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Final Report
Patient Matching Community of Practice

Guidelines for Pilot Testing of Data Management Maturity ^{sm} Model for Individual Data Matching

Submitted to

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Executive Summary

This document is intended to serve as the Guidelines for pilot testing of a Data Management Maturity [sm] Model (DMM [sm]) to be implemented in a healthcare setting to improve linking and matching patient healthcare records for individual data matching. These guidelines were developed by Venesco, LLC, as part of the deliverables for its ONC Community of Practice contract #14-233-SOL-00533. Its content was determined by Venesco, in close collaboration with the members of the Patient Matching Community of Practice (CoP), who provided the real-world insights that informed this document. There are two primary objectives for the pilot: 1) to validate that a duplicate rate measure is a universal industry measure that can be used to assess the accuracy of matching and linking patient records within (and ultimately between) care settings, and 2) to validate that the use of the DMM [sm] contributes directly to the reduction of the rate of duplicate records created in a care setting.

The pilot will also provide insights useful in refining a DMM [sm] to prepare it for more definitive testing. One or more pilot health care delivery sites will be selected for this testing which will meet certain requirements for participation. The timeline for the pilot test is anticipated to be nine (9) months in duration. Each site will need to be assessed for any current data management strategy components, and a plan will be established to execute on a full DMM [sm] based on the site's current state. While there are many principal areas within the DMM [sm]; a unique element for this scenario is the inclusion of the Data Quality Maturity Model (DQM) that specifically identifies the data attributes, processes and reporting needed to measure and improve the matching of patients' electronic healthcare records.

It is important to note what is unique and novel about this approach as well as any underlying assumptions. Establishing a DMM [sm] within the healthcare industry is intended to provide a basis to enhance and foster trust and interoperability. The DMM [sm] will provide a format that will encourage standardization and thereby improve the quality of data used to match and link records. The DMM [sm] also provides an implementation framework that can be used regardless of the size and type of healthcare organization. The objective of establishing a DMM[sm] in a healthcare setting is not to evaluate matching algorithms or analytic tools, nor to compare the benefits of deterministic vs. probabilistic matching approaches, nor to evaluate vendor products. There is an expectation that establishing a DMM[sm] in a healthcare organization will be health IT vendor agnostic; decrease the administrative burden and cost of healthcare delivery; and establish performance measures, standards, terminology and best practices that are recognized and utilized nationwide.

1 Introduction and Background

It is of critical importance to accurately link and match a patient's electronic healthcare records to ensure a reliable longitudinal healthcare record. As stated in the 2013 Office of the National Coordinator for Information Technology's (ONC's) Patient Identification and Matching Final Report[1]: "Matching records to the correct person becomes increasingly complicated as organizations share records electronically using different systems, and in a mobile society where patients seek care in many healthcare settings. Many healthcare organizations use multiple systems for clinical, administrative, and specialty services, which leads to an increased chance of identity errors when matching patient records. Additionally, many regions experience a high number of individuals who share the exact name and birthdate, leading to the need for additional identifying attributes to be used when matching a patient to their record." ONC and others have had been concerned about the reported lack of consistent patient matching standards among health systems, electronic health records (EHR), Health Information Exchange (HIE), and algorithm vendors, and in other settings.

As a follow up to this report, ONC selected Venesco LLC as its contractor to facilitate and support the Patient Matching CoP as well as synthesize the CoP learnings into reports and other deliverables, such as this guidance document. The CoP membership consisted of a variety of stakeholders with a keen interest in patient identification and matching that included hospitals, health systems, public health agencies, HIEs, research/quality improvement organizations, HIT trade associations, and others. The CoP and its activities are described in more detail in a white paper developed by Venesco to describe the evolution and accomplishments of the Patient Matching CoP and its development of the Data Management Maturity^{SM} Model.[2] In addition, the CMMI Institute has been a source of industry expertise in supporting the core aspects of a Data Management Maturity (DMM^{SM}) Model.

