# Impact of ICD-10-CM Transition on Selected Cardiovascular-Related Events in the Sentinel System
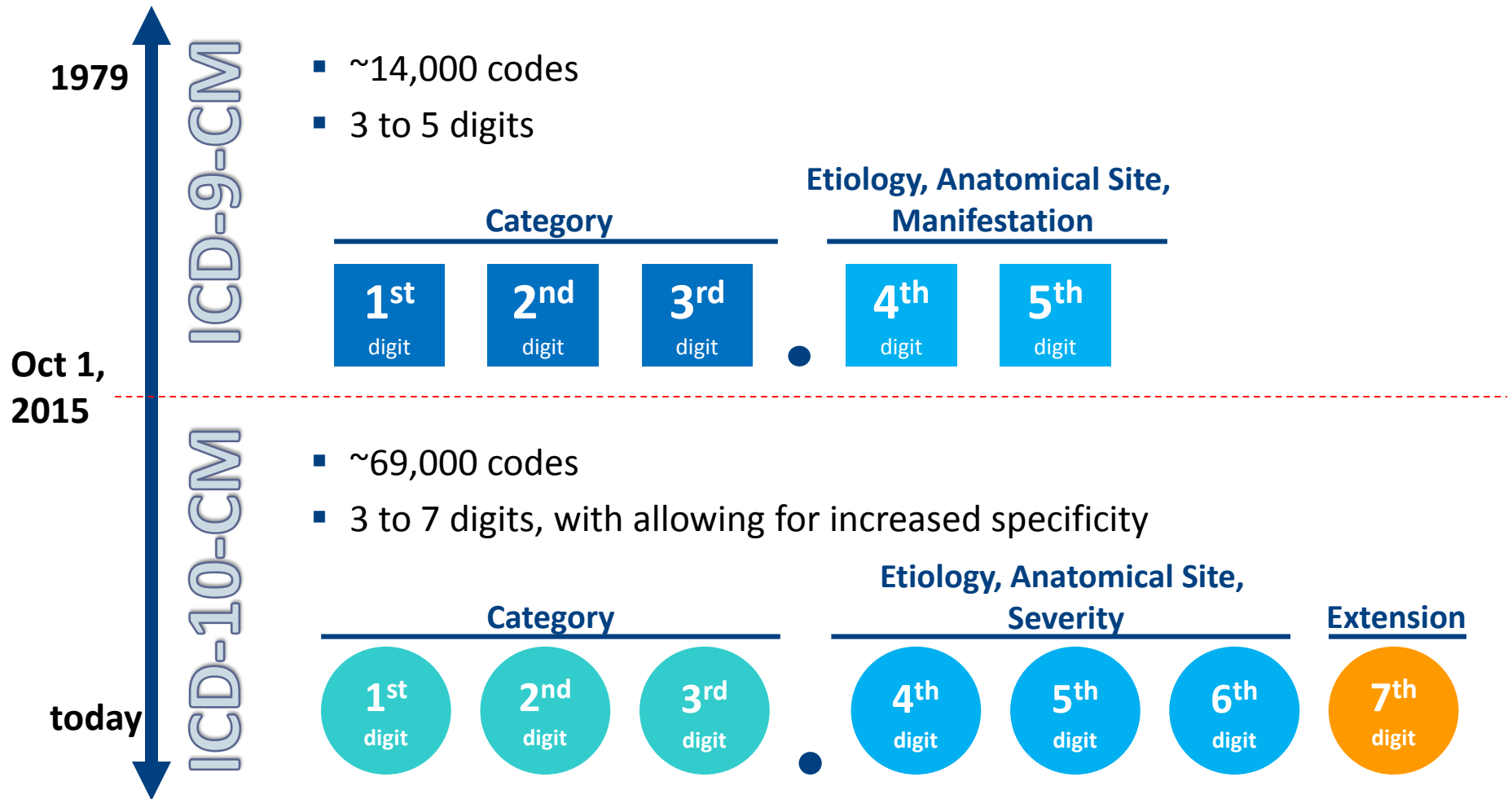
Tiffany Siu Woodworth, MPH,

