Patient Matching in Health Information Exchanges

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Introduction

Nationwide initiatives designed to improve the efficiency, safety, and quality of the delivery of healthcare are driving the adoption of interoperable health information exchange (HIE). In June 2014, the Office of the National Coordinator for Health Information Technology (ONC) released its 10-year vision to achieve an interoperable health information technology (IT) infrastructure,[1] which identifies patient matching as part of its three-year agenda. In the vision statement, the ONC reported that it "will also address critical issues such as data provenance, data quality and reliability, and patient matching to improve the quality of interoperability, and therefore facilitate an increased quantity of information movement."[2]

This growing demand for HIE brings the challenges of accurate patient identification to the forefront. A nationwide patient data matching strategy will facilitate patient matching and provide the foundation for interoperable HIE. This goal can be accomplished with the standardization of primary and secondary data elements, and adoption of a uniform data capture methodology.

Lack of a standard data set can lead to patient records not being linked to one another in the HIE, resulting in an incomplete health record being available to the provider for the patient being treated, thereby defeating the purpose of the HIE. Even more concerning is the potential for different patients being identified as the same, resulting in the possibility of improper care rendered on the basis of inaccurate patient information. In addition to patient care concerns, sharing inaccurate information also poses the risk of privacy breaches and erodes consumer confidence in the benefits of HIE. Errors in patient matching will only be compounded as healthcare organizations contend with advances in technology and the development and expansion of the eHealth Exchange (formerly known as the Nationwide Health Information Network).

Background

Historically, patient matching has been important within organizations to help identify duplicate medical records. When master patient indexes moved from paper to electronic, organizations gave little thought to data exchange, data formatting, or how data is entered into a person management system. In the past, data elements collected within a person management system were primarily used for billing purposes. Another challenge in the US healthcare system is that names are not unique and often change during a person's lifetime or are presented differently. For example, *Rob* or *Robert* can never be used to identify a patient except in conjunction with more reliable information. One of the largest unresolved issues in the safe and secure electronic exchange of health information is a nationwide patient data

matching strategy that would ensure the accurate, timely, and efficient matching of patients with their healthcare data across different systems and settings of care.[3]

Traditionally, patient matching has been done by health information management (HIM) professionals who manually review possible duplicate patients and manually update paper and electronic systems as needed. Manual review will not be sustainable in the future because electronic health records (EHRs) have created a vast amount of data that puts an undue budgetary burden on the HIE to employ additional staff responsible for ensuring data integrity. Currently, organizations are matching patient records within their own system but face challenges in incorporating patient matching techniques across care settings and different EHR systems.

As health IT innovation and system interoperability needs continue to grow, ensuring that patient data are accurate will be a key concern of many healthcare providers. Patients are taking charge of their healthcare and choosing to see different healthcare providers to address their conditions. This trend results in an increased need for organizations to share data, but the lack of a patient matching standard has prevented successful exchange. A patient match error could result in significant patient safety events, corrupt an organization's medical records, and put lives at risk. It is paramount that organizations seek to establish a real-time automated patient matching process. For HIE to be successful, standards for data capture, definitions, and formatting must be developed to allow an electronic system to accurately identify patients across disparate EHR systems.

A nationwide patient data matching strategy will assist in matching patient records in the HIE, as well as improve clinical care delivery, decrease the cost of duplicative diagnostic tests, link clinical results, provide accurate data for analytics, underpin research efforts, and establish a foundation for patient-centric care delivery. Standardization is also needed at the source of the data because individual healthcare organizations have different patient naming conventions, use different methods for identifying duplicate patient records in their own systems, and may have multiple records for a patient within their own EHR systems. When all EHR systems capture and store patient demographic elements in the same format, algorithms will be able to match patient records consistently within and across healthcare organizations. Regardless of which algorithm is used, healthcare organizations' use of consistent standards for patient identification will facilitate accurate patient matching.[4]

The adoption of a nationwide patient matching strategy that standardizes a set of patient demographic elements stored in a standard format would support existing models of patient matching such as the federated identity knowledge discovery model[5] and the centralized identity knowledge approach.[6]

Standardization of Primary and Secondary Data Elements

One of the most common solutions for patient matching has been to create a unique patient identifier. This identifier could consist of a single identifying element or use multiple standardized elements that would take a single form for all patients. A single patient's health information may be stored and identified through the use of multiple identifiers within a healthcare organization or across multiple organizations. Healthcare organizations and HIEs rely on the use of key primary and secondary demographic data elements available within unique systems to successfully link patient records.

