WHERE TO START? A PRELIMINARY DATA QUALITY CHECKLIST FOR EMERGENCY MEDICAL SERVICES DATA

(Practice - Oriented Paper)

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Abstract: While national statistical offices and other central agencies that use administrative health data tend to have data quality programs in place, primary collectors of these data (e.g., hospitals or out-of-hospital medical service organizations) might be less likely to have such programs in place. This paper presents a preliminary Data Quality Checklist, which is based on the theory and practices from the Canadian Institute for Health Information, but is customized to facilitate ongoing data quality improvement for primary collectors of administrative health service data. The purpose of this paper is to begin formalizing the content of the Data Quality Checklist.

Key Words: Data Quality, Checklist, Administrative health data

INTRODUCTION

The issues associated with administrative health data are well documented (1, 2, 6, 13, 14). While the problems associated with these data are recognized, solutions might be less common. An instrument designed to facilitate ongoing data quality improvement, as well as the documentation of limitations for users has been made available by a central agency (8, 9). This paper presents a customized version of the existing instrument for primary collectors of Emergency Medical Services (EMS) data.

BACKGROUND & RATIONALE

While national statistical offices and other central agencies that use administrative health data tend to have data quality programs in place, primary collectors of these data (e.g., hospitals or out-of-hospital medical service organizations) might be less likely to have such programs in place. Unlike central agencies where data is the core function, health care service organizations most often collect these data secondary to, or as a by-product of, patient care. When patient care is under-resourced, it is at best difficult to justify and at worse unethical to divert precious resources to data quality improvement.

The difficulty in justification exists in part because the data are often under-utilized. The data are thus of poor quality, no matter how accurate. For example, it was felt by the press and public that too many patients were dying at the Bristol Infirmary – to the point of a Royal Inquiry (1). Administrative health data was analyzed in the course of the inquiry, but experts argued over its use. It was clear that the data had not been subjected to such scrutiny on a regular basis – and that such scrutiny may have saved lives. The data were not fit for such use.

We assume here that administrative health data should aim to be fit for such analytical uses, for example, public health surveillance in the Bristol Inquiry. Thus, it is reasonable to apply the metrics of the quality of health statistics and information to such data – in particular, Emergency Medical Services (EMS) data. This paper presents a Data Quality Checklist, which is based on the theory and practices from the Canadian Institute for Health Information (8, 9, 15) and Statistics Canada (11, 12). The checklist has been customized to facilitate ongoing data quality improvement for primary collectors of EMS administrative data.

Instrument: CIHI Data Quality Framework Evaluation Instrument, Version 1

The purpose of the CIHI Data Quality Framework Evaluation Instrument, Version 1, is essentially to facilitate ongoing data quality improvement and the documentation of limitations for users. The Instrument is organized as a four-level conceptual model and at the base of the model are 86 criteria. Once addressed, the criteria can be rolled-up using the Instrument algorithm into the second level of 24 data quality characteristics that, in turn, can be rolled-up into 5 data quality dimensions (i.e., accuracy, timeliness, comparability, usability, and relevance). Finally, the 5 dimensions can be rolled-up into one overall evaluation of a database (8, 9). The Instrument is generic to the over 20 CIHI data holdings and is applied on an ongoing basis. The Instrument in full is publicly available from Appendix B of: http://secure.cihi.ca/cihiweb/en/downloads/quality_e_Meta-Eval_Study.pdf.

Identical to the CIHI Instrument, the Data Quality Checklist is based on a multi-level model and the primary purpose of the Data Quality Checklist is to facilitate ongoing data quality improvement of EMS administrative data at "source". The second objective of the Data Quality Checklist is to facilitate the documentation of the limitations of the data for users. Without background and limitation documentation (i.e., "meta-data"), data are subject to misinterpretation.

PURPOSE

The purpose of this paper is to derive the content of the Data Quality Checklist for two primary data collectors: Toronto Emergency Medical Services and Toronto Base Hospital, as well as the Ontario Air Ambulance Base Hospital Program, Toronto, Canada. Simulated Data Quality Checklist scores are also presented for the purpose of illustration.

