



AHCCCS

# Patient Merging and Linking

## Design

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## Patient Merging and Linking Summary

The purpose of the Patient Index's patient merging algorithm is to consolidate demographic data for a single patient into a single patient entry. Furthermore, the Patient Index's patient linking algorithm is to link two patient entries where they have a very high probability of being the same patient. Since the Record Locator Service (RLS) has to store routing information for each patient record, RLS will contain one entry per patient per data provider source system. This could potentially lead to a single patient having hundreds of entries in the RLS system. As a result, searching the RLS for a patient could return too many results for an end-user to process in a timely manner.

To address this issue, the Patient Index was designed to create one entry per patient. This one entry would be linked back to multiple RLS records for easy retrieval once the correct patient is identified. In order to create a single entry that relates to all of the RLS entries, a set of rules are in place to determine how to **merge** the RLS demographics into a single patient index entry. Furthermore, an additional set of rules is in place to determine a high probability that two patient index entries are the same, in which case these two entries are **linked**.

### Patient Merging

Patient Merging is combining a single RLS patient demographic entry with an existing Patient Index entry based on a predefined set of rules. The patient index stores the accumulated patient demographics from each of the RLS entries. All of the accumulated patient demographics will be related by a single patient identifier.

#### *Patient Merging Rules*

Patient merging rules are defined as a predetermined number of fields from the patient index match a set of fields from the RLS demographics data. The patient merging rules revolve around the following fields:

- AHCCCS Id
- First Name
- Last Name
- Gender
- Date of Birth



The following are the patient merging rules defined in the patient index

### **AHCCCS Id, First Name, Last Name, Gender, Date of Birth**

This rule requires incoming RLS patient data and a patient index entry to have the same AHCCCS Id, first name, last name, gender, and date of birth. If the above criterion is met, the RLS record is merged with the patient index entry.

An example satisfying this rule:  
RLS Demographic data published  
AHCCCS Id = A111111111  
First name = John  
Last name = Smith  
Gender = Male  
Date of Birth = Jan 1, 1980

Patient Index entry  
AHCCCS Id = A111111111  
First name = John  
Last name = Smith  
Gender = Male  
Date of Birth = Jan 1, 1980

Resulting Patient Index entry  
AHCCCS Id = A111111111  
First name = John  
Last name = Smith  
Gender = Male  
Date of Birth = Jan 1, 1980

### **AHCCCS Id, Last Name, Gender, Date of Birth**

This rule requires incoming RLS patient data and a patient index entry to have the same AHCCCS Id, last name, gender, and date of birth. In addition, both items must have a first name, but the first names do not have to match. If the above criterion is met, the RLS record is merged with the patient index entry.

An example satisfying this rule:  
RLS Demographic data published  
AHCCCS Id = A111111111  
First name = John  
Last name = Smith  
Gender = Male  
Date of Birth = Jan 1, 1980

Patient Index entry  
AHCCCS Id = A111111111  
First name = Jon  
Last name = Smith  
Gender = Male  
Date of Birth = Jan 1, 1980



AHCCCS

Resulting Patient Index entry  
AHCCCS Id = A111111111  
First name = John  
First name = Jon  
Last name = Smith  
Gender = Male  
Date of Birth = Jan 1, 1980

### **AHCCCS Id, First Name, Gender, Date of Birth**

This rule requires incoming RLS patient data and a patient index entry to have the same AHCCCS Id, first name, gender, and date of birth. In addition, both items must have a last name, but the last names do not have to match. If the above criterion is met, the RLS record is merged with the patient index entry.

An example satisfying this rule:  
RLS Demographic data published  
AHCCCS Id = A111111111  
First name = John  
Last name = Smith  
Gender = Male  
Date of Birth = Jan 1, 1980

Patient Index entry  
AHCCCS Id = A111111111  
First name = John  
Last name = Nelson  
Gender = Male  
Date of Birth = Jan 1, 1980

Resulting Patient Index entry  
Patient Index entry  
AHCCCS Id = A111111111  
First name = John  
Last name = Nelson  
Last name = Smith  
Gender = Male  
Date of Birth = Jan 1, 1980

### **AHCCCS Id, First Name, Last Name, Gender**

This rule requires incoming RLS patient data and a patient index entry to have the same AHCCCS Id, first name, last name and gender. In addition, both items must have a date of birth, but the dates do not have to match. If the above criterion is met, the RLS record is merged with the patient index entry.