Many HIEs have adopted patient identification approaches that use a unique identifier data element to establish identification within the boundaries of the HIE itself. In this approach, the HIE assigns a unique patient identifier (UPI) within the HIE and uses that identifier for patient matching purposes. A UPI can be provided to a patient by a regulatory body or authority. This approach has long been one of the most contentious issues in healthcare privacy because of uncertainty as to who provides and maintains control of the patient identifier. Many of the current HIE architecture designs revolve around control being placed into the hands of the HIE. This approach, although effective at the local level, creates a process that is out of alignment with national interoperability initiatives. The creation of local HIE patient matching architectures has generally not been successful in the United States because of the contention over the use of a universal patient identifier.

Existing standards that are widely accepted in the marketplace, such as the United States Postal Service (USPS) address definitions and the Council for Affordable Quality Healthcare (CAQH) and Uniform Hospital Discharge Data Set definitions, provide a means to normalize data across disparate systems. Increasing the data elements utilized and incorporating standard data definitions into technical requirements for person capture provides a solid foundation regardless of the algorithm. Instituting a standard format and accepted definitions for data element capture minimizes the burden on staffing in routine business operations, providing long term financial relief. Standardizing data element capture across the market will affect vendors financially and result in some time constraints in EHR architecture building. However, the positive results in accurate patient matching and successful interoperable HIE are of greater consideration.

Embracing standardized data attributes, requiring minimal primary data capture, and increasing the use of secondary data elements will provide a solid foundation for interoperability with patient linking. Figure 1 highlights recommended primary and secondary data attributes that will facilitate accurate patient matching. Appendix A outlines these primary and secondary data attributes in further detail with references to Health Level 7 (HL-7), Accredited Standards Committee X12 (ASC X12), and CAQH standards and recommendations from organizations including the National Committee on Vital and Health Statistics, the Healthcare Information and Management Systems Society (HIMSS), the ONC, the Office of Management and Budget, and the USPS.

Adoption of Sophisticated Patient Matching Algorithms and Integration Profiles

A fundamental and critical success factor for HIE is the ability to accurately link multiple records for the same patient across the disparate systems of the participating organizations. Algorithms can support many of the patient matching functions envisioned in HIE. In this approach, mathematical calculations and predefined rules are applied to pairs of patient records to facilitate matching of patient identifiers. Basic algorithms that compare selected data elements, such as name, date of birth, and gender, are the simplest technique for matching records. Intermediate algorithms use more advanced techniques to compare and match records by assigning subjective weights to demographic elements for use in a scoring system to determine the probability of matching patient records. Advanced algorithms contain the most sophisticated set of tools for matching records and rely on mathematical theory and statistical models to determine the likelihood of a match.

Two primary types of algorithms can be used to determine matching patient records: deterministic and statistical/mathematical algorithms. Deterministic record matching programs compare values in various fields to determine whether the values are an exact match or a partial match to the value of that field in another record. The primary challenge with this type of algorithm is that data elements must be exact for a match to be recognized, and any variation in elements is considered nonmatching, resulting in many false negatives and duplicate patient records. Structured values (such as gender, race, or marital status) can help facilitate patient matching with a deterministic algorithm, but the process becomes more challenging when dealing with variations in free-text elements, such as a person's name, or when demographics may have been captured incorrectly, such as an incorrect number in a patient's date of birth or Social Security number. Statistical/mathematical algorithms assign weights to near matches of data elements and then determine the probability of a match between the patient records. Thousands of different algorithms use statistical and mathematical constructs for patient record matching, and advanced algorithms often utilize a combination of many different algorithms.