METHODS

The early stages of validating the Data Quality Checklist involved the field study of an important health care service database. The health care service database used in this study was from the Toronto Emergency Medical (EMS) Services system and Toronto Base Hospital. This system provides out of hospital emergency medical care and inter-hospital transfer services for a population of 2.2 million in an area covering 632 square kilometers. It comprises a single ambulance service (approximately 850 paramedics) and a single fire service (approximately 2500 firefighter first responders) under the medical direction of a single base hospital (known as "Base Hospital"). The Base Hospital provides certification of providers, a quality assurance program and sets the medical directives. This EMS system responds to approximately 180,000 emergency calls annually using a tiered response system in which the nearest fire service crew and ambulance service crew (basic or advance life support level) are preferentially dispatched. The Base Hospital and EMS service use a computerized data capture system, which consists of a direct download of dispatch times, and employ data entry specialists who enter selected variables abstracted from an emergency call report generated by the paramedic shortly after care was provided to the patient. A copy of this ambulance call report stays at the hospital and becomes part of the hospital record.

Specifically, the relevant data retrieval forms, form manuals, data abstraction methods, database specifications, and available reports were reviewed by two of the authors (Robertson and Long). This facilitated the development of the Data Quality Checklist. The Canadian Institute for Health Information (CIHI) Data Quality Framework Evaluation Instrument, Version 1, was also closely reviewed in light of the issues relevant to a primary collector of administrative data. Given that a primary collector might have more direct control of the data collection process, a new accuracy characteristic entitled *Form Design and Completion* based on 10 criteria was created. Criteria were added to the *Collection* and *Bias* characteristics. Reliability and validity criteria were also added since a primary collector might also be in a better position to test these aspects of their data.

For the sake of comparability, the Data Quality Checklist is based on the 6 Statistics Canada dimensions, which have been adopted internationally. The criteria might easily be reorganized to reflect the CIHI model, which is based on 5 similar dimensions.

Instrument: Data Quality Checklist

The language used for the Data Quality Checklist is purposefully straightforward so that people from different fields or without methodological expertise can use it without difficulty. The resulting Checklist consists of 90 questions or "criteria" that are designed to capture whether key aspects of what is now considered to be data quality are met. The criteria are organized into groups that are designed to measure the 6 dimensions of data quality according to Statistics Canada (i.e., relevance, accuracy, timeliness, accessibility, interpretability, and coherence). The groups capture the more measurable or tangible "characteristics" of these dimensions. The methods used to complete and score the Checklist are identical to the CIHI model (8, 9). The Checklist is completed by database staff and each of the 90 criteria is meant to be scored as "unknown (1)", "not met (2)", or "met (3)". Each score must be briefly substantiated in writing.

While the Checklist scores provide a detailed view of an administrative holding, summary information is often required. A preliminary scoring algorithm is provided to illustrate how the results can be rolled-up from 90 "criterion" scores to 24 data quality "characteristic" scores. According to the algorithm, the 24 characteristics in turn can be further simplified or reduced to the 6 "dimensions" of quality. In keeping with the CIHI method, each characteristic and dimension is scored as "unknown (1)", "not acceptable (2)", "marginal (3)", and "appropriate (4)" (8, 9). The preliminary algorithm is as follows:

The logic to roll-up the 90 data quality questions to the 24 data quality characteristics:

- If one of the criteria within a characteristic is "unknown" then the characteristic is scored as "unknown".
- If the status of all the criteria is known and more than half are "not acceptable" then the characteristic is "not acceptable".
- If the status of all the criteria is known and half are "met" then the characteristic is scored as "marginal".
- If all the criteria are "met" then the characteristic is "appropriate".

The logic to roll-up the 24 data quality characteristics to the 6 data quality dimensions:

- If one of the characteristics within a dimension is "unknown" then the dimension is scored as "unknown".
- If the status of all the characteristics is known and at least one is "not acceptable" then the dimension is "not acceptable".
- If the status of all the characteristics is known and they are a combination of "marginal" and "appropriate" then the dimension is scored as "marginal".
- If all the characteristics are "appropriate", then the dimension is "appropriate".

