally, time and funding are allocated for optional and

mandatory courses; some clinical coding managers and health information management departments provide additional training sessions on major or frequently coded clinical diagnoses (e.g. sepsis or stroke) to attempt standardisation in clinical coding across provinces. However, clinical coding managers identified that there is limited time allotted to continuing education:

> Education is an issue. Like, I don't think there's enough put in for education. That can be very costly very quickly. And it's too bad because if you really want people to do a good job, you have to educate them. That is one thing CHIMA is trying to work on. (Participant 2)

Coding guidelines affect clinical coding work

On a systemic level, managers indicated that clinical coding guidelines contribute to clinical coding efficiency and accuracy. CIHI establishes the Canadian Coding Standards, and provides an eQuery system to ensure rapid responses to CC inquiries about the standards. These standards provide guidelines and details on the clinical coding of specific diagnoses. Provincial standards are then developed in response to the national standards. Each of the Provincial Health Ministries across Canada provides distinct deadlines, productivity standards, additional projects and studies, and informal coding guidelines for health information management departments. Provincial standards for coding are in place to enhance clinical coding quality, but practices, like team meetings about quality issues, vary across each province. Further, clinical coding managers reported that it was challenging to keep up with ever-changing coding guidelines (see Box 3).

Data quality feedback mechanisms in health information management departments across Canada include audits, re-abstraction studies, CIHI reports, internal performance reviews and team discussions. Clinical coding managers reported that the feedback provided by CIHI is invaluable, as it uncovers coding issues and inconsistencies: "the coders really like those re-abstraction studies . . . They like that validation, because it's really hard to validate yourself" (Participant 3). Re-abstraction studies were reported to indicate that the clinical coding is high quality in each of the provinces. Challenges with data quality feedback mechanisms are described in Box 3, including time to review feedback: "that is probably one of the first things that falls off the books when they're busy with just operational stuff" (Participant 1).

Other auditing methods were mentioned by participants, and differed greatly between provinces; these included special project re-abstraction studies in certain fields (e.g. perinatal), continuous quality improvement (CQI) audits, key performance indicators that provide trackable error rate, and third-party contractors to conduct reviews. Managers reported health information analysts provided reports on data quality: "if they come across an oddity in coding or a missed field or something, they dig deep and then come back with recommendations for the CCs" (Participant 3).

Box 3. Clinical coding managers' accounts of challenges related to guidelines and feedback mechanisms.

- Respondents suggested that while guidelines are helpful and the CIHI eQuery system effective, revised guidelines are released once every 3 years and are expected to be learned within short time frames
- Clinical coding requirements vary between provinces, depending on the interest in particular medical conditions (e.g. diabetes) or departments (e.g. day surgery)
- There is a lack of time available for reviewing the feedback provided from external feedback (e.g. CIHI reports) and internal feedback (internal performance reviews)
- Feedback mechanisms were inconsistent and varied across provinces

CIHI: Canadian Institute for Health Information.

Performance review processes were another feedback mechanism that varied across provinces. For two provinces, internal reports and CIHI audits were the only feedback provided to CCs; no individual performance reviews were provided. For three provinces, yearly performance review discussions were conducted, and one-on-one feedback was provided to struggling CCs. For most provinces, team discussions were provided in a variety of forms, for example through CQI processes, regular communication through emails, and monthly informal data quality meetings. In one province, CCs attended medical rounds to encourage discussion with residents and help clarify what should be documented in hospital charts; "I think there's those education opportunities and feedback loops that make a huge difference in the quality of data" (Participant 1).

Ultimately, clinical coding managers suggested improvement in physician chart documentation standards, streamlined coding manuals and improved accessibility of reference materials for CCs. One coding manager said that data submission is often redundant, as data are submitted both nationally (to CIHI) and provincially (to Health Ministries).

A summary of the barriers and facilitators that the clinical coding managers identified is found in Figure 1.

Current initiatives noted by clinical coding managers, and various suggestions for improvement of education and training provided are listed in Box 4.

Discussion

We identified three themes that contributed to the organisation of quality of clinically coded hospital data (see Figure 1). The first theme was the quality of chart documentation in hospital charts, including clarity, completeness, organisation and legibility, and hybrid charts, which made it difficult to find information. The second theme was lack of resources, mainly budget and time. Limited resources create team dissatisfaction and compromise data quality. Lack of continuing education, staffing support, fixed and tight budgets and quick turnaround times impact CCs' ability to produce good quality clinically coded data. Finally, the third theme relates to clinical coding