Policies that are designed to support capturing demographics in a standardized format can also facilitate patient matching. The process of capturing data is an operational consideration that cannot be taken lightly. In this case, standards such as those developed by CAQH can assist because they provide rules that define how a patient's name is captured and exchanged. See Appendix B for a sample naming convention policy that provides structure for data entry where free text is required.

Although patient matching algorithms have been widely adopted, methods of matching patient records within and across organizations have not been adopted uniformly across the industry. No

consensus exists regarding patient matching accuracy thresholds, and each organization employs its own matching algorithm and patient matching methods, resulting in inconsistent results across the industry. Standards development organizations have developed integration profiles to resolve several algorithm issues related to patient matching. One of the most well-known of these profiles is the Integrating the Health Enterprise (IHE) Cross-Community Patient Discovery (XCPD) profile, which allows for Patient Identification (PIX) and Patient Demographic Query (PDQ) transactions to be conducted to facilitate patient matching across multiple organizations within a single HIE. The XCPD profile has seen widespread adoption as a standard for query-based exchange of patient records, and, in addition to a patient matching algorithm, XCPD and/or PIX and PDQ transactions can be used to help link multiple patient identities within or across healthcare communities.

Conclusion

Without accurate patient matching, providers may have incomplete information on their patients or may be presented with inaccurate information. A nationwide patient identification standard will facilitate patient matching and provide the foundation for interoperable HIE. This goal can be accomplished with the standardization of the following:

- Primary and secondary data elements;
- The use of industry-recognized data definitions;
- Elimination of free text, except for the name; and
- Separate data entry for data elements.

A common set of standardized data elements to be used across multiple interoperability standards is ideal to support accurate patient matching. While the organizational impact of increased data entry is a consideration, the capture of additional data elements enables significant improvement of patient linking accuracy until a unique patient identifier becomes available or biometric technology improves, providing a more cost-effective matching method. Secondary data recommendations increase matching probability in the pediatric population and also serve as an additional level for data triangulation in the adult population. Data integrity improves with the elimination of free text and the utilization of national data standards. Free-text entry is necessary for patient names, but capture of the complete legal name in discrete fields minimizes data entry errors.

Common data capture of demographic elements through uniform policies that are widely shared will help to overcome the policy variations across organizations and appropriately manage the free-text component of data entry for names. Continued use and adoption of existing technical profiles supports varying query and retrieval approaches for patient demographic data by providing flexibility to allow the use of various combinations where they are most feasible and applicable.

Standardizing data capture through the use of existing national standards, increasing the number of primary data elements, and incorporating secondary data elements will provide a means to accurately identify participants in HIE. The glossary of recommended primary and secondary data elements in Appendix A and the sample patient naming policy in Appendix B can be used to ensure consistency of data elements and provide structure for data entry where free text is required.

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Notes

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Figure 1

Recommended Primary and Secondary Data Attributes to Facilitate Patient Matching

Data Attribute	**Requirement Level**
Legal Name	
First	Primary
Middle	Primary
Last	Primary
Prefix	Secondary
Suffix	Primary
Date of Birth	Primary
Date and Time of Death	Secondary
Birth Place	Secondary
Multiple Birth	Secondary
Birth Order	Secondary
Sex/Gender	Primary
Race	Primary
Ethnicity	Primary
Marital Status	Secondary
Phone Numbers	
Primary	Primary
Secondary	Secondary
Tertiary	Secondary
Historical	Secondary
All Previous Last Names	Primary
All Previous First Names	Primary
All Previous Nicknames	Secondary
Mother's Maiden Name	Primary
Social Security Number	Secondary
Driver's License Number	Secondary
Passport Number	Secondary
Current Address	
Current Street Address	Primary
Current City	Primary
Current State	Primary
Current Country	Primary
Historical Addresses	Secondary
E-mail Address	Secondary
Biometrics	Secondary