Upon completion, priority recommendations for database improvement are put forth and the database manager and senior manager sign and date the Checklist. The Checklist can be used to help identify priorities, as well as design and stimulate new data quality programs. Moreover the Checklist can be used on an ongoing basis to track ongoing data quality improvement through time (e.g., bi-annually). In summary, the criteria are mostly from the CIHI Data Quality Framework Evaluation Instrument, Version 1 (8) and provide the base for a three-level model that is designed to capture the concept of data quality (see Figure 1).

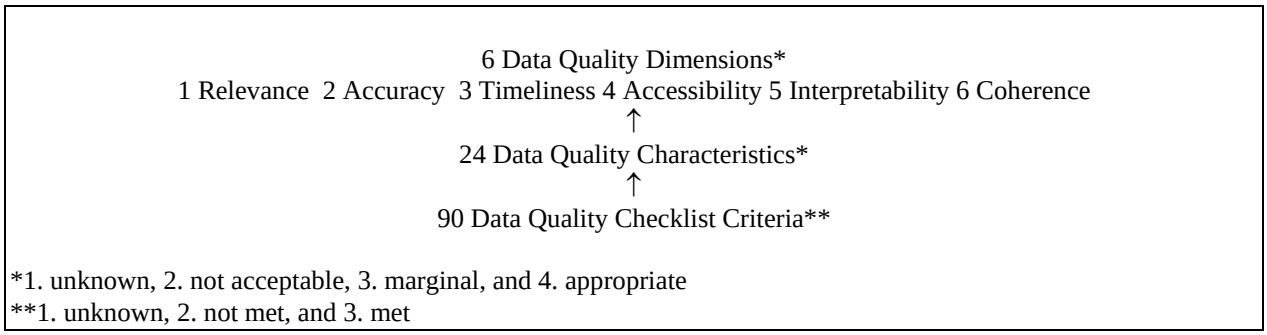

Figure 1: The preliminary Data Quality Checklist Three-Level Model

Data were simulated to illustrate how the Data Quality Checklist scores might be summarized. The simulated data might be interpreted as the results for one database across 5 years (e.g., one ambulance call report database across 5 years), the results of comparable databases across 5 peer organizations (e.g., ambulatory care records abstracts for 5 regions), or the results of multiple administrative databases within one organization

RESULTS

The results of a review of an important health care service database were used to customize the data quality evaluation work conducted at the Canadian Institute for Health Information for primary collectors of EMS administrative data. The Data Quality Checklist is the result of this work. The Checklist in its

entirety is as follows.

The Preliminary Data Quality Checklist

1. Relevance

1.1 Value

1.1.1 The purpose of the data is clear

1.1.2 The data shed light on the issues of most importance to users and the data are used in policy formulation and decision making

1.1.3 There are no other more valid sources for the data

1.1.4 Client liaison mechanisms are in place and client needs are monitored

1.1.5 How the data are used is known and well understood

1.1.6 Client evaluations are conducted and reviewed

1.1.7 The data are found to meet the needs of its users

1.1.8 The data are found to be worth the resources dedicated to its production

1.2 Adaptability

1.2.1 The data can be used to inform emerging issues and can adapt to change

1.2.2 Ongoing explicit program review and priority determination are conducted

2. Accuracy

2.1 Form Design and Completion

2.1.1 The data retrieval form was designed by a team that includes methodologists, a form design expert, representatives for those who are responsible for completing the form, as well as other subject matter experts

2.1.2 The purpose and population of interest are clear and well documented

2.1.3 There is adequate justification for each field gathered

2.1.4 The form is user-friendly and is accompanied by a clear, readily accessible, and user-friendly manual that describes in detail the data collection guidelines including when and how to complete the form and defines each field in detail

2.1.5 Those responsible for completing the form receive training so that they are able to properly complete the form

2.1.6 As part of training, the importance of the data is conveyed and those responsible for completing the form are tested and immediate feedback is provided regarding the reliability and validity of their performance

