August 17, 2011

The HIT Policy Committee asked the HIT Standards Committee to recommend standards to:
* Standardize the formats for patient matching demographics
* Internally evaluate matching accuracy
* Address Accountability
* Developing and disseminating best practices

In order to be able to address this charge, the HIT Standards Committee formed the Patient Matching Power Team (Power Team) which focused on a specific, and arguably the most demanding, use case: near time, direct patient care.

Given this use case, the Power Team made several assumptions in order to develop preliminary recommendations. We believe this use case demands the highest levels of matching accuracy and accountability. While we don't yet have a policy decisions about what levels are required, we assumed that specificity is more critical than sensitivity, and that specificity of at least 99.9% and sensitivity of 95% are in the range that will eventually be recommended. These levels translate to an acceptable false positive rate of 0.1% or 1 in 1,000 patients inappropriately matched. Sensitivities lower than this may result in incomplete views of the patient's record and lower specificities will result in incorrect matching, putting both the patient (as a result of data that isn't theirs being included in their record) and the inappropriately matched individual (as a result of their PHI being exposed) at risk. Of course, the eventual requirements that are established may be more stringent, but we believe not much less stringent. In addition, given the relative immaturity of the field of patient matching and to support future development, we assumed that the standard should provide a method that would allow additional patient attributes to be easily added to the matching process. Finally, we assumed that we need to align the importance of the patient attributes for matching.

Principles

The Power Team reviewed previous work in this area, including the published literature, white papers and testimony provided to the HIT Policy Committee as a basis for developing our recommendations.

We make four recommendations, including **patient attributes** that could be used for matching (in order to understand the standards that are needed), **quality** of the data, **formats** for these data elements, and **what data are returned** from a match request.

Patient attributes for matching should ideally be discriminating (some authors discuss uniqueness of attributes such as biometrics, but in most cases we are simply hoping for attributes that discriminate one patient from another). Patient attributes: ubiquitous (e.g., last name, date of birth, eye color), unchanging or invariable (e.g., date of birth, Gender, Given Name, DNA), uncomplicated (e.g., last name, date of birth, gender), easily and inexpensively accessible and uncontroversial.

Patient attributes that are commonly applied in patient matching or have been proposed as potential attributes to be used in the future are listed in Table 1.

Table 1 – Potential patient matching attributes

Basic Attributes	Last Name
	Given Name
	Date of birth
	Administrative gender
Other Attributes	Insurance policy number
	Medical record number
	Social Security Number (or last 4)
	Street address
	Telephone number
	ZIP code
Potential Attributes	E-mail address
	Voluntary identifiers
	Facial images
	Other biometrics

Having a common "base" set of patient attributes across entities that are matching patients is important if the entities are going to achieve an acceptable level of sensitivity and specificity. If two entities use very different sets of patient attributes for matching, there a few possible scenarios. First, A queries B using A1, A2, A3 while B relies primarily on A3, A4, A5 for matching. Essentially B is only matching on A3. If B has only one patient with a value for A3 that matches the query, B could return that patient but there is a high likelihood that this patient is not a match (despite it being the only record in B that has the given value for A3). If B has more than one record with a value for A3 that matches the query, B could not return any of the patients because specificity would be too low. An alternative is for B to request additional attributes from A but if there is not a common base of patient attributes, it is unlikely that A will have those attributes or, put another way, A would have sent the attributes in the first place if it had them and had confidence in their correctness. In order for A to have confidence in the correctness of these additional attributes, A would have to expend effort to improve the quality of all patient attributes that it might collect since any might be needed for a query.   B can only establish the sensitivity and specificity for matching in the context of a specific set of attributes with which it might be queried and even more specifically the established sensitivity and specificity will be dependent on the characteristics of the values of the attributes with which it will be queried.

The literature and practical experience demonstrates that, at operational scale, the basic attributes are not adequate to achieve these levels of sensitivity and specificity we assumed are necessary, even if the attribute data are perfectly recorded. Adding ZIP code to the basic attributes, for example, may allow a matching algorithm to achieve false positive rates of 0.001 to 0.1 but with two important caveats. First, ZIP codes change fairly frequently throughout a patient's life, making patient matching over longer time intervals less effective. In one large application using last name, given name, date of birth and zip code, they have chosen to treat patients in whom the last name, given name and date of birth but not the ZIP code as non-matching. [RAND study] Second, the levels of sensitivity are modest and may not reach the desired levels. We constructed the graph in figure one below based on our analysis of available data on how frequently patient attributes change over time and in what proportion of the population. The available data were scattered across a variety of sources, and only

available as point estimates, some as old as 2002, but it provides a perspective on the stability of patient attributes over time. Errors in data capture, changes in fields (especially ZIP code and last name) over time, a larger population (approximately four times larger than used in the RAND study) will increase the actual false positive rate. Adding the last four digits of the ZIP code to last name, given name and date of birth achieves (even without ZIP code) achieves a false positive rate of .001 to .00001 – approximately two orders of magnitude higher.