Appendix A

Patient Identification Data Integrity Glossary

Data Attribute	Requirement Level	Recommendation	HL7 Message	References/Comments
Name		Separate data entry field for all components of the name Legal name as documented on the birth certificate, passport or equivalent documents from another nation	HL7 version 2.6 PID-5, length 48, Date Type: XPN (Extended person name) HL7 Format: Family Name^Given Name^Middle Initial or Name^Suffix^Prefix^Degree^NameTypeCode^NameRepresentationCode Example: Doe^John^T^II^Mr^^	NCVHS, "Core Health Data Elements" NCVHS: Name = Last name, first name, middle initial, suffix (e.g., Jr., III, etc.) HIMSS, *Patient Identity Integrity*
First Name	Primary	Legal first name • Uppercase letters from A to Z • Digits from 0 to 9 • Special characters: hyphen (-) and space character		CAQH, *Core 258: Eligibility and Benefits 270/271 Normalizing Patient Last Name Rule Version 2.1.0* ASC X12 Basic Character Set

Middle Name	Primary	Full legal middle name • Uppercase letters from A to Z • Digits from 0 to 9 • Special characters: hyphen (-) and space character		CAQH, *Core 258: Eligibility and Benefits 270/271 Normalizing Patient Last Name Rule Version 2.1.0* ASC X12 Basic Character Set NCVHS, "Core Health Data Elements"
Last Name	Primary	Legal last name • Uppercase letters from A to Z • Digits from 0 to 9 • Special characters: hyphen (-) and space character		CAQH, *Core 258: Eligibility and Benefits 270/271 Normalizing Patient Last Name Rule Version 2.1.0* ASC X12 Basic Character Set
Prefix	Secondary	Separate data entry field, all uppercase letters; do not include as a portion of last name. • Uppercase letters from A to Z • Digits from 0 to 9 • Special characters: hyphen (-) and space character Use lookup entries, no free text.		CAQH, *Core 258: Eligibility and Benefits 270/271 Normalizing Patient Last Name Rule Version 2.1.0* ASC X12 Basic Character Set HIMSS, *Patient Identity Integrity*
Suffix	Primary	Separate data entry field, all uppercase letters; do not include as a portion of last name. • Uppercase letters from A to Z • Digits from 0 to 9 • Special characters: comma (,), hyphen (-), period (.), and space character Use lookup entries, no		CAQH, *Core 258: Eligibility and Benefits 270/271 Normalizing Patient Last Name Rule Version 2.1.0* ASC X12 Basic Character Set HIMSS, *Patient Identity Integrity* ONC, *Patient Identification and Matching Final Report*

		free text.		
Date of Birth	Primary	Capture month by selection, displaying the complete name of month as best practice. best practice. Use lookup selection entries, no free text.	HL7, version 2.6 PID-7, Length 26, Data type: Time Stamp YYYYMMDD (hhmmss)(	ONC, *Patient Identification and Matching Final Report* NCVHS, Core Health Data Set, Uniform Hospital Discharge Data Set NCVHS, Core Health Data Set, Uniform Ambulatory Care Data Set HIMSS, *Patient Identity Integrity*
Date and Time of Death	Secondary	Capture month by selection, displaying the complete name of month as best practice. Use lookup selection entries, no free text.	HL7, version 2.6 PID-29, Length 26, Data type: Time Stamp UHDDS: YYYYMMDD	Department of Veterans Affairs, *Master Patient Index Patient Demographics (MPI/PD) User Manual*
Birth Place	Secondary	**City** **State** (2-letter authorized state abbreviation) Or **Country of birth** Use lookup selection entries, no free text.	HL7, version 2.6 PID-23, Length 60, Data type: String Maximum length of 250 characters	USPS, "Complete Address Definition" HIMSS, *Patient Identity Integrity* ONC, *Patient Identification and Matching Final Report*
Multiple Birth	Secondary	Y = Yes N = No U = Unknown	HL7, version 2.6 PID-24, Length 2, Data type: coded values	Identification of multiple-birth persons
Birth Order	Secondary	Digits from 0 to 9	HL7, version 2.6 PID-25, Length 2, Data type: Numeric	ASC X12 Basic Character Set Allows identification of multiple birth persons
Sex/Gender	Primary	M = Male F = Female U = Unknown	HL7, version 2.6 PID-8, Length 1, Data type: coded value Format: Identifier^Text^CodingSystem^Alternat	Uniform Hospital Discharge Data Set Uniform Ambulatory Care Data Set Stage 1 Meaningful Use demographics "gender"; Stage

