Open@Epic CONFERENCE

Epic

Connecting the Dots: Introduction to Patient Matching

Presenters



Luke Breyer

Care Everywhere Software Developer



Max Lauster

HIM and Identity Technical Services

Agenda

1. Importance of patient matching
2. Define patient matching
3. Matching workflow overview
4. Challenges in patient matching
5. Epic’s approach to matching
6. The importance of data quality maintenance
7. Evaluating matching quality
8. How can you improve matching

54%
with non-Epic orgs

30 million

Average patient records exchanged **DAILY**

9.63 billion
Care Everywhere exchanges annually

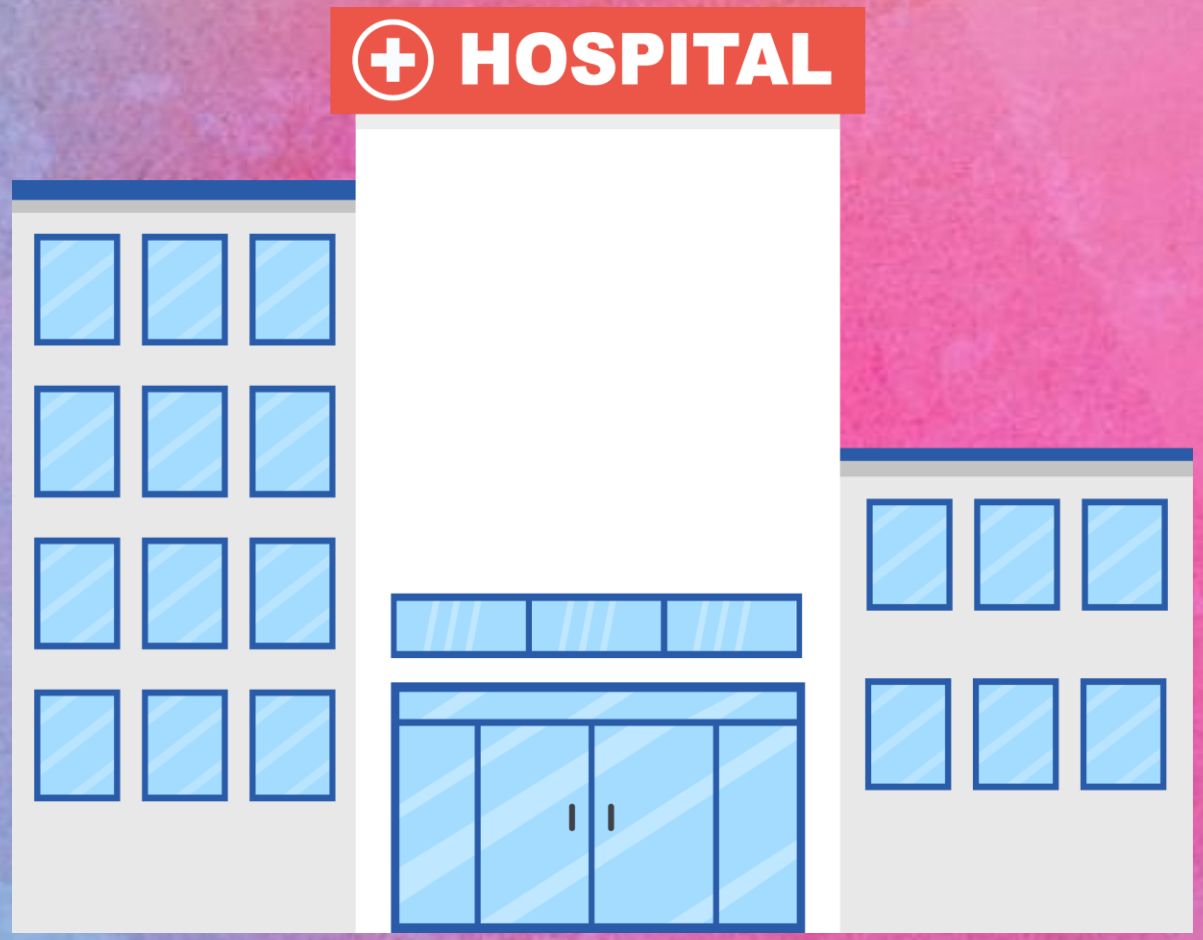
660 billion
Interface transactions annually