2.1.7 Those responsible for completing the form are allocated the time and have the motivation to do so, as well as confidence in the form completion process

2.1.8 The data are monitored for outliers, logical errors, completeness, and consistency and ongoing monitoring and constructive feedback is provided to the primary collectors where necessary

2.1.9 Any major revisions to the original form design, as well as purpose, structure etc… of the database and the dates of any major revisions are known, documented, and readily available. Moreover, an explicit consideration of overall trade-offs between accuracy, cost, timeliness, and respondent burden was conducted at the design stage

2.1.10 A revised form is pilot tested until high standards of reliability and validity are met and the pilot test results are readily available

2.2 Frame

2.2.1 The frame is known and documented

2.2.2 The frame is maintained in an ongoing manner

2.3 Over coverage

2.3.1 Only qualifying data suppliers are on the frame

2.3.2 The data are checked for duplicates and erroneous entries from qualifying suppliers

2.4 Under coverage

2.4.1 Data are received from all qualifying data suppliers on the frame

2.4.2 The list of those actually sending data are compared to independent lists

2.5 Response

2.5.1 The overall expected and actually received number of records are known and tracked per year and response across month is checked and compared against previous years

2.5.2 The amount of missing data per record is known and tracked per field per year and key fields (e.g., age, gender, and clinical code) are at least 98% complete.

2.6 Completeness

2.6.1 The patient service form/chart used for data retrieval form abstraction is easy to understand

2.6.2 The form/chart used for abstraction is complete

2.6.3 All patient encounters/visits are abstracted and represented in the database

2.6.4 All fields are systematically completed per patient record

2.7 Bias

2.7.1 Explicit standard guidelines are in place and adherence is monitored for data collection

2.7.2 Clear guidelines and training eliminate as much as possible the need for interpretation

2.7.3 For data that need to be classified, clear coding standards are available

2.7.4 For data that need to be classified, the available standards are adhered to

2.7.5 For data that need to be classified, only highly trained certified staff classify the data

2.7.6 Sources of bias (e.g., upcoding) are understood and eliminated if possible and ongoing quality assurance tests ensure that data collection, abstraction, and entry are conducted in a standard manner according to guidelines

2.8 Validity

2.8.1 The patient service form/chart is complete and reflects the patient encounter and the codesheet or abstract that is based on the form/chart reflects what is in the form/chart

2.8.2 Adequate resources are in place to ensure valid timely data and ongoing database improvement

2.8.3 Random audits and/or reabstraction studies are conducted and the data are compared to external sources of the same or similar data (if possible)

2.8.4 Validity coefficients are available and are greater than or equal to 0.8 for key data elements (i.e., postal code, patient age, most responsible diagnosis, procedures, and comorbities)

2.9 Reliability

2.9.1 Reliability studies of key data elements (e.g., age, gender, and clinical code) are conducted at regular intervals

2.9.2 Intra rater coefficients are available

2.9.3 Inter rater coefficients are available

2.9.4 Rater coefficients are greater than or equal to 0.8 for key data elements (i.e., postal code, patient age, most responsible diagnosis, procedures, and comorbities)

2.10 Collection

2.10.1 Standard data retrieval form is in place

2.10.2 Range checks are place for all fields at data entry and key logic checks are run (e.g., checks for clinical impossibilities or date of birth greater than call date)

2.10.3 Standard data specifications are provided to vendor(s)

2.10.4 Standard test data are used to test edits

2.10.5 Data entry software and equipment are user friendly

2.10.6 Staff is available and motivated to enter the data and data entry is monitored and constructive feedback is provide to staff

2.10.7 Edit errors are set aside and made available for analysis

2.10.8 Data entry of abstracted data takes place in close proximity to the original data (original forms / charts)

2.10.9 Error detection reports are generated

2.10.10 Error correction is documented

2.11 Processing

2.11.1 All programming is tested and the results are documented

2.11.2 Ongoing quality control checks are conducted on electronically extracted data

2.11.3 Documentation on how the various systems involved interact, extract, change, and/or append the data exists and is available