			eIdentifier^AlternateText^NameOfAlternateCodingSystem Example: M^Male^0001	2 Meaningful Use demographics "sex"
Race	Primary	• American Indian or Alaskan Native • Asian • Black or African American • Native Hawaiian or Other Pacific Islander • White • Declined • Unknown	HL7, version 2.6 PID-10,Length 1, Data type: coded element Format: Identifier^Text^CodingSystem^AlternateIdentifier^AlternateText^NameOfAlternateCodingSystem Example: 2131-1^Other Race^HL70005	NCVHS, Core Health Data Set, Uniform Hospital Discharge Data Set NCVHS, Core Health Data Set, Uniform Ambulatory Care Data Set OMB, "Revisions to the Standards for Classification of Federal Data on Race and Ethnicity" American Indian or Alaska Native: A person having origins in any of the original peoples of North and South America (including Central America) who maintains that tribal affiliation or community attachment Asian: A person having origins in any of the original peoples of the Far East, Southeast Asia or the Indian subcontinent; examples include Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam Black or African American: A person having origins in any of the black racial groups of Africa Native Hawaiian or Other Pacific Islander: A person having origins in any of the

				original peoples of Hawaii, Guam, Samoa, or other Pacific Islands White: A person having origins in any of the original peoples of Europe, the Middle East, or North Africa
Ethnicity	Primary	H= Hispanic origin N = Not of Hispanic origin U = Unknown	HL7, version 2.6 PID- 22, Length 3, Data type: coded element Format: Identifier^Text^CodingSystem^AlternateIdentifier^AlternateText^NameOfAlternateCodingSystem Example: U^Unknown^0189	Uniform Hospital Discharge Data Set OMB, "Revisions to the Standards for Classification of Federal Data on Race and Ethnicity" Hispanic or Latino: A person of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture origin, regardless of race
Marital Status	Secondary	A = Separated D = Divorced M = Married S = Single W = Widowed D = Divorced U = Unknown	HL7, version 2.6 PID-16, Length 1, Data type: coded element Format: Identifier^Text^CodingSystem^AlternateIdentifier^AlternateText^NameOfAlternateCodingSystem Example: M^Married^0002	NCVHS, "Core Health Data Elements" NCVHS: 1. Married A person currently married. Classify common law marriage as married. • A) living together • B) not living together 2. Never married A person who has never been married or whose only marriages have been annulled. 3. Widowed A person widowed and not remarried. 4. Divorced A person divorced and not remarried. 5. Separated A person legally separated.

				6. Unknown/not stated
Phone Numbers		• Digits from 0 to 9 • Special characters: parentheses and space character	HL7, version 2.6 PID-13, Length 40, Data type: Extended telecom number Format: [(999)] 999-9999 [x99999] [c Any Text]^TelecomUseCode^TelecomEquipType(ID)^EmailAddress^CountryCode^Area/CityCode^PhoneNumber^Extension^AnyText Example: (214)111-1234^CP^^^214^1111234	ASC X12 Basic Character Set
Primary phone number	Primary	Category list for type of phone: • Nonmobile • Mobile • No phone		ONC, *Patient Identification and Matching Final Report*
Secondary phone number	Secondary	Category list for type of phone: • Nonmobile • Mobile • No phone		ONC, *Patient Identification and Matching Final Report*
Tertiary phone number	Secondary	Category list for type of phone: • Nonmobile • Mobile • No phone		ONC, *Patient Identification and Matching Final Report*