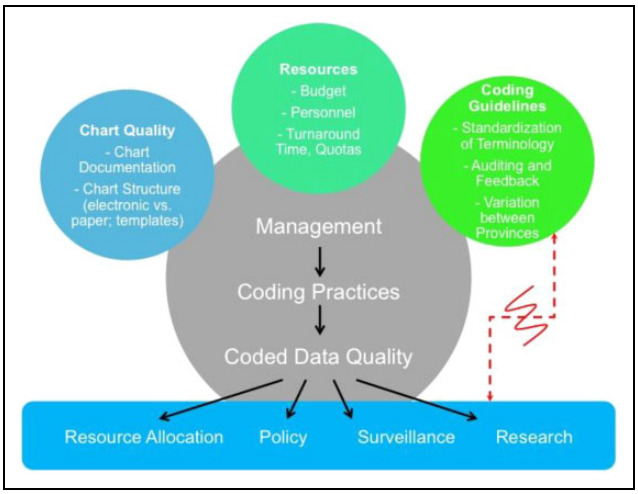

Figure 1. Concept map of coded data quality. The three main contributors to data quality include national and provincial standards, chart quality (including documentation and physical structure and template of the charts) and resources (including budget, personnel and turnaround time/quotas). Purposes for data collection are inconsistent between national and provincial clinical coding standards (red dotted line in diagram), and the purposes that the data are collected for (e.g. research and surveillance).

guidelines, which includes a lack of standardisation in terminology (physicians may use different terms for the same procedure) within and across provinces, and inconsistent and insufficient audit and feedback mechanisms by health information management departments and national agencies.

Similar to the current study, Tang et al. (2017) identified chart quality-related barriers that affect quality of clinically coded health data from CCs' perspectives. These barriers were physician documentation of clinical events, chart organisation and assembly, and clinical coding and abstraction practices. The clinical coding managers in our study reinforced the contention that the quality of the clinically coded data is closely associated with the quality of the documentation provided to the CCs. Interactive collaboration and consistent communication between CCs, clinical coding managers, data users and physicians can reduce confusion when coding clinical data. Clinical coding managers noted that automation of the data coding and editing processes could improve data quality. Providing structure to the documentation process, such as templates that guide physician documentation and dictation, has been shown to improve charting quality (Dean et al., 2015; Mehta et al., 2016). Not only do errors arise from the "patient trail," including communication between patient and provider and the physician's knowledge and experience, but also arise from the "paper trail" that includes variation arising from the electronic and paper charts, CC training and experience, and feedback and auditing mechanisms established in the health information management department (O'Malley et al., 2005). Various suggestions have been made by both physicians and academics, which include improved education for medical students, residents and attending physicians (Thurston et al., 2014), and the development of electronic health records that capture elements of physician communication that can be computed for administrative and research purposes (Morrison et al., 2013). The American College of Physicians has emphasised that

Box 4. Current initiatives and suggestions for data quality improvement.

Current initiatives to improve clinical coding quality

- Clinical information systems are currently being developed for automated data collection, such as synoptic reporting and automatically coded electronic charts
- Site-specific quality initiatives are in place, where feedback is solicited from other CCs and CIHI
- Physician feedback on chart quality for specific units is available in one province
- A data quality tool is currently being tested that identifies errors in clinical coding

Suggestions for improving clinical coding quality

- Improve physician communication and involvement in chart quality, documentation and clinical coding procedures
- Provide higher budget for hiring staff, training and education
- Provide financial support for interactive training and continuing education for CCs (e.g. physical attendance of yearly CHIMA conference, hands-on training)
- Flexible budget allocation for HIM departments for more data re-abstraction studies and quality feedback discussions
- Increase the availability of resources as workload increases with new programmes or disease-specific data collection requests
- Streamline sources of information in charts (i.e. transition to standardised electronic charting)
- Improve clarity and standardisation of guidelines at provincial and national levels
- Continuing education could include:
  - More content on clinical coding standards, classifications and running reports
  - Provision of in-person training by national HIM organisations (CIHI, CHIMA) to encourage open communication and networking
  - Frequent webinars
  - Additional time and staff to provide better on-site CC training
- Stronger efforts for recruitment and retention of CCs to retain experienced staff
- Automated clinical coding tools (e.g. Encoder or 3M™ Codefinder™ software), downloading data characteristics through data linkage (e.g. demographics) and reducing CC workload (e.g. not requiring the coding of secondary information)
- Streamlining information between health systems and facilities, ensuring only essential documents are copied and sent with the patient to the next facility
- Auditing discharge abstract summaries could improve documentation and quality of data

CC: clinical coder; CIHI: Canadian Institute for Health Information; CHIMA: Canadian Health Information Management Association; HIM: health information management.

documentation should ultimately improve clinical outcomes by enhancing communication (Kuhn et al., 2015). Documentation should include the patient story for improved clarity, incorporate templates for improved completeness, efficiency and terminology standardisation in documentation, and training of chart documentation should be ongoing for clinical personnel (Kuhn et al., 2015). This milieu of texts is key in this investigation as they further our understanding of how clinical coding work is organised by local practices and by regulatory organisations beyond the local setting where CCs and clinical coding managers produce quality clinically coded data.