Catherine A. Panozzo, PhD, Emily C. Welch, MPH,

Ting-Ying Jane Huang, PhD, BSPharm, Qoua L. Her, PharmD, MSc,

Catherine Rogers, MPH, Max Ehrmann, MPH, Talia Menzin,

Nicole Haug, MPH, Katherine Freitas, Sengwee Darren Toh, ScD

*Harvard Pilgrim Health Care Institute,  Boston, MA, USA*

# Disclosures

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- The views expressed are the authors' and not necessarily those of the Food and Drug Administration, or the Department of Health and Human Services

# Transitioning to ICD-10-CM in the U.S.

**ICD-9-CM**

1979

- ~14,000 codes
- 3 to 5 digits

**Category**

**Etiology, Anatomical Site, Manifestation**

| 1st digit | 2nd digit | 3rd digit | • | 4th digit | 5th digit |

Oct 1, 2015

**ICD-10-CM**

- ~69,000 codes
- 3 to 7 digits, with allowing for increased specificity

**Category**

**Etiology, Anatomical Site, Severity**

**Extension**

| 1st digit | 2nd digit | 3rd digit | • | 4th digit | 5th digit | 6th digit | 7th digit |

today

http://www.roadto10.org/icd-10-basics

# Objective

- To characterize the impact of the ICD-10-CM transition on the identification selected Health Outcomes of Interest (HOIs)

  - Assess feasibility of using validated algorithms from international studies

  - Assess the feasibility of using algorithms defined through mapping techniques

# Approach to defining conditions

- Four definitions used to identify each condition
    - ICD-9-CM algorithm from medical literature or previous Sentinel work
    - ICD-10-CM algorithm derived from international validation studies
    - ICD-10-CM Simple Forward Mapping (SFM) conversion using General Equivalence Mappings (GEMs)*
    - ICD-10-CM Forward-Backward Mapping (FBM) conversion using GEMs*

- Selected health conditions
    - Acute myocardial infarction (AMI), ischemic stroke, angioedema

*Fung et al, eGEMs 2016;4(1):Article 4

# Example: Algorithms from literature

- **Ischemic stroke algorithm** *(total 119 ICD-10 codes)*:

  *Any of the following ICD-10 codes in the principal position on an inpatient hospital claim:*

  - *I63.\* (cerebral infarction)*
  - *H34.1\* (retinal artery occlusion)*

- **Derived algorithm based on literature review**

  - Two international studies validated similar algorithm including inpatient and other settings
    - Kokotailo (Canada)
      - *Kokotailo, R. A., and M. D. Hill. "Coding of Stroke and Stroke Risk Factors Using International Classification of Diseases, Revisions 9 and 10." Stroke 36.8 (2005): 1776-781*
    - Tolonen (Finland)
      - *H, Tolonen, Salomaa V, Torppa J, Sivenius J, Immonen-Räihä P, and Lehtonen A. "The Validation of the Finnish Hospital Discharge Register and Causes of Death Register Data on Stroke Diagnoses." Eur J Cardiovasc Prev Rehabil. 2007 Jun 14(3): 380-5*