Historical phone numbers	Secondary	May enter up to five numbers • Digits from 0 to 9 Special characters: parentheses and space character	HL7, version 2.6 PID-13, Length 40, Data type: Extended telecom number Format: [(999)] 999-9999 [x99999] [c Any Text]^TelecomUseCode^TelecomEquipType(ID)^EmailAddress^CountryCode^Area/CityCode^PhoneNumber^Extension^AnyText Example: (214)111-1234^CP^^^214^11111234	ONC, *Patient Identification and Matching Final Report*
All Previous Last Names	Primary	Separate data entry field that allows multiple entries up to five. Ability to enter "No previous last names" • Uppercase letters from A to Z • Digits from 0 to 9 • Special characters: hyphen (-) and space character	HL7, version 2.6 PID Sequence 9, Length 48, Data type: XPN	CAQH, *Core 258: Eligibility and Benefits 270/271 Normalizing Patient Last Name Rule Version 2.1.0* ONC, *Patient Identification and Matching Final Report*
All Previous First Names	Primary	Separate data entry field that allows multiple entries up to five. Ability to enter "No previous first names"	HL7, version 2.6 PID-9, Length 48, Data type: XPN Format: Family Name^Given Name^Middle Initial or Name^Suffix^Prefix^Degree^NameTypeCode^NameRepresentationCode Example**:** Doe^Johnny^T^II^Mr^^	ONC, *Patient Identification and Matching Final Report*

All Previous Nicknames	Secondary	Separate data entry field that allows multiple entries up to five. Ability to enter "No previous first names"	HL7, version 2.6 PID-9, Length 48, Data type: XPN Format: Family Name^Given Name^Middle Initial or Name^Suffix^Prefix ^Degree^NameType Code^NameRepresentationCode Example**:** Doe^Johnny^T^II^ Mr^^	ONC, *Patient Identification and Matching Final Report*
Mother's Maiden Name	Primary	Legal name • Uppercase letters from A to Z • Digits from 0 to 9 • Special characters: hyphen (-) and space character	HL7, version 2.6 PID-6 Sequence 19, Length 16, Data type: String	ONC, *Patient Identification and Matching Final Report* Family name under which the mother was born.
Social Security Number	Secondary	• Digits from 0 to 9	HL7, version 2.6 PID-6, Length 48, Data type: String Format: Maximum string of 16 characters	ASC X12 Basic Character Set ONC, *Patient Identification and Matching Final Report* Tricare Provider Handbook: requirement to determine if patient is eligible for benefits. Pseudo–Social Security numbers may be utilized at times when Social Security number is unknown or is not yet available.
Driver's License Number	Secondary	• Uppercase letters from A to Z • Digits from 0 to 9	HL7, version 2.6 PID-20, Length 25, Data type: Driver's License Number Format: DriversLicenseNumber^IssuingStateProvinceOrCountry^ExpirationDate	ASC X12 Basic Character Set ONC, *Patient Identification and Matching Final Report*

			Example: 12345678^TX^20160101	
Passport Number	Secondary	• Uppercase letters from A to Z • Digits from 0 to 9		ASC X12 Basic Character Set ONC, *Patient Identification and Matching Final Report*
Current Address		• Uppercase letters from A to Z • Digits from 0 to 9 Separate data entry fields: **City** **State** (2-letter authorized abbreviation) **Zip code** (5-digit or Zip+4) Approved abbreviations: BLVD = Boulevard CTR = Center CIR = Circle CT = Court DR = Drive LN = Lane PL = Place RD = Road SQ = Square ST = Street TER = Terrace TRL = Trail APT = Apartment FL = Floor RM = Room STE = Suite	HL7, version 2.6 PID Sequence 11, Length 106, Data type: Extended Address	ASC X12 Basic Character Set NCVHS, "Core Health Data Elements" USPS, "Complete Address Definition" USPS, "Abbreviations & Standards" ONC, *Patient Identification and Matching Final Report* Library of Congress, ISO 3166-1 alpha-2 for country abbreviations is a Meaningful Use requirement. Examples: Brazil – BR, New Zealand – NZ, and Switzerland – CH.
Current Street Address	Primary	**Street number and name of street** = Street number and name (including predirectional, suffix, and postdirectional as shown in USPS ZIP+4 Product for the delivery address or rural route and box number (RR 5 BOX		NCVHS, "Core Health Data Elements" USPS, "Complete Address Definition" USPS, "Abbreviations & Standards" ONC, *Patient Identification and Matching Final Report*