311 billion
Web service transactions annually

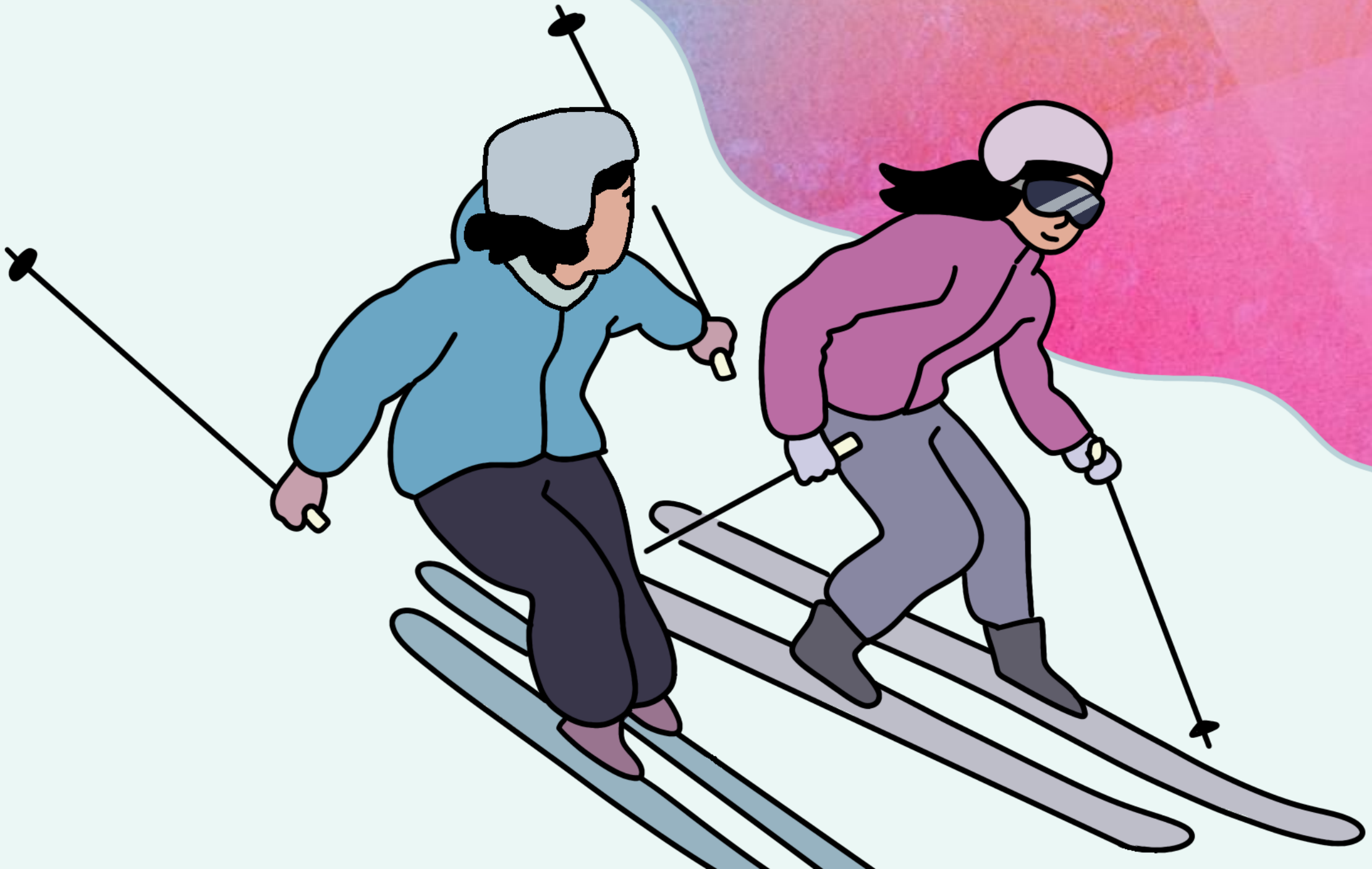
Importance of patient matching

Maria Garcia



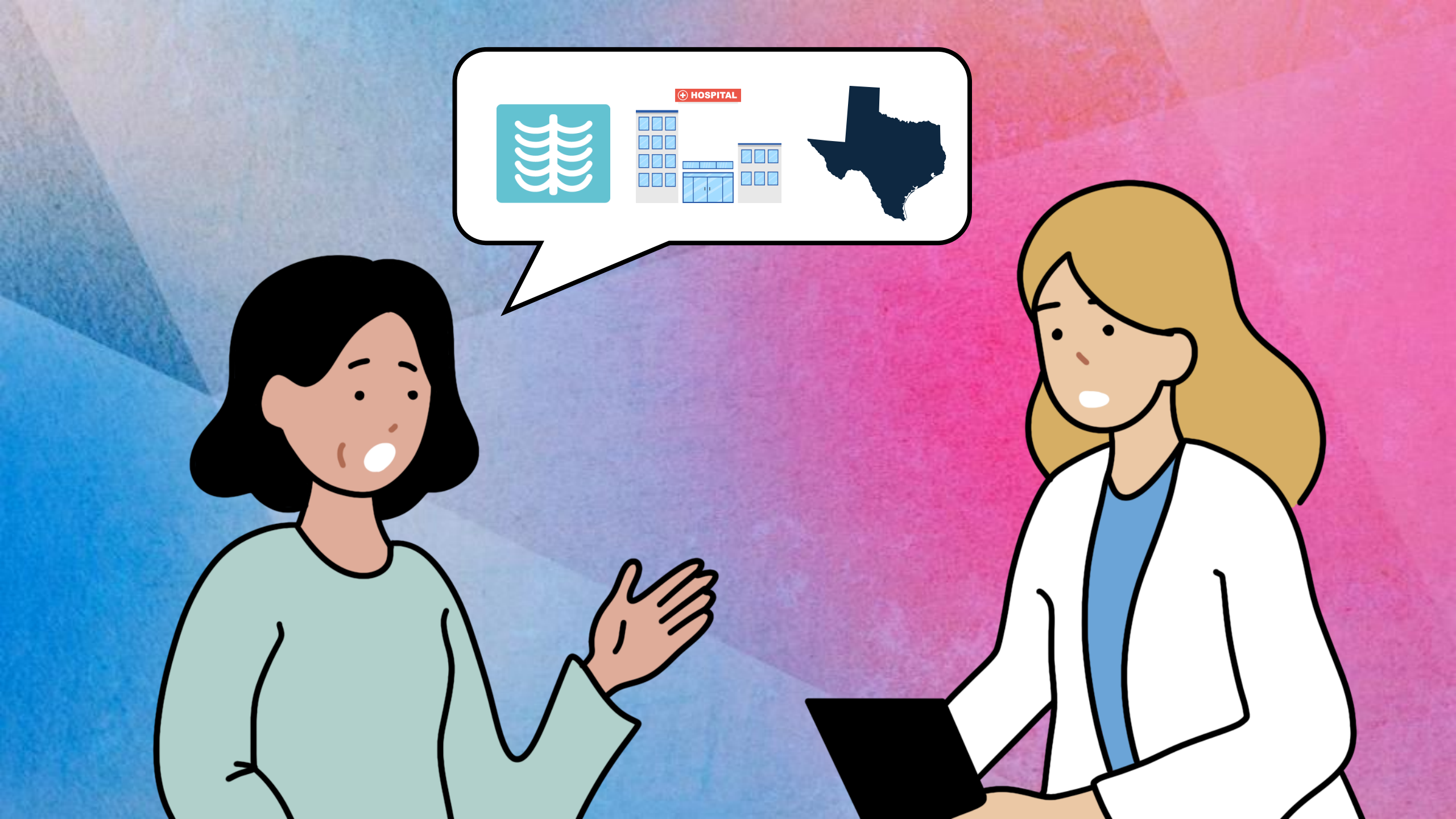


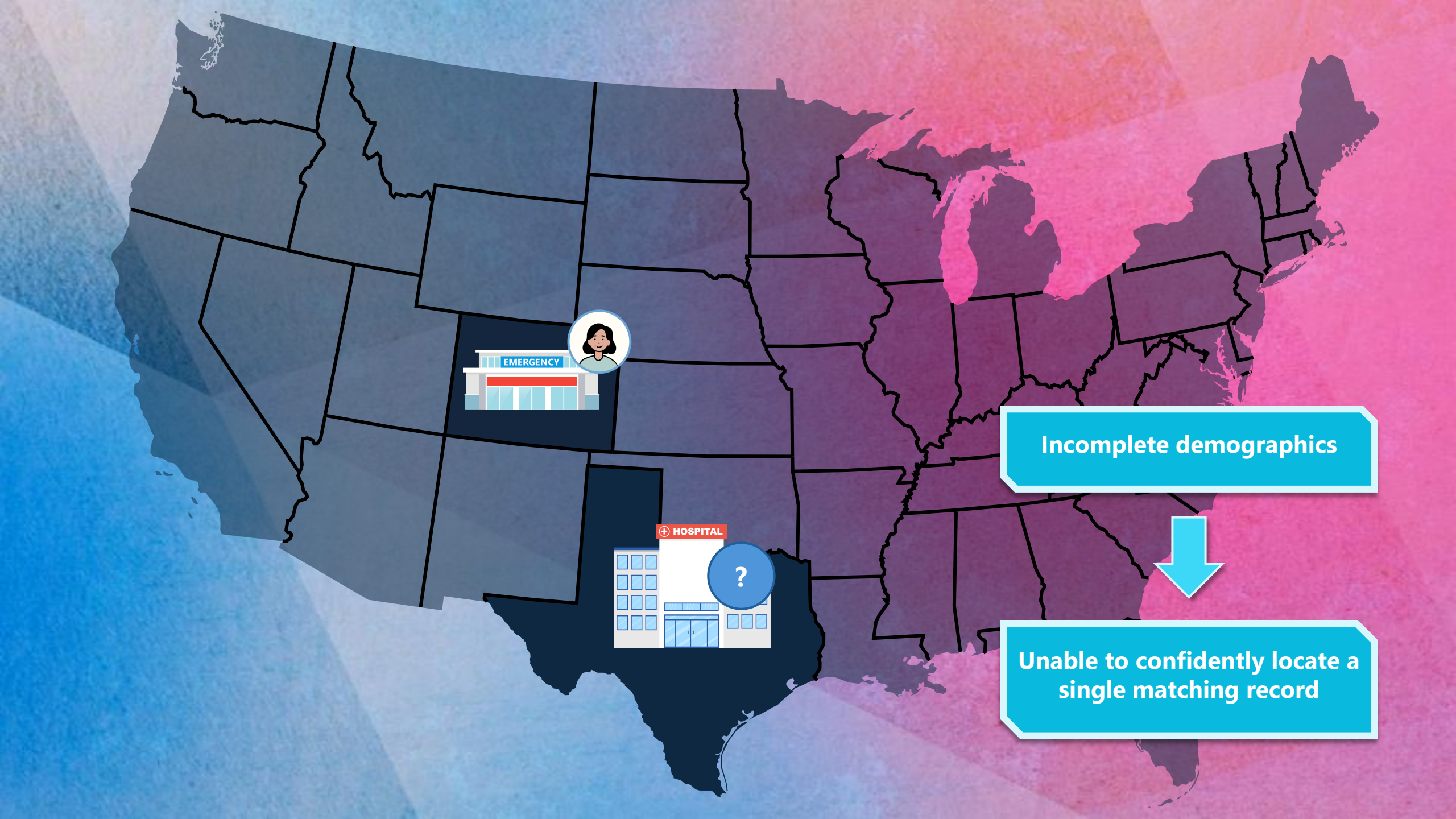
Harris County Health System






EMERGENCY
Colorado Mountain Hospital


HOSPITAL


EMERGENCY
HOSPITAL
?
Incomplete demographics
Unable to confidently locate a single matching record