An example satisfying this rule:



AHCCCS

RLS Demographic data published

AHCCCS Id = A111111111

First name = John

Last name = Smith

Gender = Male

Date of Birth = Jan 1, 1980

Patient Index entry

AHCCCS Id = A111111111

First name = John

Last name = Smith

Gender = Male

Date of Birth = Jul 1, 1980

Resulting Patient Index entry

AHCCCS Id = A111111111

First name = John

Last name = Smith

Gender = Male

Date of Birth = Jan 1, 1980

Date of Birth = Jul 1, 1980

### **AHCCCS Id, First Name, Last Name, Null Gender, Date of Birth**

This rule requires incoming RLS patient data and a patient index entry to have the same AHCCCS Id, first name, last name and gender. In addition, the incoming record must not have a gender specified. If the above criterion is met, the RLS data is merged with the patient index data.

An example satisfying this rule:

RLS Demographic data published

AHCCCS Id = A111111111

First name = John

Last name = Smith

Gender =

Date of Birth = Jan 1, 1980

Patient Index entry

AHCCCS Id = A111111111

First name = John

Last name = Smith

Gender = Male

Date of Birth = Jan 1, 1980

Resulting Patient Index entry – No Change



AHCCCS

### **AHCCCS Id, Null First Name, Last Name, Gender, Date of Birth**

This rule requires incoming RLS patient data and a patient index entry to have the same AHCCCS Id, last name, gender, and date of birth. In addition, the incoming data must not have a first name specified. If the above criterion is met, the RLS data is merged with the patient index entry.

An example satisfying this rule:

RLS Demographic data published

AHCCCS Id = A111111111

First name =

Last name = Smith

Gender = Male

Date of Birth = Jan 1, 1980

Patient Index entry

AHCCCS Id = A111111111

First name = John

Last name = Smith

Gender = Male

Date of Birth = Jan 1, 1980

Resulting Patient Index entry – No Change

### **AHCCCS Id, First Name, Last Name, Gender, Null Date of Birth**

This rule requires incoming RLS patient data and a patient index entry to have the same AHCCCS Id, first name, last name, and gender. In addition, the incoming data must not have a date of birth specified. If the above criterion is met, the RLS data is merged with the patient index entry.

An example satisfying this rule:

RLS Demographic data published

AHCCCS Id = A111111111

First name = John

Last name = Smith

Gender = Male

Date of Birth =

Patient Index entry

AHCCCS Id = A111111111

First name = John

Last name = Smith

Gender = Male

Date of Birth = Jan 1, 1980

Resulting Patient Index entry – No Change





AHCCCS

### **Null AHCCCS Id, First Name, Last Name, Gender, Date of Birth**

This rule requires incoming RLS patient data and a patient index entry to have the same first name, last name, gender, and date of birth. In addition, the incoming data must not have an AHCCCS Id specified. If the above criterion is met, the RLS data is merged with the patient index entry.

An example satisfying this rule:

RLS Demographic data published

AHCCCS Id =

First name = John

Last name = Smith

Gender = Male

Date of Birth = Jan 1, 1980

Patient Index data

AHCCCS Id = A111111111

First name = John

Last name = Smith

Gender = Male

Date of Birth = Jan 1, 1980

Resulting Patient Index entry – No Change



## ***Patient Merge Scenario***

The following is a possible scenario for patient merge.

First RLS Demographic data published

AHCCCS Id = A123456  
First name = John  
Last name = Smith  
Gender = Male  
Date of Birth = Jan 1, 1980

Patient Index data – No matching Entry

Resulting Patient Index entry

AHCCCS Id = A123456  
First name = John  
Last name = Smith  
Gender = Male  
Date of Birth = Jan 1, 1980

Second RLS Demographic data published

AHCCCS Id = A123456  
First name = Jack  
Last name = Smith  
Gender = Male  
Date of Birth = Jan 1, 1980

Resulting Patient Index entry

AHCCCS Id = A123456  
First name = John  
First name = Jack  
Last name = Smith  
Gender = Male  
Date of Birth = Jan 1, 1980

Third RLS Demographic data published

AHCCCS Id = A123456  
First name = Jack  
Last name = Smith  
Gender = Male  
Date of Birth = Feb 1, 1980

Resulting Patient Index entry

AHCCCS Id = A123456  
First name = John  
First name = Jack  
Last name = Smith  
Gender = Male