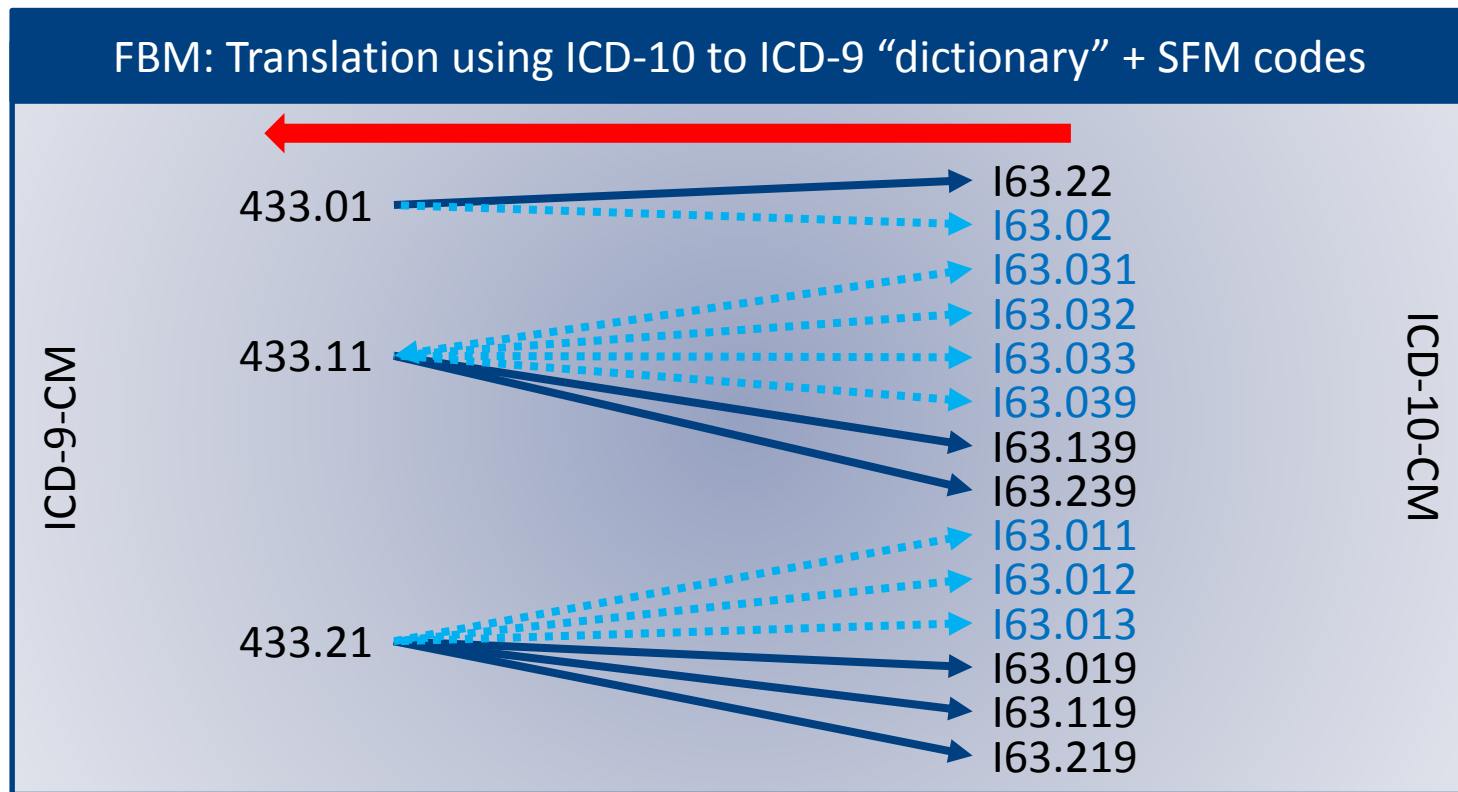# Example: Simple-forward mapping

- Ischemic Stroke algorithm* (*total 