		10), highway contract route and box number (HC 4 BOX 45), or post office box number (PO BOX 458), as shown in USPS ZIP+4 Product for the delivery address). ("PO Box" is used incorrectly if preceding a private box number, e.g., a college mailroom.)		
Current	Primary	**Secondary address =** Secondary address unit designator and number (such as an apartment or suite number, e.g., APT 202, STE 100).		NCVHS, "Core Health Data Elements" USPS, "Complete Address Definition" USPS, "Abbreviations & Standards" ONC, *Patient Identification and Matching Final Report*
Current City	Primary	Use of lookup selection entries, no free text.		HIMSS, *Patient Identity Integrity* NCVHS, "Core Health Data Elements" USPS, "Complete Address Definition" USPS, "Abbreviations & Standards" ONC, *Patient Identification and Matching Final Report*
Current State	Primary	Use of lookup selection entries, no free text.		HIMSS, *Patient Identity Integrity* NCVHS, "Core Health Data Elements" USPS, "Complete Address Definition" USPS, "Abbreviations &

				Standards” ONC, *Patient Identification and Matching Final Report*
Current Country	Primary	Use of lookup selection entries, no free text.	HL7, version 2.6 PID Sequence 12, Length 4, Data type: Coded value for user defined table	ISO 3166-1 alpha-2 codes HIMSS, *Patient Identity Integrity* NCVHS, “Core Health Data Elements” USPS, “Complete Address Definition” USPS, “Abbreviations & Standards” ONC, *Patient Identification and Matching Final Report*
Historical Addresses	Secondary	**Street number and name of street** = Street number and name (including predirectional, suffix, and postdirectional as shown in USPS ZIP+4 Product for the delivery address or rural route and box number (RR 5 BOX 10), highway contract route and box number (HC 4 BOX 45), or post office box number (PO BOX 458), as shown in USPS ZIP+4 Product for the delivery address). (“PO Box” is used incorrectly if preceding a private box number, e.g., a college mailroom.)		ONC, *Patient Identification and Matching Final Report*
E-mail Address	Secondary	• Primary • Secondary • Tertiary		ONC, *Patient Identification and Matching Final Report*

Biometrics	Secondary	• Eye color • Handprint • Fingerprint • Cornea scan • Footprint		ONC, *Patient Identification and Matching Final Report* Data gathered from driver's license and passport—government-issued documents. This area is growing and changing as technology evolves.

Sources:

Accredited Standards Committee X12, Basic Character Set. Available at http://www.x12.org

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Appendix B

Sample Patient Naming Policy

Policy:
Accurate patient identification is foundational to a successful linking of patient records. Standardized naming conventions improve data integrity within an enterprise master patient index, resulting in increased accuracy in patient identification and providing more complete clinical information during care delivery.

[Insert individual organization's procedure for data capture here.]

Rules and conventions:

- The patient's name will be entered in all capitals.
- The complete legal name will be entered as reflected on government-issued identification, such as but not limited to birth certificate, passport, or driver's license, or as altered by a legal name change event. Events altering the legal name include marriage, divorce, adoption, or a court-approved name change.
- If the patient does not have a middle name, this field is left blank in the registration process.
- If the patient's middle name is an initial only, the initial should be entered.

Name at Registration	First Name	Middle Name	Last Name
Harvey William Blake	HARVEY	WILLIAM	BLAKE
K. D. Lang	K	D	LANG
R. D. Wayne Miller	RD	WAYNE	MILLER
George 7 Jones	GEORGE	7	JONES
Elena Lusk	ELENA		LUSK
Gus M. Mask	GUS	M	MASK

- Suffixes should be entered if the suffix appears on the legal form of identification. Examples of suffixes include but are not limited to Junior, Jr., II, III, Sr., and IV.