The pilot will approach the task of matching a patient and his/her electronic medical records with the understanding that in order to improve the accuracy of matching patients to their medical records (while assuring that the records within the episode of care as well as across episodes of care continue to be correctly linked), they must consider: (a) the technology (health information systems involved in capturing and preserving the records), (b) the process (organizational policies and practices related to patient/record identification and matching); (c) the collection of appropriate data elements recorded in standard formats; and (c) as the result, the quality of the data captured in the record and across the record. The CMMI Institute has augmented their Data Management Maturity (DMM^{SM}) Model to support and address these considerations.

The DMM^{SM} is an assimilation of data management best practices organized in six practice areas[3]:

1. Data Management Strategy
2. Data Standards Adherence
3. Data Quality
4. Operations
5. Platform and Architecture
6. Support Processes

2 Development of a Data Management Maturity (DMM[SM]) Model for Individual (Patient) Data Matching

1. Data Management Strategy

   The data management strategy will provide a framework for a common understanding of terms and definitions about structured and unstructured data supporting business processes for all stakeholders (see appendix for a stakeholder value proposition matrix). The advantages of a data management model include its intended independence of specific vendors and its neutral application across vendors, health systems, and other settings where patient matching is required.

2. Data Standards Adherence

   The data adherence component will include governance management, a business glossary and metadata management. There are certain organizational polices that need to be established and adhered to that will ensure best outcomes as related to patient electronic health records matching. For example, a set of HIM (Health Information Management) policies describing a duplicate record correction process, patient identification, standardized naming convention, etc. Each policy will include a purpose, the policy description, who is responsible, and any other related information.

3. Data Quality

   In addition to a data quality strategy, this section will include details regarding data profiling, quality assessment and data cleansing. Within the data quality strategy there is a Data Quality Maturity (DQM) scale that provides a framework that will be used to define a common set of data elements with standard data conventions to establish a standard format for the collection of data that may be used to match and identify patients with their records. Within the data quality scale there will be a defined list of data elements specifically used at registration to match patients with their electronic health records. The levels within the scale are determined by the required data elements identified, with Level 1, the lowest level, including the most basic level of data elements, e.g., first and last name, date of birth, gender, phone, address. As the levels progress from 1 to 5, additional data elements are available to further reduce duplicate records, e.g., middle name, cell phone, mother's maiden name. The highest data quality level (5) includes various identifiers, such as biometrics, insurance plan ID, Medicaid ID, and Medicare ID. See **Figure 1** for the Data Quality Maturity Scale.

   Including this DQM in the pilot will allow for the following: Expansion of the appropriate data elements collected and assessing the extent of improvement in the process and format of such data collection; the degree of ease, burden, or cost/cost savings associated with training and implementing the model; degree of change in data quality maturity level between baseline and following full implementation; degree of change in the patient matching success rate between baseline and following full implementation; and specific recommendations for changes in the Model and/or its implementation.

Figure 1. Data Quality Maturity Level Scale*†

Item	Level 1	Level 2	Level 3	Level 4	Level 5
Data Attribute	Given Name* Last Name* Date of Birth* Gender* Middle Initial Suffix† Race Primary Phone #* Address* Street* State* Zip*	Middle Name Mother's Maiden Name Prefix† Marital Status†	Alias or Previous Name USPS Address† Identifier Last 4 SSN* DL Passport Alien ID#	Multi Birth† Birth Order† Birth Place E-mail* Previous Address† Previous Cell Phone(s) † Quality Assurance Process†	Insurance ID/policy* Insurance Plan Name† Previous Insurance Medicaid ID Medicare ID Biometric ID*
Supporting Process	-	-	Daily Reconciliation	Quality Assurance Process	-
Required Reporting	Confirm % captured	-	-	-	-

Data Elements in green with asterisk (*) are in the proposed rule
Data Elements in blue with dagger (†) require structured data capture

4. Operations

   Standard operating procedures (SOP) will ensure certain requirements, definitions and data life cycle management practices that are consistent and support the pilot goals. SOPs will complement the specific processes needed to accomplish specific patient matching scenarios, staff training, report requirements and other activities.

5. Platform and Architecture

   Platform architecture is especially important when we think about the 'handoff' of information between systems and organizations. This is a cornerstone for interoperability. The platform architecture section of the data management strategy will support the architectural approach and standards, the data management platform, data integration, data history, archiving and retention.