12 codes*):
  - Utilize GEMs forward mapping files
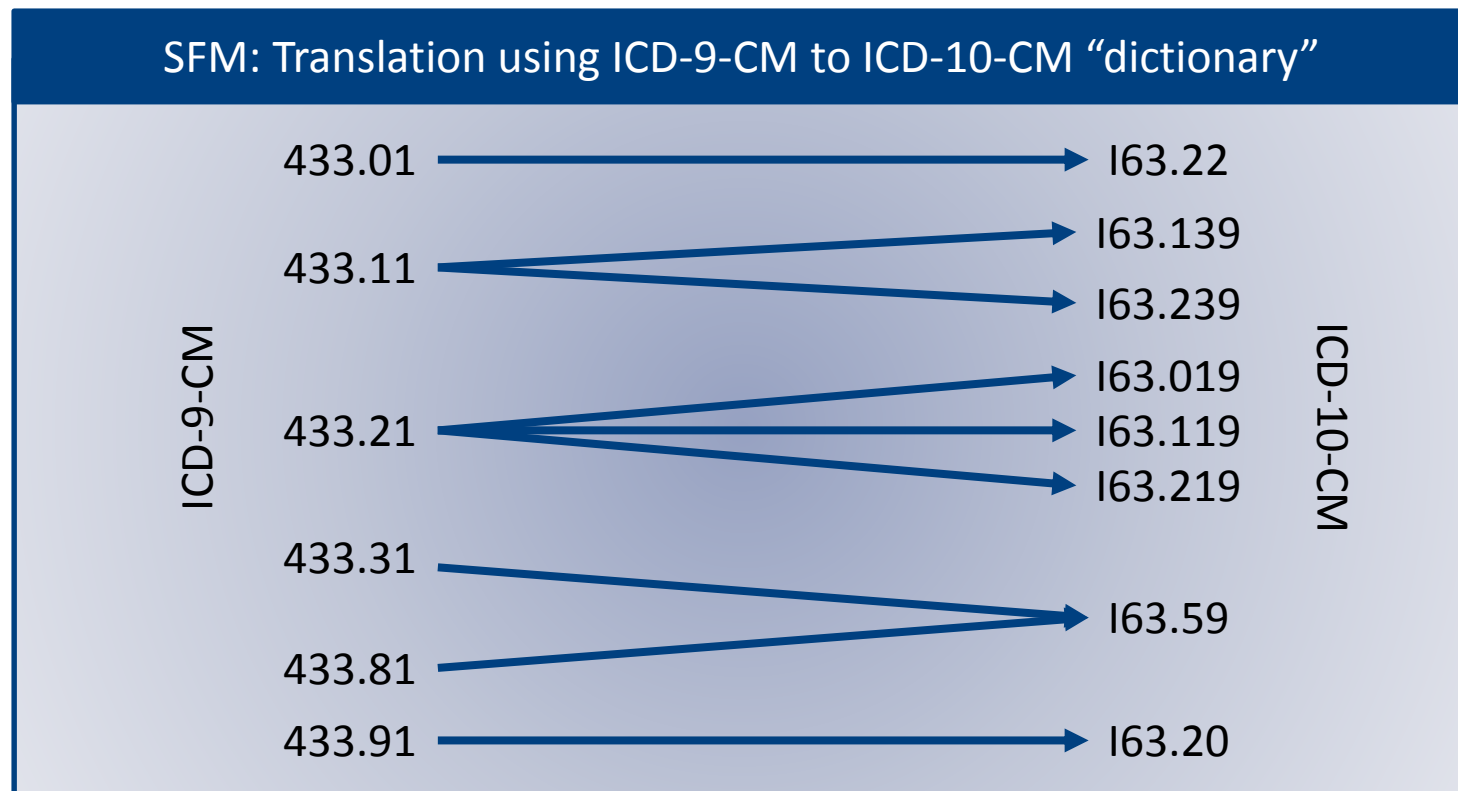