2.11.4 Ongoing tests are run to ensure all systems are interacting properly

2.12 Imputation

2.12.1 Imputation is automatically derived

2.12.2 The raw data are preserved

2.13 Analysis

2.13.1 Edit errors are analyzed

2.13.2 Error detection analyses are conducted and the data are checked for missing data

2.13.3 Outliers or other suspicious data are investigated

2.13.4 Regular standard summary analyses are conducted and made available

3. Timeliness

3.1 Data currency

3.1.1 The time between original form or chart completion and data abstraction is reasonably brief

3.1.2 The time between the end of the reference period to which the data pertain and data release is reasonably brief

3.1.3 The official date of release was announced in advance of the release

3.1.4 The official date of release was achieved

3.2 System efficiency

3.2.1 Database methods are regularly reviewed for efficiency

3.2.2 Processing methods are regularly reviewed for efficiency

4. Accessibility

4.1 Awareness

4.1.1 The existence of the data can be ascertained

4.1.2 Standard tables and analyses are produced and made available per reference period

4.2 Ease of access

4.2.1 The data are well organized and readily available for users

4.2.2 Privacy and confidentiality rules related to accessibility are adhered to

5. Interpretability

5.1 Documentation

5.1.1 The limitations of the data are documented for users using a standard format and the documentation is readily available for users

5.1.2 The supplementary information and metadata necessary to interpret and utilize the data appropriately are kept up to date and are readily available

5.2 Education

5.2.1 Examples of how the data can be used appropriately are provided

5.2.2 Staff is available to answer questions about the data and to aid interpretation

6. Coherence

6.1 Standardization

6.1.1 All data elements are compared to a standard data dictionary in an ongoing manner and for classified data, standard classification methodologies are used (e.g., ICD10)

6.1.2 As many data elements as possible conform to a standard data dictionary

6.1.3 Data are collected at the finest level of detail as is practical

6.1.4 For any derived variable, the original variable or variables are also maintained

6.2 Linkage

6.2.1 Standard Geographical Classifications (SGC) can be used

6.2.2 Data are collected using a consistent time frame (e.g., fiscal year)

6.2.3 Codes are used to uniquely identify institutions (e.g., hospital numbers) and persons (e.g., health insurance number)

6.2.4 Privacy and confidentiality rules related to record linkage are adhered to

6.3 Historical Comparability

6.3.1 Trend analysis is used to examine changes in key data elements over time and breaks in the series are explained

6.3.2 Documentation of changes in concepts or methods exists and is readily accessible

Simulated Results

Again, each of the 90 criteria are scored as “unknown (1)”, “not met (2)”, or “met (3)” and the characteristic and dimension scores are “unknown (1)”, “not acceptable (2)”, “marginal (3)”, and “appropriate (4)”. Fictional criterion level data are presented in Table 1 to illustrate how these scores can be displayed.

Dimension	Criterion	Items	1	2	3	4	5
Coherence	Historical Comparability	12	21	22	22	32	33
	Linkage	1234	1123	1123	2223	3223	3333
	Standardization	1234	2123	2123	2223	3223	3333
Interpretability	Education	12	31	32	32	32	33
	Documentation	12	11	21	23	23	33
Accessibility	Ease of access	12	12	22	22	22	33
	Awareness	12	23	23	23	33	33
Timeliness	System efficiency	12	33	33	33	33	33
	Data Currency	1234	3222	3322	3333	3333	3333
Accuracy	Analysis	1234	2222	2223	2223	2223	3333
	Imputation	12	12	12	22	22	33
	Processing	1234	2223	2223	2223	2223	3333
	Collection	12345678910	2332222222	2333222223	2333222223	2333222223	3333333333
	Reliability	1234	1122	3122	3222	3222	3333
	Validity	1234	1122	1132	2232	2232	3333
	Bias	123456	111112	222212	222222	222222	333333
	Completeness	1234	2211	2211	2222	2222	3333
	Response	12	11	22	22	23	33
	Under coverage	12	22	22	22	23	33
	Over coverage	12	22	22	22	32	33
	Frame	12	32	32	32	33	33
	Form Design & Completion	12345678910	2222222222	2222222223	3222322223	3322322223	3333333333
Relevance	Adaptability	12	22	32	33	33	33
	Value	12345678	23322223	23332323	33332323	33333333	33333333