6. Support Process

   The process section of the data management strategy will support the measurements and analytics needs, process management, process quality assurance, risk management and configuration management. There will be strong focus on the process work flow around and actual duplicate records and potential duplicate records.

Table 1 defines the levels within the data management model.

Table 1. Levels in the Data Management Model

Level	Description	Objective
1. Performed	Processes are performed ad hoc	Logical data model attributes are created
2. Managed	Processes are planned and executed in accordance with policy	Standard terms are published, each term has a unique name and definition
3. Defined	There is a predictable measure of consistency	Approved business terms are used in shared repositories, data transfer mechanisms, semantic models, etc.
4. Measured	There are formal processes for managing variances	Standard industry terms and properties are established and used
5. Optimized	Process performance is continually improved through both incremental and innovative improvements	The business glossary is enhanced with all applicable business rules, and ontology / semantic structures

2.1 Pilot Guidelines

The remainder of this document describes the guidelines that may need to be completed by "The Site" to fulfill the feasibility, implementation, reliability and validity testing requirements.

Measure: The proposed measurement standard will be a retrospective duplicate rate:

- # of actual duplicate records / # of registrations (patient records) = actual duplication % rate

Duplicate Record: more than one entry or file for the same person in a single facility (database) - level MPI. This causes one patient to have two or more different medical records within the same facility.[3]

2.1.1 Pre-requisites for Site Participation

- Has a current registration workflow in place that documents:
  - The registration process for all registration settings, including but not limited to:
    - Phone registration
    - In person registration
    - Self-registration
    - Emergent registration
  - Eligibility process steps
  - Reconciliation process steps
- Ability to assess The Site's level within the data management model.
- Be able to provide their baseline actual duplication rate and report their duplicate rate on a monthly basis during the pilot.

- Commit to the training and other interventions needed to increase their data quality maturity level.
- The Site will document and share any changes or tuning to their matching algorithm during the pilot.
- Be able to provide information needed to improve level within the maturity model.
- If The Site has an Institutional Review Board (IRB), it is their obligation to manage any requirements and comply with all agreed upon milestones and timelines.
- The site's patient matching vendor's algorithm must already include the required data elements within the data quality maturity scale OR the algorithm vendor must express written willingness to add these specific data elements to the algorithm. This is important to allow for the accurate assessment of pre-post differences in the patient matching success rates.

2.1.2 Personnel and Resources

An individual project Director from a funded organization will lead the pilot project.

Other key personnel on the project will be a designated Site Project Manager in each site. The Site Project Manager will also assure that the implementation and evaluation of the pilot are carried out as designed. The Site Project Manager will work closely with registration desk personnel and other staff in the facility to assure appropriate training and process changes. Each site will also create a Project Team that will consist of the Site Project Manager, the Project Director and other key personnel.

2.1.3 Guidance on Tasks and Suggested Timeline

Task 1: Start-Up Activities and Site Selection (Month 1). Start-up activities will include the final refinements of the DMM[sm] specific for The Site. This task will also include the negotiation and signing of the Business Associate agreements and other required MOUs/agreements between the awarding organization and The Site, and the formal designation of the Project Director and a Site Project Manager in each pilot site. The Project Team will conduct an environmental scan to assess the current data management practices in place including the data elements currently captured in the registration processes. (Note: Because this project represents a quality improvement initiative, it is anticipated that the pilot will not be classified as research, but rather as operations/quality improvement, so it is the responsibility of the participating organization to follow the appropriate internal review process as needed.)

Task 2: Site Activities Preparatory to Pilot Intervention (Month 2). These activities include: developing an action plan to implement the DMM[sm], documentation of the current duplicate rate, development and planning of training material for the Project Team.

Task 3: Initiate the Pilots in Project Site(s) (Month 3). The project will be initiated in the pilot site(s) during Month 3, which will entail an in-person site visit in each site by the Project Director to meet with the site Project Team to more fully explain the program and to answer questions, the collection of the baseline data on maturity level and patient matching rate, and the

training of registration desk personnel and other relevant staff in the new approach to data quality recording.