*partial ischemic stroke algorithm*
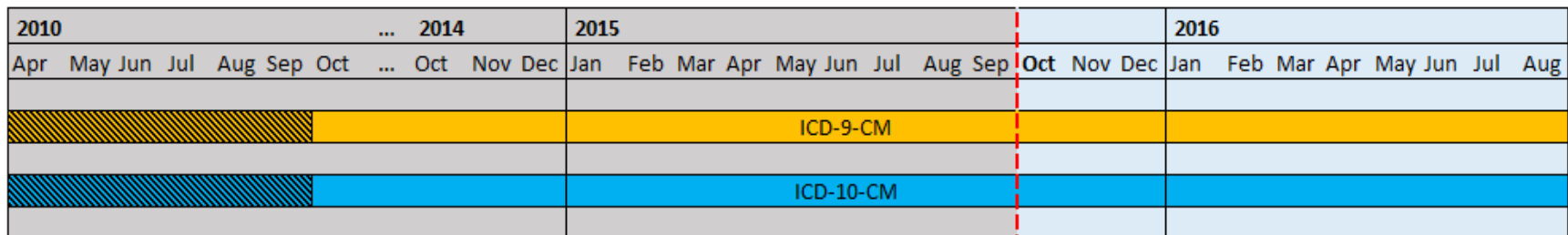
# Example: Forward-backward mapping

- Ischemic Stroke algorithm* (*total 91 codes*):
  - Utilize both forward mapping and backward mapping files



FBM: Translation using ICD-10 to ICD-9 "dictionary" + SFM codes

ICD-9-CM

433.01 → I63.22
433.01 ⟶ I63.02

I63.031
I63.032
433.11 → I63.033
I63.039
I63.139
I63.239

I63.011
I63.012
433.21 → I63.013
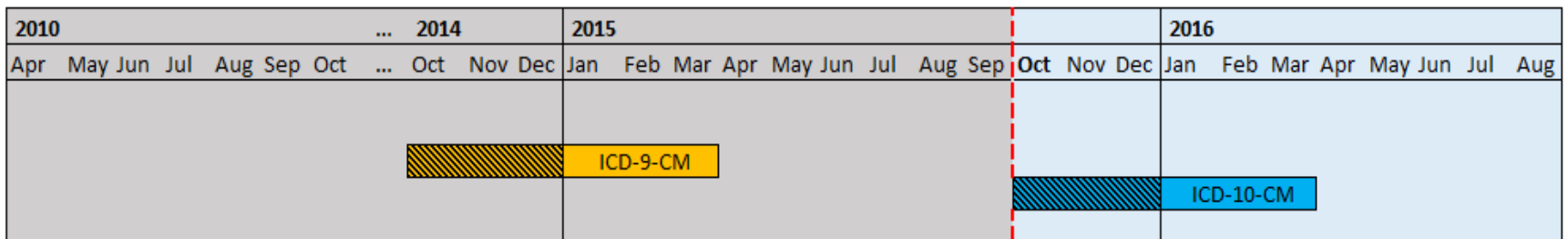I63.019
I63.119
I63.219

ICD-10-CM

*partial ischemic stroke algorithm

# Analysis specifications

- Leveraged publicly available Sentinel tools
- For each outcome algorithm:
  - Detect trends: incidence over time



| 2010 | | | | | | | ... | 2014 | | | 2015 | | | | | | | | | | Oct | Nov | Dec | 2016 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Apr | May | Jun | Jul | Aug | Sep | Oct | ... | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | | |

  - Coding-era comparison: incidence



Indicates study period      Indicates washout period only

# Summary of results

- 11 health plans participating in Sentinel
  - Mix of national and regional health insurers, integrated delivery systems
  - At a minimum, included data through March 31, 2016

- Data included:

| Analysis type | Members | Member-years |
|---|---|---|
| Trend analysis:<br>October 1, 2010 – August 31, 2016 | 131 million | 319 million |
| Coding-era analysis:<br>October 1, 2014 – March 31, 2015<br>October 1, 2015 – March 31, 2016 | 57 million | 13 million |