Figure 1 – based on a variety of sources we crudely estimated the proportion of the US population that changes a specific attribute sometime during their lifetime and the number of changes as well as any trends we could discern in these rates. Finally, we added our estimates of how often these attributes are recorded by healthcare providers today.
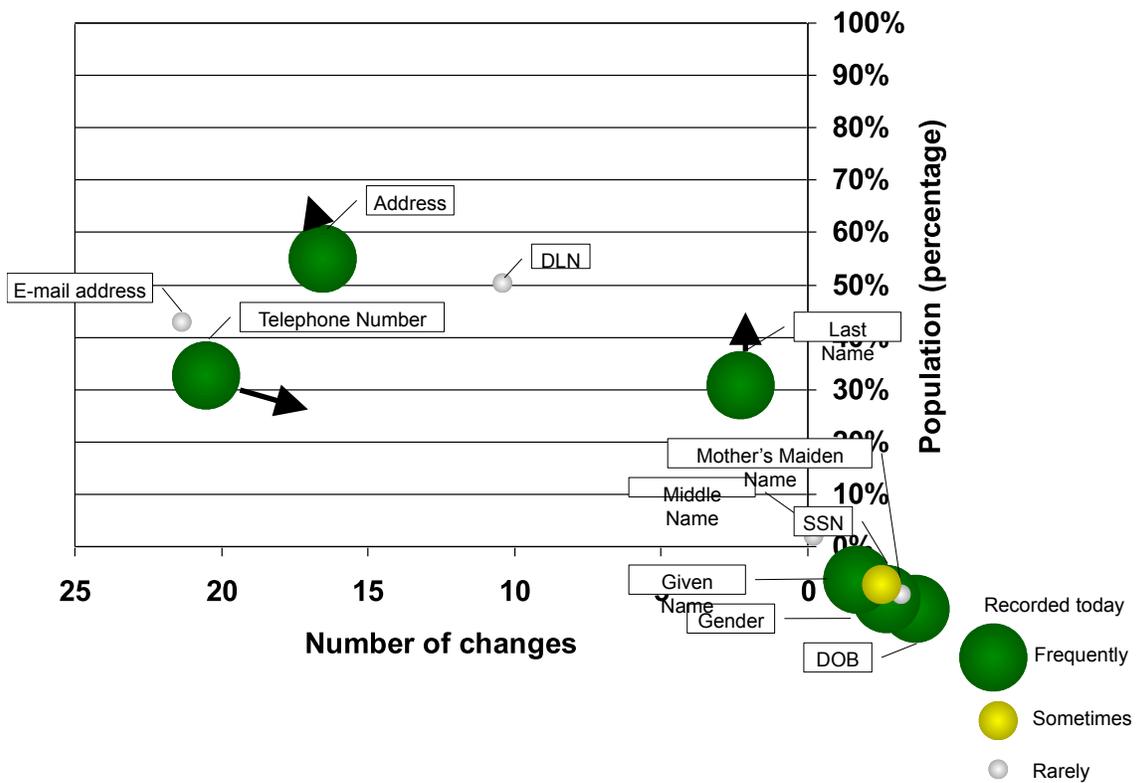
Recommendation 1: We recommend, depending on the level of sensitivity and specificity eventually adopted for patient matching, that a base set of patient attributes adequate to achieve those adopted levels be selected based on demonstrated achievement of those levels.

Based on our analysis of candidate patient attributes for matching and recognizing the value of high quality data to improve the quality of matches, we recommend that providers and health IT developers adopt the following approaches.

Recommendation 2A – Providers should allow patients to verify the patient attributes the provider has recorded for them through a method such as sharing the data entry screen with the patient for review, providing the patient with a printed summary or on-line

access to the data to help identify quality issues and utilize the methods provided by HIT developers to identify missing/unavailable data and approximate or questionable values at the time of data entry.

Recommendation 2B -- Health IT developers should provide a method for providers to identify missing/unavailable data and approximate/questionable values at the time of entry as well as apply basic checks on the validity of patient attributes (such as valid dates in the past for dates of birth, no more than six 9s or six 0s in a row in the Social Security Number), and validate data using external sources and for consistency (such as the consistency of street address and ZIP code).

In order to help ensure that the format in which the data are represented facilitate proper interpretation of the data, is consistent with other format recommendations, and allows the flexibility to expand the patient attributes used for matching, we recommend that:

Recommendation 3 – Patient queries patterns should follow the NwHIN patient query implementation guide and that the CDA R2 header formats should be used to represent patient attributes.

We found little data and no standards to support recommendations regarding evaluating and making match quality visible. We are forced to conclude, as were the authors of *Perspectives on Patient Matching: Approaches, Findings, and Challenges* that there is insufficient information at this time to provide specific recommendations therefore we recommend to the HIT Standards Committee that:

Recommendation 4 – Responses to patient queries should not return any patient attributes that were not included in the original query, though it may be appropriate for the response to indicate other data that could be useful in matching this patient. The Office of the National Coordinator or other appropriate agencies should sponsor specific research and analysis to identify the most relevant and achievable metrics to return in response to a patient matching query. Meanwhile, the response should, at a minimum, provide a URL that provides information on the matching approach used, any available characterization of the matching approach, and a point of contact for additional information.

References
http://www.himss.org/content/files/PrivacySecurity/PIIWhitePaper.pdf
healthit.hhs.gov/portal/...0.../PatientMatchingWhite_Paper_Final.pdf