Task 4: Launch of the Full Implementation and Early Assessment of the Adequacy of the Implementation (Month 4-5). This launch phase will entail Site Project Manager's monitoring and troubleshooting any new processes to assure that the intended changes/improvements are being instituted within the intent of the data management model. There will be extensive communication and liaison between the Project Team and Project Director in this launch phase. It is anticipated that there will be problems and issues that typically arise in new programs that will need to be addressed by the Project Team working together. Any major problems will be brought to the attention of the Site Project Manager and Project Director for resolution. An interim report will be generated at the end of Month 5 to provide an update on the project's progress in each site.

Task 5: Continuation of Intervention (Month 6-7). The pilot intervention will continue for another 2 months to assure time to solidify the new registration data quality process procedures and for the site to completely implement the changes needed to qualify for a higher placement on the data management model. Frequent communication will continue between the Project Director and the site personnel to identify any problems that arise throughout the course of the intervention pilot.

Task 6: Evaluation and Impact Assessment Activities (Month 8). During this important phase, the qualitative and quantitative impact evaluation will take place, focusing on both the new data quality process (interviews with site personnel concerning how easy or difficult it was to implement and the extent to which the intended changes in data quality, process, and format, were actually made) and on the key outcomes (was the site able to increase its level within the data management model and, if so, was there an improvement in its patient matching rate?). The Project Director and Project Site Manager will also solicit from site personnel opinions of strong features of the data management model as well as recommendations for changes or refinements.

Task 7: Development of Final Report and Recommendations (Month 9). The Final Report will be developed during the last month of the Project, outlining the key findings of the pilot project as well as recommendations regarding any needed further refinement of the data management model. If there is more than one site, any relevant differences in the process and outcomes at the two sites will be highlighted and discussed. Meetings with relevant leaders will be scheduled to present and discuss the findings and determine the appropriate next steps.

Example Deliverables Table and Timeline

#	Activity	Deliverable	Completion
	Task 1-2: Start Up and Pre-Intervention Activities (Months 1-2)		
1	Refinement of the DMM℠	Pilot-ready Model	10 days after start
2	Create project plan	Agreed to project plan	20 days after start
3	Signing of collaborative agreements	Signed agreements at sites	30 days after start
4	Kick Off Project Meeting	Kick Off mtg. held	40 days after start
5	Weekly Project Meetings	Site designation of attendees at weekly project mtgs.	Weekly
6	Collection of baseline measures	Level and Match rate measured	50 days after start
7	Monthly Progress Reports	Monthly Report submitted on time	Due monthly on 2nd Monday of following month
	Tasks 3-4: Pilot Intervention Launch and implementation in pilot site(s) (Months 3-5)		
8	Training of site personnel in new data quality processes	Training complete in sites	30 days
9	Implementation of new processes in facility	Attestation of initial implementation by project managers	45 days
10	Early assessment of implementation adequacy and needed problem resolution	Awarding organization interviews with project managers	75 days
11	Weekly meetings continue		Weekly
12	Monthly Progress Report (1st qtr.)	Submitted	Due end of month following end of reporting quarter
13	Interim Progress Report	Submitted	End of Month 5
	Task 5: Continuation of Intervention (Months 6-7)		
14	Monthly Progress Report (2nd qtr.)	Submitted	Due end of month following end of reporting quarter
	Task 6: Evaluation and Impact Assessment Activities (Month 8)		
15	Evaluate DMM℠ placement and duplicate rate measure	Data collection and evaluation analysis complete	30 days
16	Interviews of site personnel	Completed	30 days
	Task 7: Final Report (Month 9)		
17	Final data analysis and the writing of the Final Report including recommendations concerning refining the DMM℠, matching performance measure (duplicate rate) and next steps.	Submitted	30 days

3 References

1. http://www.healthit.gov/sites/default/files/patient_identification_matching_final_report.pdf
2. Developing and Testing a Data Management Model and Maturity Scale Tailored to Improving Patient Matching Accuracy. White Paper developed by Maggie Gunter, Venesco LLC under Contract #14-233-SOL-00533. September, 2015.
3. http://www.himss.org/jhim/archive/volume-29-2015
4. http://library.ahima.org/xpedio/groups/public/documents/ahima/bok1_044000.hcsp?dDocName=bok1_044000