# AMI: trend analysis



Incidence per 1,000 Eligible Members of Acute Myocardial Infarction (AMI) between October 2010- August 2016, by Outcome Definition
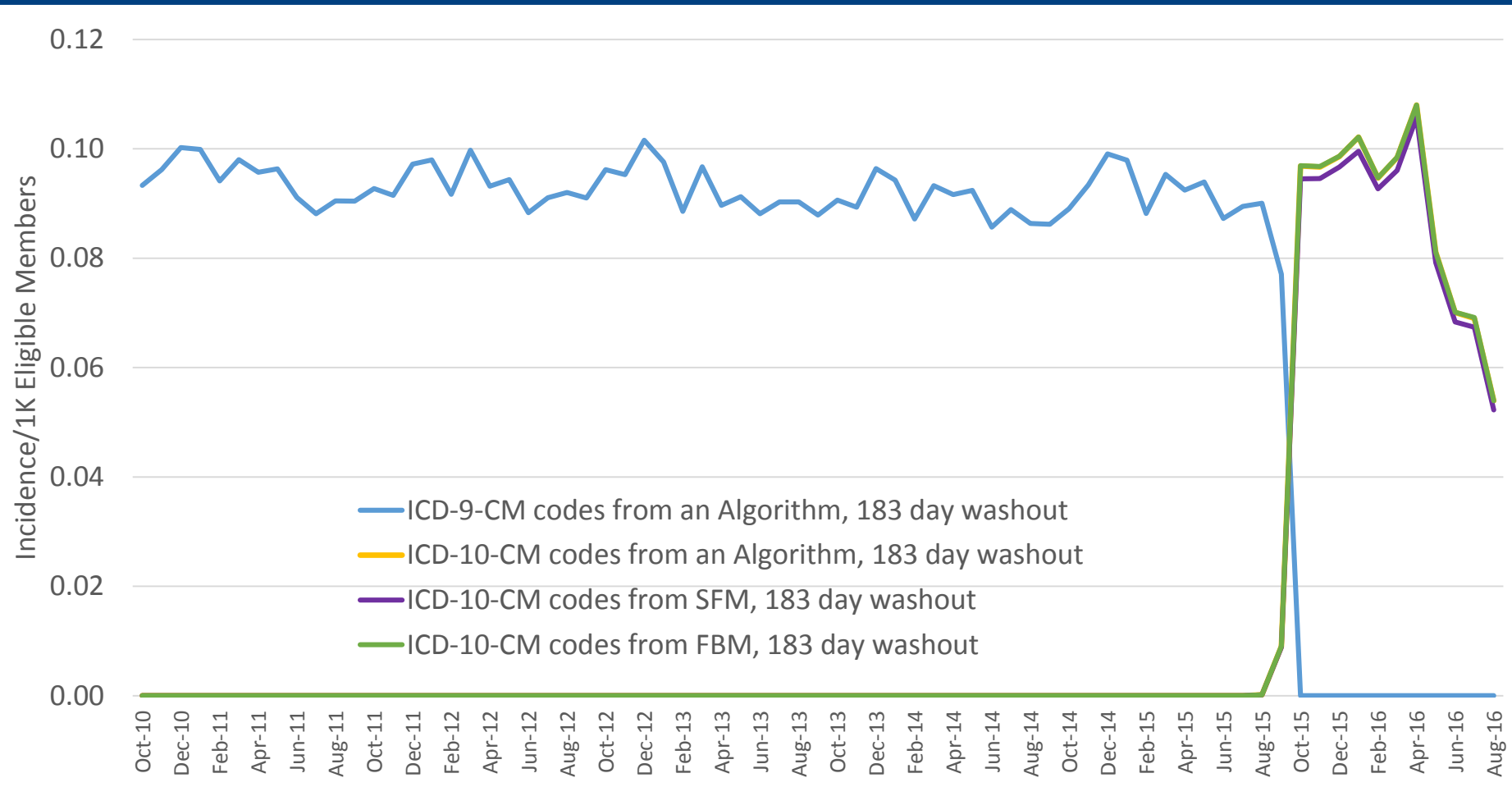
# AMI: coding-era analysis