Patient matching workflows

Patient Information

FIRST NAME
Maria

LAST NAME
Garcia

SEX
F

DOB
06/12/1980

SSN
123-45-7890

TEL
713-111-9068

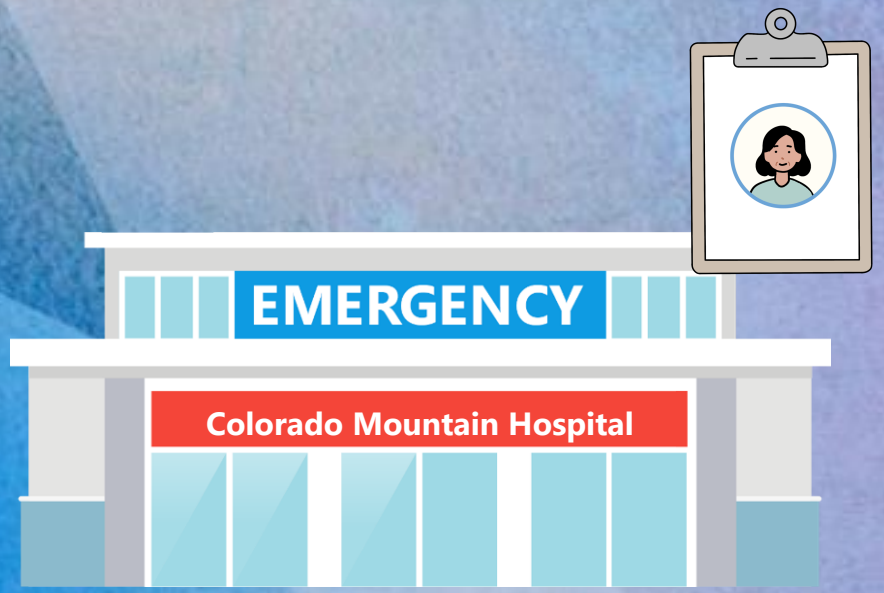
STREET
123 Main St

CITY
Houston

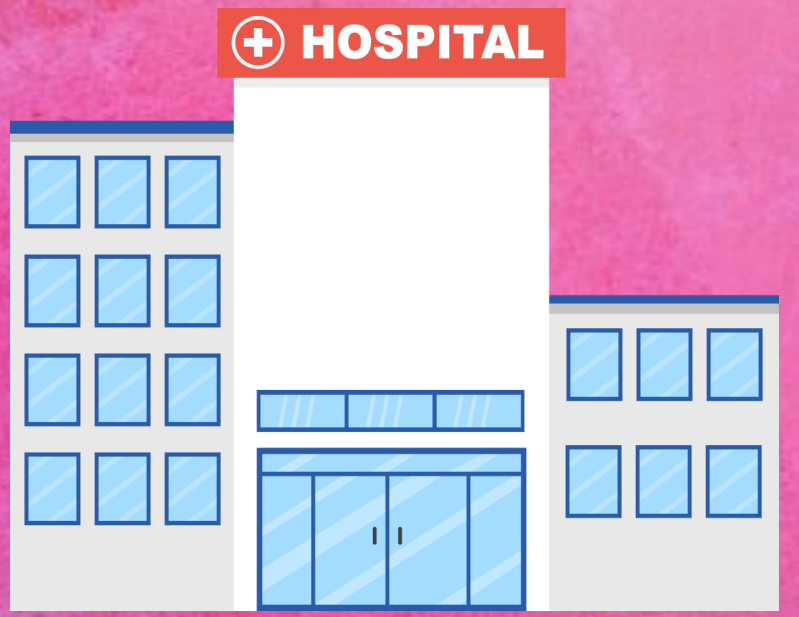
STATE
TX

ZIP
77099





Requesting Organization



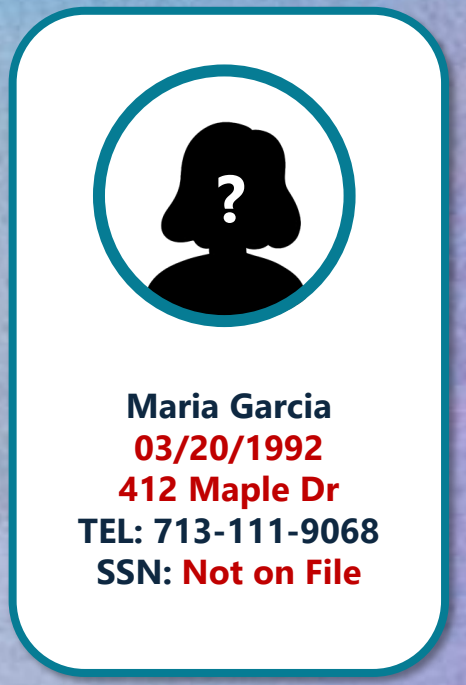
Responding Organization

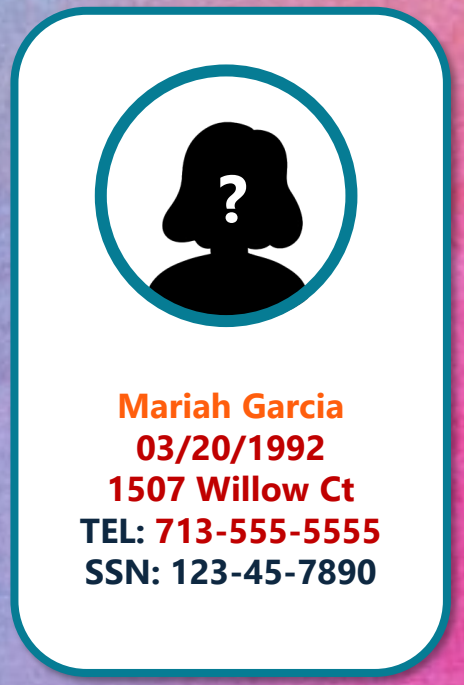




Responding Organization


Maria Garcia
06/12/1980
123 Main St
TEL: 713-111-9068
SSN: 123-45-7890

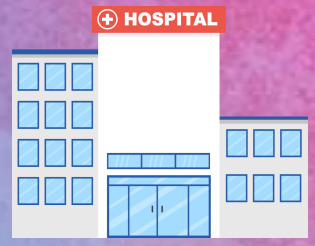

Maria Garcia
03/20/1992
412 Maple Dr
TEL: 713-111-9068
SSN: Not on File


Mariah Garcia
03/20/1992
1507 Willow Ct
TEL: 713-555-5555
SSN: 123-45-7890


Maria Garcia
12/06/1980
88 Juniper Rd
TEL: 713-111-1111
SSN: 685-88-1000


Marie Garcia
06/12/1980
123 Main St
TEL: 713-111-9068
SSN: Not on File


EMERGENCY


HOSPITAL



Maria Garcia
06/12/1980
123 Main St
TEL: 713-111-9068
SSN: 123-45-7890



Maria Garcia
03/20/1992
412 Maple Dr
TEL: 713-111-9068
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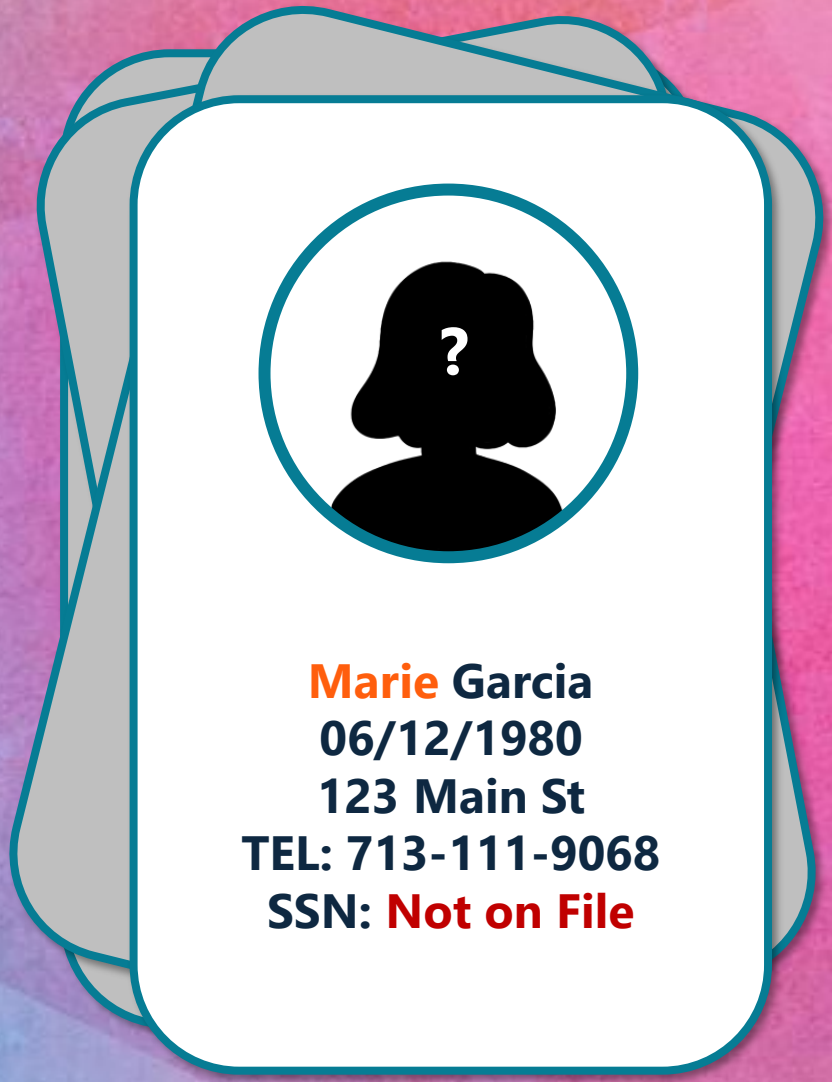
Mariah Garcia
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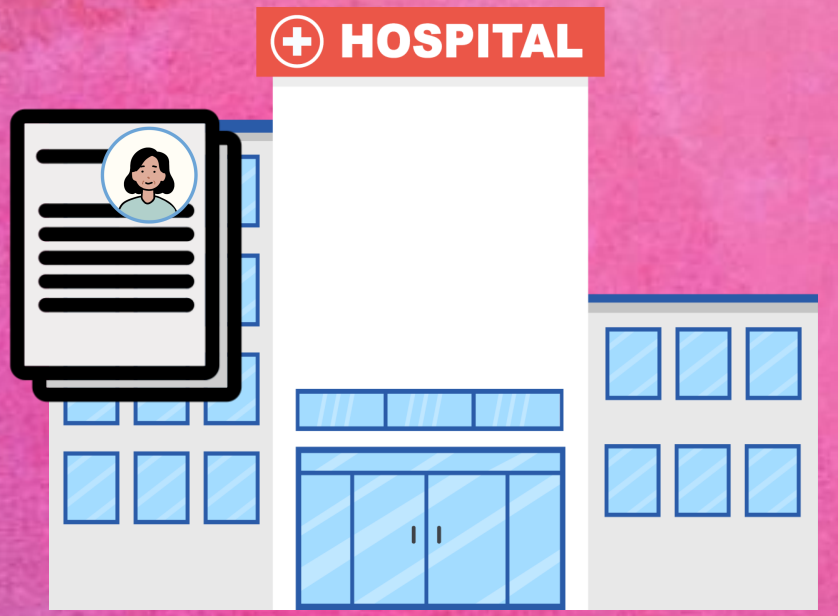


Patient Identity Verified

Patient Authorization Collected



Requesting Organization



Responding Organization



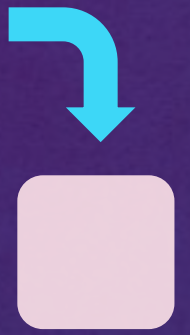
What makes patient matching challenging?