Date of Birth = Jan 1, 1980  
Date of Birth = Feb 1, 1980

Fourth RLS Demographic data published

AHCCCS Id = A123456  
First name = John  
Last name = Nelson  
Gender = Male  
Date of Birth = Feb 1, 1980

Resulting Patient Index entry

AHCCCS Id = A123456  
First name = John  
First name = Jack  
Last name = Smith  
Last name = Nelson  
Gender = Male  
Date of Birth = Jan 1, 1980  
Date of Birth = Feb 1, 1980

Fourth RLS Demographic data published

AHCCCS Id = A123456  
First name = Jack  
Last name = Nelson  
Gender = Male  
Date of Birth = Jan 1, 1980

Resulting Patient Index entry – No Change

AHCCCS Id = A123456  
First name = John  
First name = Jack  
Last name = Smith  
Last name = Nelson  
Gender = Male  
Date of Birth = Jan 1, 1980  
Date of Birth = Feb 1, 1980

## Patient Linking

Patient linking is linking two Patient Index records based on a predefined set of rules. Patient linking is done when two records do not match enough to be merged, but there is a high probability that the two patients are the same person. As a result, when one patient is found during a search, the linked patient information will be presented as an additional likely match and displayed as two separate patients.



AHCCCS

## **Patient Linking Rules**

Patient linking rules are defined as a predetermined number of fields from the patient index match a set of fields from another patient index record. The patient linking rules revolve around the following fields:

- AHCCCS Id
- First Name
- Last Name
- Gender
- Date of Birth

The following are the patient linking rules defined in the patient index

### **AHCCCS ID, First Name, Last Name**

This rule requires that incoming RLS patient data and a patient index entry must have the same AHCCCS Id, last name, and first name. If the above criterion is met, the RLS data is will be added as a new patient index entry and linked to the matching patient index entry.

An example satisfying this rule:

RLS Demographic data published

AHCCCS Id = A111111111

First name = John

Last name = Smith

Gender = Male

Date of Birth = Jan 1, 1980

Patient Index data

AHCCCS Id = A111111111

First name = John

Last name = Smith

Gender = Female

Date of Birth = Feb 1, 1980

### **AHCCCS ID, First Name, Gender**

This rule requires that an incoming RLS patient record and a patient index record must have the same AHCCCS Id, first name, and gender. If the above criterion is met, the RLS record is will be added as a new patient index record linked to the existing patient index record.

An example satisfying this rule:

RLS Demographic data published

AHCCCS Id = A111111111

First name = John

Last name = Smith

Gender = Male

Date of Birth = Jan 1, 1980



Patient Index data  
AHCCCS Id = A111111111  
First name = John  
Last name = Nelson  
Gender = Male  
Date of Birth = Feb 1, 1980

### **AHCCCS ID, First Name, Date of Birth**

This rule requires that an incoming RLS patient record and a patient index record must have the same AHCCCS Id, first name, and date of birth. If the above criterion is met, the RLS record is will be added as a new patient index record linked to the existing patient index record.

An example satisfying this rule:  
RLS Demographic data published  
AHCCCS Id = A111111111  
First name = John  
Last name = Smith  
Gender = Male  
Date of Birth = Jan 1, 1980

Patient Index data  
AHCCCS Id = A111111111  
First name = John  
Last name = Nelson  
Gender = Female  
Date of Birth = Jan 1, 1980

### **AHCCCS ID, Last Name, Gender**

This rule requires that an incoming RLS patient record and a patient index record must have the same AHCCCS Id, last name, and gender. If the above criterion is met, the RLS record is will be added as a new patient index record linked to the existing patient index record.

An example satisfying this rule:  
RLS Demographic data published  
AHCCCS Id = A111111111  
First name = John  
Last name = Smith  
Gender = Male  
Date of Birth = Jan 1, 1980

Patient Index data  
AHCCCS Id = A111111111  
First name = Jack  
Last name = Smith



AHCCCS

Gender = Male

Date of Birth = Feb 1, 1980

### **AHCCCS ID, Last Name, Date of Birth**

This rule requires that an incoming RLS patient record and a patient index record must have the same AHCCCS Id, last name, and date of birth. If the above criterion is met, the RLS record is will be added as a new patient index record linked to the existing patient index record.