Name at Registration	First Name	Middle Name	Last Name	Suffix
James R. Billings Jr.	JAMES	RANDOLPH	BILLINGS	JUNIOR
Charles Wayne Miller III	CHARLES	WAYNE	MILLER	III

- Nicknames or diminutive forms of the name should be entered only as alternative names or as an alias. They should never be entered as the legal name. When the patient's legal name is a commonly used nickname, the legal name will be entered as given.

Name at Registration	First Name	Middle Name	Last Name
Bob T. Williams	ROBERT	THOMAS	WILLIAMS
Lizzie Susan Whitley	ELIZABETH	SUSAN	WHITLEY
Billy Bob Williams	WILLIAM	BOB	WILLIAMS

- A hyphen (-) or space is the only acceptable punctuation.

Name at Registration	First Name	Middle Name	Last Name
Sean M. O'Donnell	SEAN	MATTHEW	ODONNELL
Mary D. Smith-Logan	MARY	DEBRA	SMITH-LOGAN
Susan L. Saint James	SUSAN	LOUISA	SAINT JAMES
Patrick Otis St. Peters	PATRICK	OTIS	SAINT PETERS
Humphrey E. Van Der Ark	HUMPHREY	EDWARD	VAN DER ARK
Abbie Nicole McClintock	ABBIE	NICOLE	MCCLINTOCK
George Herbert Walker Bush	GEORGE	HERBERT WALKER	BUSH

- Newborn names, if a birth name has not yet been given, shall be entered as Last Name = Mother's last name, First Name = Boy or Girl, and Middle Name = Mother's first name. Multiple births will contain 1, 2, 3, 4 or A, B, C, D depending on system limitations, depicting birth order in the first name field. After the newborn birth certificate has been completed, change the name to the baby's legal name and follow policy conventions, moving the initial data entry name to the alternative or alias name fields.

Name at Registration	Mother's First Name	First Name	Middle Name	Last Name
Newborn Male Rodriquez	MARTHA	BOY	MARTHA	RODRIQUEZ
Newborn Female First Born Foglia	CARLA	GIRL 1 or A	CARLA	FOGLIA
Newborn Female Second Born Foglia	CARLA	GIRL 2 or B	CARLA	FOGLIA

- If the gender of the newborn is unknown, *Baby* should be used as the first name until such time as identified. At the time of identification, the record should be updated to include this information.

Name at Registration	Mother's First Name	First Name	Middle Name	Last Name
Newborn Miller	DONNA	BABY	DONNA	MILLER
Newborn First Born Reed	KILEY	BABY 1	KILEY	REED
Newborn Second Born Reed	KILEY	BABY 2	KILEY	REED

- Fetal patient care is registered under the mother's name, with the documentation transferred to the child's record at the time of birth if or when the child becomes a patient in the normal course of business.

Examples of the correct method for recording names are as follows. Cultural variations in surnames exist. The registrar will need to clarify the family name or surname.

Name at Registration	**First Name**	**Middle Name**	**Last Name**
Cesear Jose Chavez	CESEAR	JOSE	CHAVEZ
Juan Pablo Rodriquez-Martinez	JUAN	PABLO	RODRIQUEZ-MARTINEZ
Maria del Carmen Ramirez-Salinas	MARIA	DEL CARMEN	RAMIREZ-SALINAS
Mao Tse-tung	TSE-TUNG		MAO
Kim Young	YOUNG		KIM
Yao Ming	MING		YAO
Dat Nguyen	DAT		NGUYEN
Abdulaziz Bin Mohamed Al Nasser	ABDULAZIZ	BIN MOHAMED	AL NASSER
Gumasha Said Ahmed Al Tuwaijri	GUMASHA	SAID AHMED	AL TUWAIJRI