*Simulated criterion score 1=“unknown”, 2=“not met”, and 3=“met”

Table 1 Simulated Data Quality Checklist criterion scores*

The 90 scores for each criterion are presented across an arbitrarily chosen number of 5 levels. If the 5 levels are interpreted as the results for one database from year 1 to year 5, then much was unknown or not met in years 1 through 3. If the 5 levels are interpreted as 5 comparable peer databases, then whereas much is known and met for database 5, much is unknown or not met for databases 1 to 3.

Based on the preliminary algorithm, the simulated criterion scores were rolled-up to 24 data quality characteristics (see the Methods section) and the characteristic scores are presented in Table 2.

	Relevance		**Accuracy**													**Timeliness**		**Accessibility**		**Interpretability**		**Coherence**		
	Value	Adaptability	Form Design & Completion	Frame	Over coverage	Under coverage	Response	Completeness	Bias	Validity	Reliability	Collection	Processing	Imputation	Analysis	Data Currency	System efficiency	Awareness	Ease of access	Documentation	Education	Standardization	Linkage	Historical Comparability
1	2	2	2	3	2	2	1	1	1	1	1	2	2	1	2	2	3	3	1	1	1	1	1	1
2	3	3	2	3	2	2	2	1	1	1	1	2	2	1	2	3	3	3	2	1	2	1	1	2
3	4	4	2	3	2	2	2	2	2	2	2	2	2	2	2	4	4	3	3	3	2	2	2	2
4	4	4	3	4	3	3	3	3	3	3	3	3	3	3	3	4	4	4	3	3	3	3	3	3
5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

*Simulated characteristic score 1="unknown", 2="not acceptable", 3="marginal", and 4="appropriate"

Table 2 Simulated data quality characteristic scores*

Similar to the criterion level scores, though fewer in number, the characteristic scores indicate either much was unknown or not acceptable during years 1 through 3. Lastly, the algorithm was used to roll-up the 24 data quality characteristics to the 6 dimensions of data quality according to the Statistics Canada model (i.e., relevance, accuracy, timeliness, accessibility, interpretability, and coherence). Table 3 depicts the dimension scores.

	Relevance	Accuracy	Timeliness	Accessibility	Interpretability	Coherence
1	2	1	2	1	1	1
2	3	1	3	2	1	1
3	4	2	4	3	2	2
4	4	3	4	3	3	3
5	4	4	4	4	4	4

*Simulated dimension score 1="unknown", 2="not acceptable", 3="marginal", and 4="appropriate"

Table 3 Simulated data quality dimension scores*

DISCUSSION

The purpose of this paper is to derive the content of the Data Quality Checklist for two primary data collectors of Emergency Medical Services (EMS) data: Toronto Emergency Medical Services and Toronto Base Hospital, as well as the Ontario Air Ambulance Base Hospital Program, Toronto, Canada. Simulated Data Quality Checklist scores are also presented for the purpose of illustration.

The primary objective of the Data Quality Checklist is to facilitate data quality improvement for primary collectors of administrative health services data. Though Checklist scores are highly confidential and for internal purposes only, the documentation that is required to substantiate the scores can be easily re-formatted (minus the scores) for external users. It goes without saying that, without good meta-data, data are subject to misinterpretation. Hence the second objective of the Checklist is to facilitate the documentation of data limitations for users.

Tables 1 through 3 depict fictional data for the purpose of illustrating what Data Quality Checklist scores and summary scores might look like. If the 5 levels are interpreted as the results for one database across 5 years, then based on the scores much was "unknown" or "not met" in the early years. However, great progress in every area was made by year 5. Each row might also be interpreted as the results from 5 comparable peer organization databases within one year or the results of 5 databases within one organization. In either scenario, the organizations or database teams with the lower scores might learn from those with higher scores or might be in a position to call for more resources.