Harris County

3.4 million patients

250k patients

shared a **first and last name** with someone else



Source: Bipartisan Policy Center, *Challenges and Strategies for Accurately Matching Patients to Their Health Data* (June 2012).

250k patients

shared a **first and last name** with someone else

70k patients

shared first name, last name, and **date of birth**

250k
patients

shared a **first and last name** with someone else

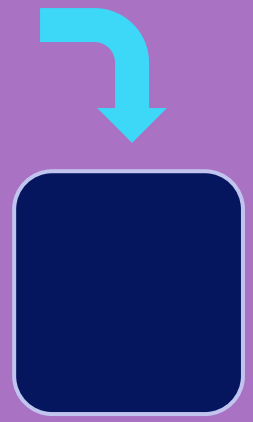
76k
patients

shared a name with **four or more others**

76k
patients

shared a name with
four or more others

2,500 Maria Garcias



2,500 Maria Garcias

231

share a date of birth

Epic's approach to patient matching

1 - PARSE

Population





Mary Garcia
12/06/1980
TEL: (713) 111-9078
SSN: 111687980



John Doe
1/1/1900
TEL: 713-555-5555
SSN: 999-99-9999

2 – FIND CANDIDATES

Name

SSN

Phone

Population



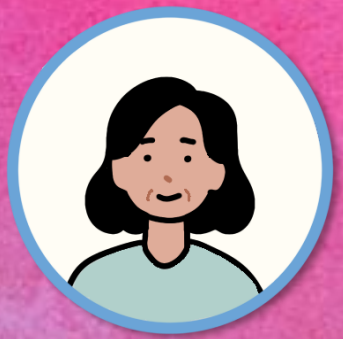
Candidates

3 - MATCHING

Candidates



60%



3 - MATCHING



Mary Garcia

12/06/1980

713-111-9078

maryg@email.com

111-68-7980

Female

321 First St

77099

60%

name: 8/10

DOB: 3/8

phone: 1/2

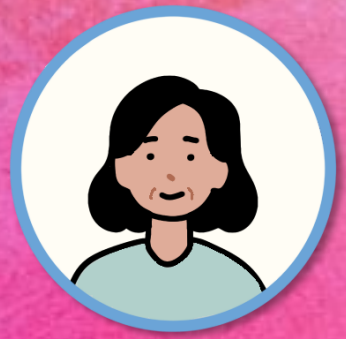
email: 0/2

SSN: 0/5

sex: 1/1

address: 0/3

zip code: 1/1



Maria Garcia

06/12/1980

713-111-9068

mgarcia@email.com

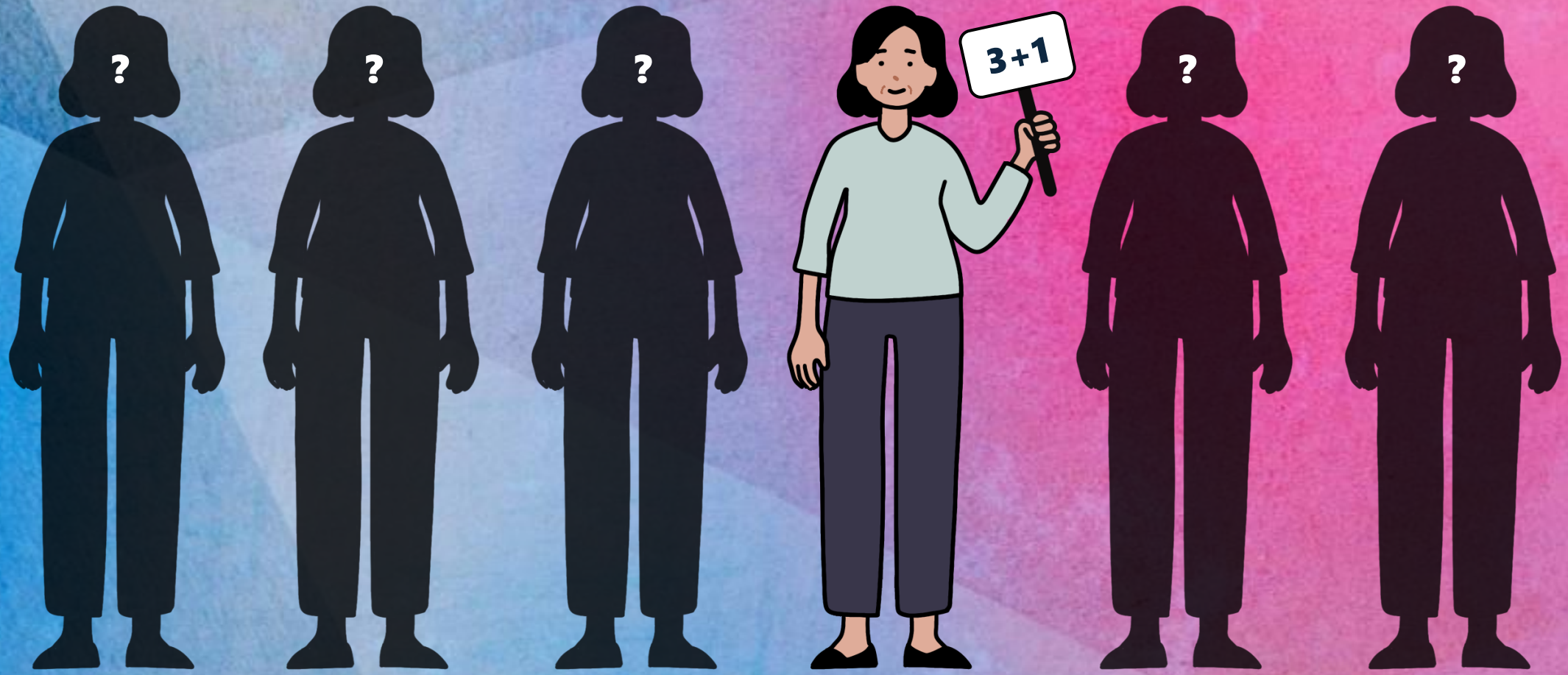
123-45-7980

Female

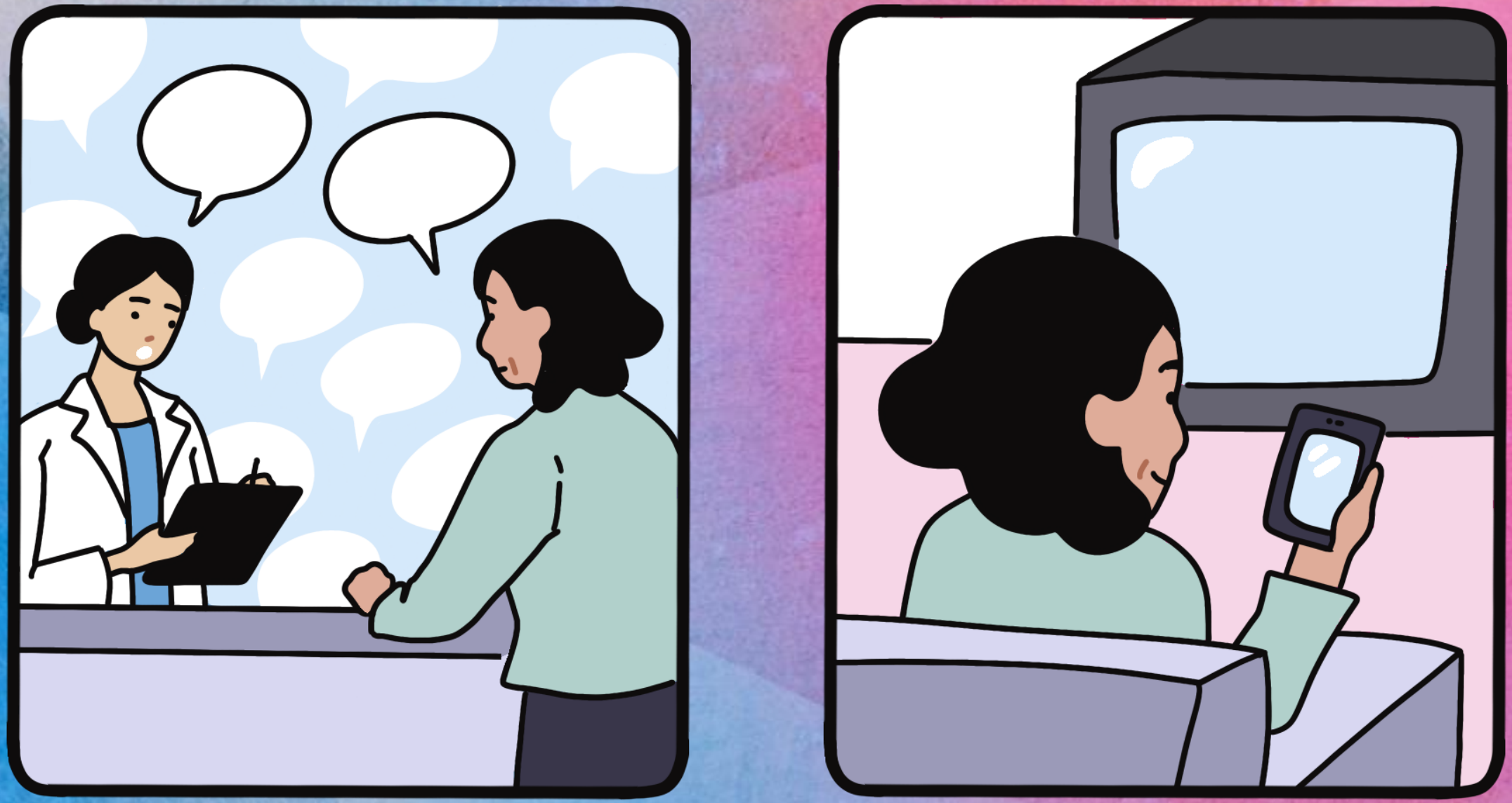
123 Main St

77099

name | sex | DOB + corroborating element

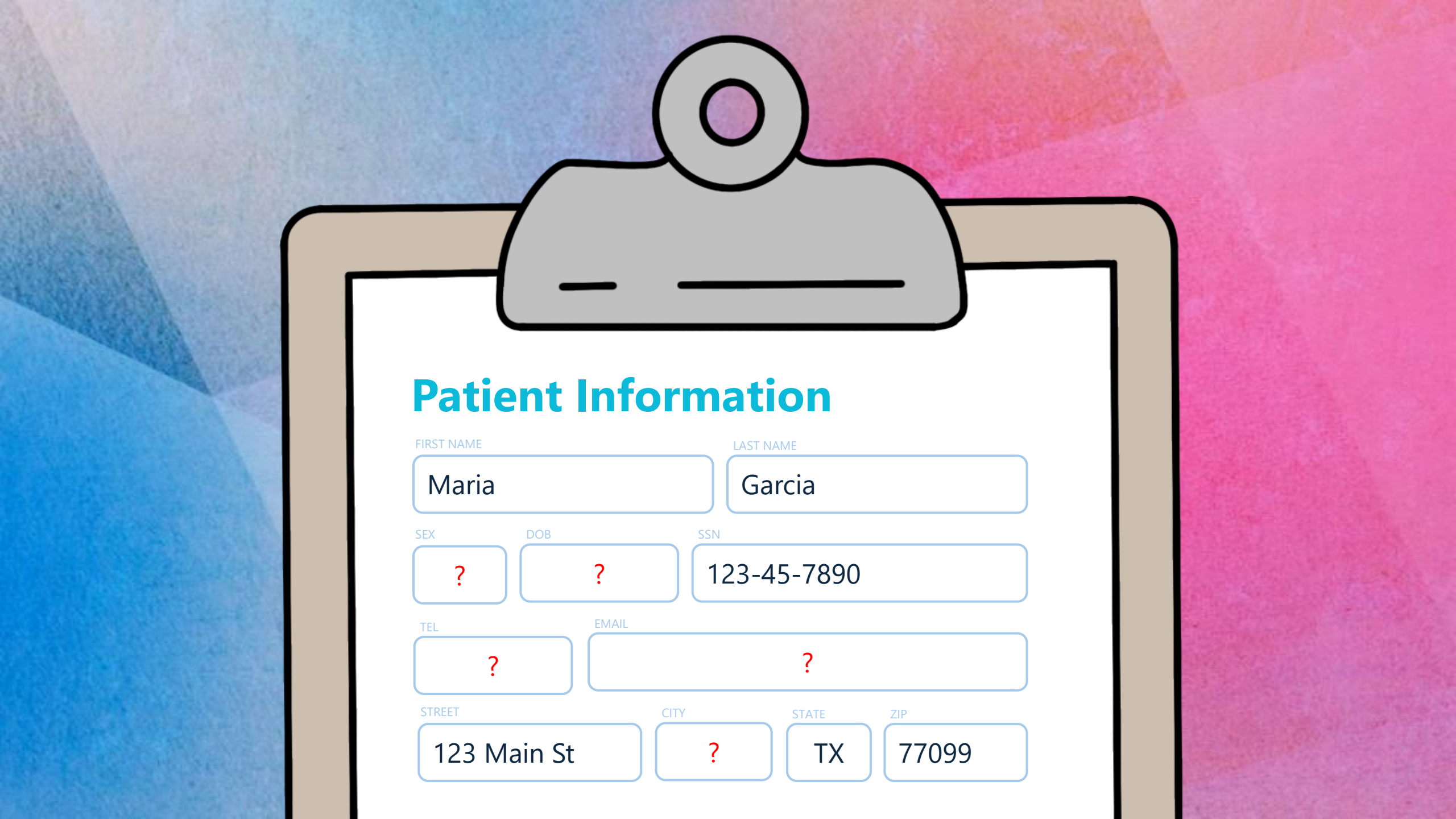


The importance of data quality maintenance



NAME	DOB	SSN
Maria Garcia	06/12/1980	123-45-7890
Marie Garcia	12/06/1980	xxx-xx-7890
Mariah Garcia	06/12/1908	123-45-7890
Garcia Maria	06/12/1980	523-45-7890