An example satisfying this rule:

RLS Demographic data published

AHCCCS Id = A111111111

First name = John

Last name = Smith

Gender = Male

Date of Birth = Jan 1, 1980

Patient Index data

AHCCCS Id = A111111111

First name = Jack

Last name = Smith

Gender = Female

Date of Birth = Jan 1, 1980

### **AHCCCS ID, Gender, Date of Birth**

This rule requires that an incoming RLS patient record and a patient index record must have the same AHCCCS Id, gender, and date of birth. If the above criterion is met, the RLS record is will be added as a new patient index record linked to the existing patient index record.

An example satisfying this rule:

RLS Demographic data published

AHCCCS Id = A111111111

First name = John

Last name = Smith

Gender = Male

Date of Birth = Jan 1, 1980

Patient Index data

AHCCCS Id = A111111111

First name = Jack

Last name = Nelson

Gender = Male

Date of Birth = Jan 1, 1980



AHCCCS  
**Patient Linking Scenario**

The following is a possible scenario for patient linking.

First RLS Demographic data published

AHCCCS Id = A123456  
First name = John  
Last name = Smith  
Gender = Male  
Date of Birth = Jan 1, 1980

Patient Index data – No matching Entry

Resulting Patient Index entry

AHCCCS Id = A123456  
First name = John  
Last name = Smith  
Gender = Male  
Date of Birth = Jan 1, 1980

Second RLS Demographic data published

AHCCCS Id = A123456  
First name = Jane  
Last name = Smith  
Gender = Female  
Date of Birth = Jan 1, 1980

Resulting Patient Index entries

AHCCCS Id = A123456  
First name = John  
Last name = Smith  
Gender = Male  
Date of Birth = Jan 1, 1980  
Link to: A123456, Jane, Smith, Female, Jan 1, 1980

AHCCCS Id = A123456  
First name = Jane  
Last name = Smith  
Gender = Female  
Date of Birth = Jan 1, 1980  
Link to: A123456, John, Smith, Male, Jan 1, 1980

Third RLS Demographic data published

AHCCCS Id = A123456  
First name = John  
Last name = Nelson  
Gender = Male  
Date of Birth = Feb 1, 1980



AHCCCS

Resulting Patient Index entries

AHCCCS Id = A123456

First name = John

Last name = Smith

Gender = Male

Date of Birth = Jan 1, 1980

Link to: A123456, Jane, Smith, Female, Jan 1, 1980

Link to: A123456, Jane, Nelson, Male, Feb 1, 1980

AHCCCS Id = A123456

First name = Jane

Last name = Smith

Gender = Female

Date of Birth = Jan 1, 1980

Link to: A123456, John, Smith, Male, Jan 1, 1980

AHCCCS Id = A123456

First name = John

Last name = Nelson

Gender = Male

Date of Birth = Feb 1, 1980

Link to: A123456, John, Smith, Male, Jan 1, 1980





## Search Scenarios

The following information is in the Patient Index:

AHCCCS Id = A123456  
First name = John  
First name = Jack  
Last name = Smith  
Gender = Male  
Date of Birth = Jan 1, 1980  
Link to: A123456, Jane, Smith, Female, Jan 1, 1980  
Link to: A123456, Jane, Nelson, Male, Feb 1, 1980

AHCCCS Id = A123456  
First name = Jane  
Last name = Smith  
Gender = Female  
Date of Birth = Jan 1, 1980  
Link to: A123456, John, Smith, Male, Jan 1, 1980

AHCCCS Id = A123456  
First name = John  
Last name = Nelson  
Gender = Male  
Date of Birth = Feb 1, 1980  
Date of Birth = Jan 1, 1981  
Link to: A123456, John, Smith, Male, Jan 1, 1980

Patient Query:  
AHCCCS Id = A123456  
Last Name = Smith

Results:  
A123456, Smith, John, Male, Jan 1, 1980  
A123456, Smith, Jane, Female, Jan 1, 1980  
A123456, Nelson, John, Male, Feb 1, 1980

Patient Query:  
AHCCCS Id = A123456  
Date of Birth = Jan 1, 1981

Results:  
A123456, Nelson, John, Male, Jan 1, 1981  
A123456, Smith, John, Male, Jan 1, 1980

Patient Query:  
Last Name: Smith  
Gender: Female  
Date of Birth: Jan 1, 1980



AHCCCS

Results:

A123456, Smith, Jane, Female, Jan 1, 1980

A123456, Smith, John, Male, Jan 1, 1980

Patient Query:

First Name: John

Last Name: Nelson

Date of Birth: Jan 1, 1980

Results:

No Results