If peer organizations adopt the same data quality improvement and meta-data procedures, then data might be more readily pooled and more valid peer comparisons might result. A standard approach within an organization with more than one database might enable a fair distribution of resources.

Though annual results are presented, a more likely plan might be to complete the Checklist on a bi-annual basis to identify and prioritize data quality improvement activities for a database team. The team ideally

would consist of clinical content experts (e.g., paramedics and physicians), IT staff, as well as a consulting methodologist (e.g., statistician or epidemiologist). Such a team might target improvements at the criterion level. If resources are not available to complete the entire Checklist, a team might choose to focus on the criteria from one dimension (e.g., accuracy). Even with a bi-annual administration of the Checklist, progress in addressing priority findings needs to be followed on an ongoing basis (e.g., monthly or once a quarter). The Checklist must be only one part of a broader data quality process.

Any data quality initiative needs the backing of senior management. Full disclosure needs to be encouraged and anonymity for individual staff must be reassured. Senior management, in collaboration with database staff, must be responsible for adjudication and resource allocation once an evaluation is completed.

To facilitate the implementation of the Checklist, it is essential that staff is assured that the scores are in no way a reflection of their personal abilities, and that they are given reasonable time to perform data quality improvement activities. The process needs to be kind and sensitive to the paramedics, as well as the database staff. The objective is to evaluate the database in a clear and standard way for the purpose of data quality improvement. The Checklist should be used as a tool to enable staff to improve their data holding. Other resources, in addition to time, required to carry out priority improvements must also be made available to staff (e.g., technical support or equipment). The summary scores might facilitate decision making for management and senior management.

LIMITATIONS

Only one health care service database was studied in the field, i.e., “at source”, and to date, feedback has not been solicited from the database staff. Though only one holding was studied, it is anticipated that the Checklist is generic enough to apply to both the land and air EMS data holdings in Toronto and for Ontario, respectively, as well as for other primary collectors of administrative health service data. The collaboration of database staff and content experts is obviously crucial so that key issues are reflected in the content of the Data Quality Checklist. Future work might include a formal data quality survey of database staff, as well as paramedics in the field (5). This will enhance the application process and ensure the feedback is constructive and pertinent. Feedback from the Total Quality Management field is also crucial. This paper represents a first attempt at both.

The list of preliminary criteria needs to be applied to the two EMS databases under study. In the interest of comparable results or linkage ability, a standard or generic checklist for primary collectors would be ideal so, not only do more administrative databases need to be studied in the field, but feedback from other database teams is needed. Though 90 criteria might seem like a large number, the current criteria are not refined enough to target specific key fields within a database. A future version of the Checklist should enable database staff to pinpoint, improve, and track the quality of key fields within their database. Tracking criteria that are designed to improve the quality of key fields might be one way to track specific areas (e.g. patient demographics or co morbidities). Since data warehouse expertise is important for data quality (4), the Checklist might benefit from the collaboration of data warehouse experts.

In the interest of time and space, no definitions are provided. It is hoped that the terms and phrasing used are self-explanatory enough for feedback regarding the content of the Checklist. Definitions will be included for future versions of the Checklist.

CONCLUSION

While the problems associated with administrative health data are well documented (1, 2, 6, 13, 14), solutions are less forthcoming. This paper presents a simple multi-level method for primary collectors of Emergency Medical Services (EMS) administrative data that is designed to facilitate ongoing data quality improvement, as well as the documentation of limitations for users. The method was based on an instrument available from the Canadian Institute for Health Information, which is designed to improve the data holdings of a central agency. The method can be an important starting point for any new data quality initiative. The method allows a consideration of quality at different levels. For example, it can be used to provide a crude overview of the relevance, accuracy, timeliness, accessibility, interpretability, and coherence of a database or it can be used to drill down to specific priority areas. The method might be used as a communication tool across database personnel fields (e.g., information technology, database administration, and medical). While the purpose of this paper is to begin formalizing the content of the Data Quality Checklist, the larger aim is to enable the improvement, however small, of two vitally important sources of health data.

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