Maryl Garcie	06/12/1980	123-54-7890
Maria Garciaa	06/21/1980	123-45-7890
Mary Garcia	06/11/1980	111-11-1111

https://www.ahima.org/


Patient Information
FIRST NAME
Maria
LAST NAME
Garcia
SEX
?
DOB
?
SSN
123-45-7890
TEL
?
EMAIL
?
STREET
123 Main St
CITY
?
STATE
TX
ZIP
77099

Maria ~~Knowles~~ Garcia

?

?

?

~~126 First St~~ 123 Main St

?



~~Wisconsin~~ ~~Montana~~ Texas

?

?

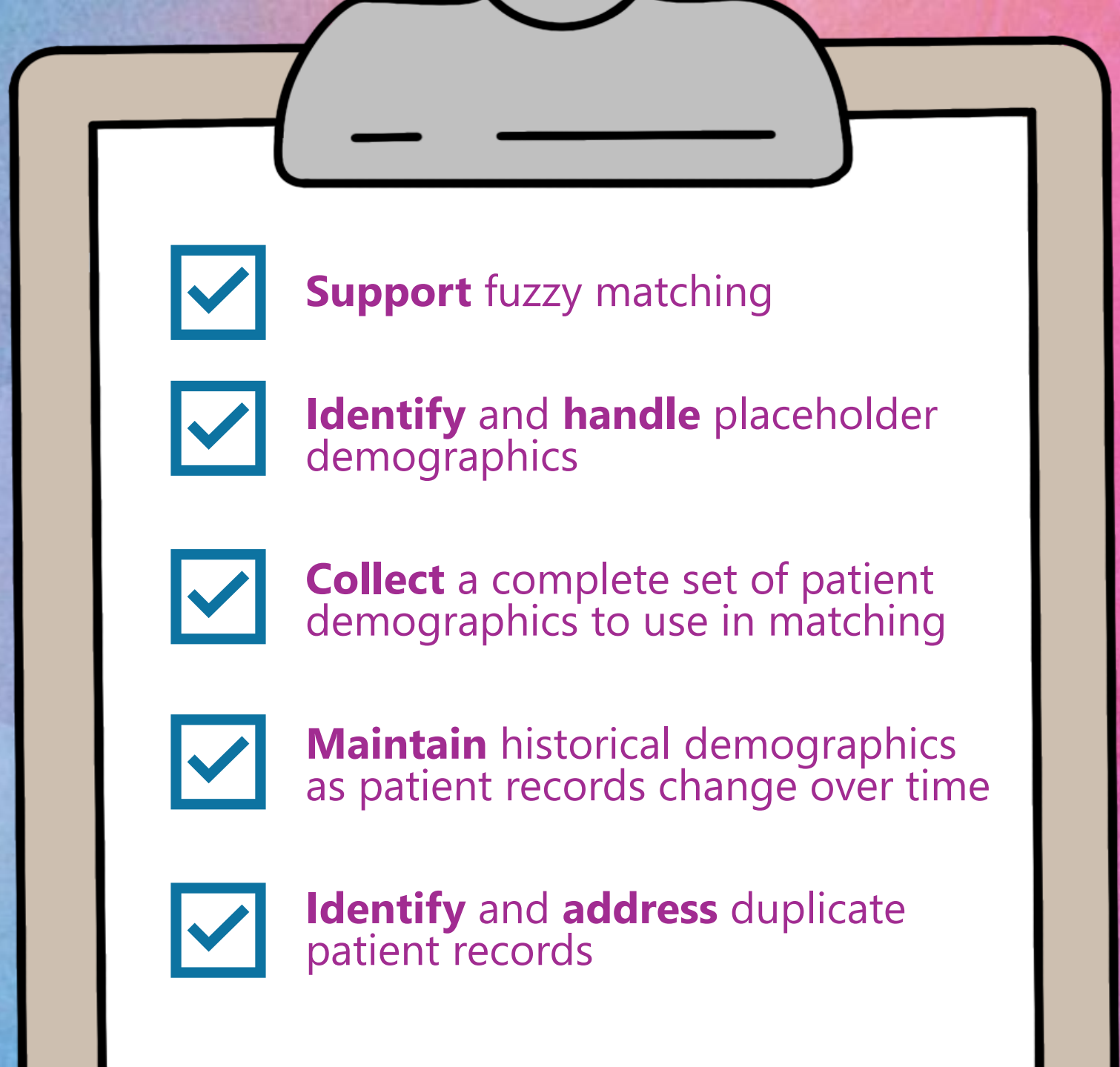
713-~~111-9068~~ 713-222-7234

?


NYPD

Data Quality Checklist

What you can focus on now



- [x] **Support** fuzzy matching
- [x] **Identify** and **handle** placeholder demographics
- [x] **Collect** a complete set of patient demographics to use in matching
- [x] **Maintain** historical demographics as patient records change over time
- [x] **Identify** and **address** duplicate patient records

How to evaluate matching quality?