Issues such as clarity of clinical coding standards, access to reference materials and inconsistent clinical coding standards across provinces (i.e. use of terminology or mandatory co-morbidity codes) were recurring issues related to clinical coding guidelines. These insights were reflected in the literature; at the international level, clinical coding standards are also inconsistent where the main condition is coded differently depending on the country ("reason for admission" or "condition using most resources") (Quan et al., 2014). Inconsistencies in the requirements for coding hospital data are reflected in research, surveillance and ultimately the care of patients. Harmonising standards at the provincial, national and international levels can help to accurately estimate prevalence of disease, appropriately allocate resources in hospitals and assess the severity of illness for quality and safety purposes (Quan et al., 2014). The World Health Organization Topic Advisory Group for Quality and Safety recommends clarifying clinical coding guidelines and classification criteria (e.g. specifying whether the condition arose after admission, with a predetermined definition) and ongoing CC education (Sundararajan et al., 2015). This is crucial for the refinement of ICD-11, released in June 2018.

As described in Figure 1, we identified a discrepancy between what data are collected as mandated by Canadian clinical coding standards, and the purposes for which these coded health data are used (i.e. surveillance and research). For example, CCs in Canada are only required to code the main condition, service transfer and co-morbidities that use the most resources (CIHI, 2015). Secondary diagnoses that do not require treatments, nursing care, monitoring or clinical evaluation are optional for clinical coding. However, researchers have consistently identified that asymptomatic, clinically insignificant or non-complex co-morbidities are under-coded, leading to inaccurate prevalence estimates (Peng et al., 2016; Powell et al., 2001; Quan et al., 2008). Under-coding is problematic for administrative data, which is used for surveillance of various co-morbidities. Because these co-morbidities are under-reported, estimates of mortality, length of stay, disability and care received are inaccurate and do not reflect what is happening in hospitals (Peng et al., 2016; Powell et al., 2001). Under-coding negatively influences quality of hospital resource allocation, research that uses administrative data, surveillance and policy. Ultimately, data should be clinically coded for more than billing and administrative purposes, and non-complex co-morbidities should be coded. We recommend that researchers, hospital administrators and clinical coding guideline decision makers align to ensure clinically coded health data are collected for common purposes.

Our study was limited by a small sample size of clinical coding manager participants. We recognise that snowball sampling introduces the potential to miss participants who were from other cities, or limit our sample to those known by others. We missed responses from Quebec, which includes 18.7% of Canada's hospital establishments. Further recruiting through the CHIMA membership may have yielded a larger sample size and better representation. While our sample was small, we had responses from clinical coding managers in most provinces in Canada, and believe our participants to be a reasonable representation of coding managers in Canada. Further, we recognise that physician perspectives would provide unique qualitative information to the current research question, although clinical coding managers provide valuable insight into the management and regulatory bodies governing clinical coding processes. This qualitative study is unique in that it explicates organisational processes that expose new information about hospital data quality. It may have benefited from using an institutional ethnographic approach from the outset, in order to have sought richer ethnographic descriptions of managers' everyday work as it may affect the quality of the clinically coded data.

We have provided novel suggestions for improvement in this field, and critically timed prior to the implementation of ICD-11. We suggest system-level changes that could be made to physician documentation. Transitions to EMRs with standardised templates may facilitate consistent documentation, and ensure correct information is entered (e.g. primary diagnosis) for more reliable clinical coding (Kuhn et al., 2015). The current study is part of a larger research programme at the University of Calgary, to identify coded data challenges to help develop ICD-11 and plan for its implementation. Further, by improving clinical coding practices and the quality of coded data, we illuminate that automated clinical coding systems are needed. Our team is currently creating a measure to assess hospital chart quality. In addition, there is also a need to create a comprehensive measure or indicator of hospital data quality in Canada to help improve healthcare system performance.

Conclusion

By interviewing clinical coding managers in Canada, we examined barriers and facilitators of coded data quality at a higher institution level compared to CCs' perspectives alone. The three overarching contributors of data quality included chart documentation and structure, resources and clinical coding standards. Further, aligning clinical coding standards with the various uses of clinically coded data can reduce issues in coded data quality; for example, coded data used for surveillance and research are hampered by limited coding of secondary conditions, resulting in underestimation of various conditions (e.g. depression). Previous thinking was inclined to attribute clinically coded data quality to the CCs themselves; however, this study has

countered that belief by providing evidence to suggest that system-level changes can dramatically improve the quality of clinically coded data used in research, hospital administration, surveillance and health policy.

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