	True	False
Positive	**TP** Correct patient matched	**FP** Wrong patient matched
Negative	**TN** No matching patients	**FN** Matching patient not found

Maria's Chart

Immunizations

Medications

Allergies

Problems



FP

Wrong patient matched



Marie Garcia
06/12/1980
123 Main St
TEL: 713-111-9068
SSN: 123-456-7890

Evaluation Metrics

$$\textbf{Precision} = \frac{TP}{TP + FP}$$

Portion of Matches Made That Were Correct

$$\textbf{Recall} = \frac{TP}{TP + FN}$$

Portion of All Correct Matches That Were Found

$$\textbf{Accuracy} = \frac{TP + TN}{TP + TN + FP + FN}$$

Portion of All Predictions (Matches and Non-Matches) That Were Correct

Evaluation Metrics

Precision

Portion of Matches Made That Were **Correct**

Recall

Portion of All Correct Matches That Were **Found**

Accuracy

Portion of All Predictions (Matches and Non-Matches) That Were Correct

Recall

Portion of All Correct Matches
That Were **Found**

Precision

Portion of Matches Made
That Were **Correct**

Loosened Thresholds

Precision

Portion of Matches Made
That Were **Correct**

Recall

Portion of All Correct Matches
That Were **Found**

Tightened Thresholds

Evaluation Metrics

Precision

Portion of Matches Made That Were **Correct**

Recall

Portion of All Correct Matches That Were **Found**

Accuracy

Portion of All Predictions (Matches and Non-Matches) That Were Correct

Answer Key



Population One



Population Two



Mutations



Maria Garcia
12/06/1980
123 Main St
TEL: 713-111-8609
SSN: 123-456-7980



Mary Garcia
06/12/1980
123 Main St
TEL: 713-222-7234
SSN: 123-456-7890



Maria Knowles
06/12/1980
126 First St
TEL: 713-111-8609
SSN: 123-456-7890

Population One



Population Two



Population One



Requester Environment

Population Two



Responder Environment

Population One





Run Patient Matching

Requester Environment

Population Two



Responder Environment

Population One



Population Two





Run Patient Matching



Requester Environment

Responder Environment

Requester Environment

Responder Environment

Patient Matching Results

Answer Key

Patient Matching Results



Patient Matching Results



Epic's Performance

"Northeast" Urban Population

Precision:	99.99%
Recall:	96.28%
Accuracy:	97.94%
FP Rate:	0.0013%

"Midwest" Rural Population

Precision:	99.99%
Recall:	97.66%
Accuracy:	98.61%
FP Rate:	0.0037%

"National Health App" Population

Precision:	99.99%
Recall:	96.35%
Accuracy:	98.54%
FP Rate:	0.0001%

Twins are tough!





Maria Garcia
06/12/1980
123 Main St
TEL: 713-111-9068
SSN: 123-45-6789



Maggie Garcia
06/12/1980
456 Side St
TEL: 713-111-1136
SSN: 098-76-5432

Also shared phone number and address when they were kids

Test Your Algorithm

[QR CODE]

What can you do to improve patient matching?

To Do



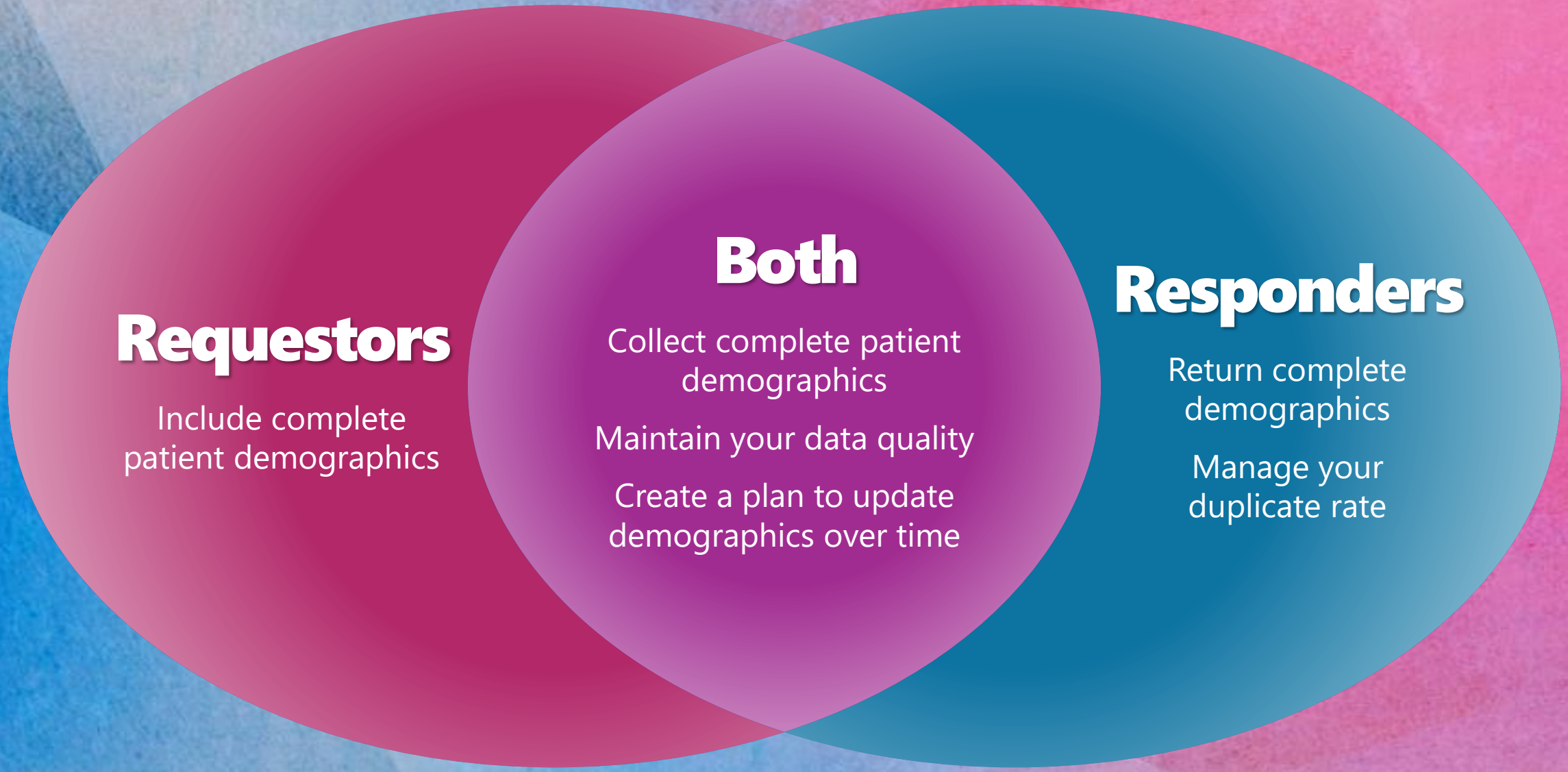
Measure your current performance.

Review cases where your organization's matching logic struggled.

Look for ways to improve your data quality.

Monitor changes to your matching algorithm's performance.

How do I improve my match rate with Epic's customers?



Test Your Algorithm

Q&A

[QR CODE]

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