**Incidence of various AMI definitions per 1000 eligible members using a *90 day washout,* Jan-Mar 2015 vs. Jan-Mar 2016**
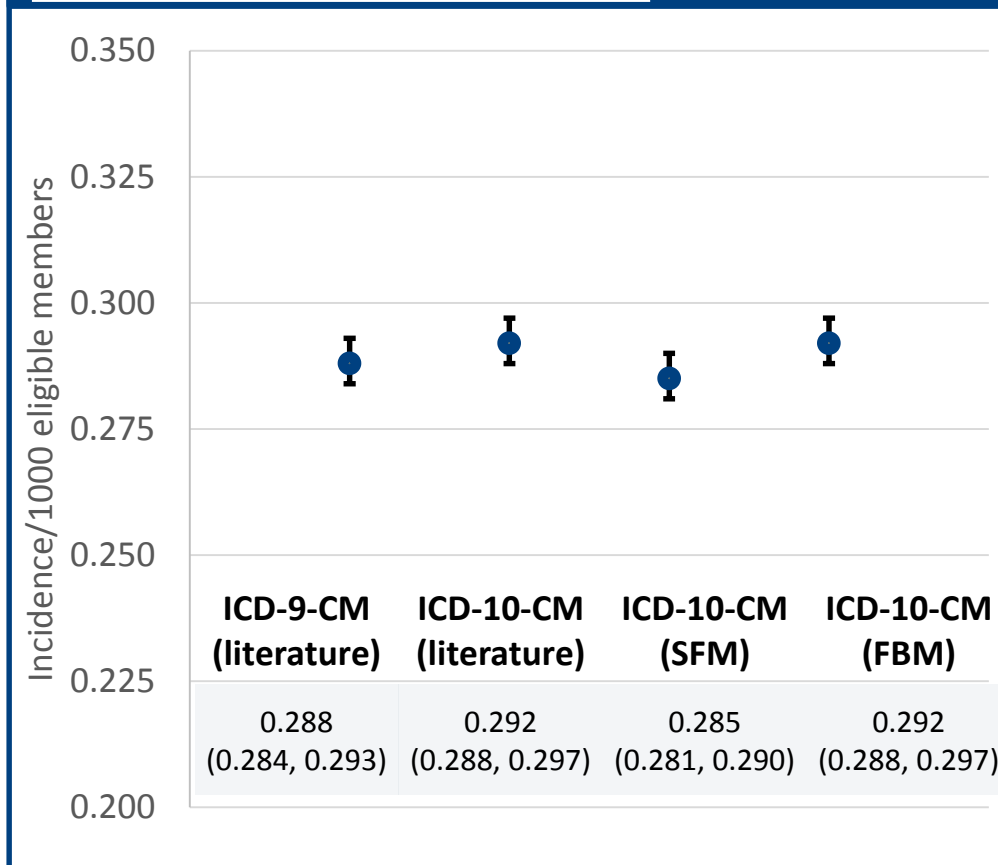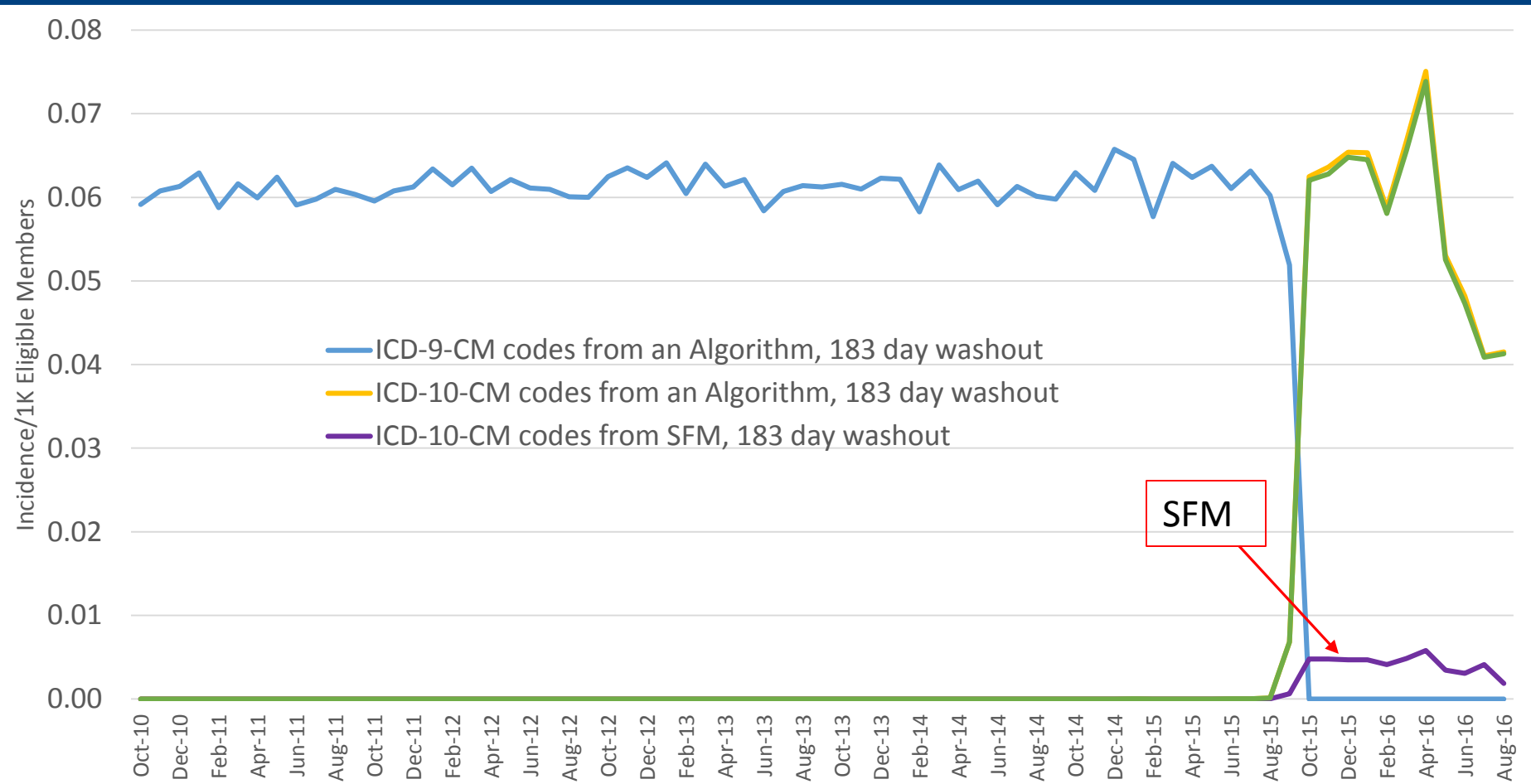
| | ICD-9-CM Code Count | ICD-10-CM Code Count |
|---|---|---|
| **Definition** | | |
| Algorithm* | 20 | 12 |
| SFM | 20 | 6 |
| FBM | 20 | 14 |

- Each algorithm identified ~16.5K events

- ICD-10-CM codes identified by the three approaches all included the most frequently used codes

| | ICD-9-CM (literature) | ICD-10-CM (literature) | ICD-10-CM (SFM) | ICD-10-CM (FBM) |
|---|---|---|---|---|
| | 0.288 (0.284, 0.293) | 0.292 (0.288, 0.297) | 0.285 (0.281, 0.290) | 0.292 (0.288, 0.297) |

*Incidence/1000 eligible members* (y-axis: 0.200 – 0.350)

*Cutrona et al 2013

# Ischemic stroke: trend analysis

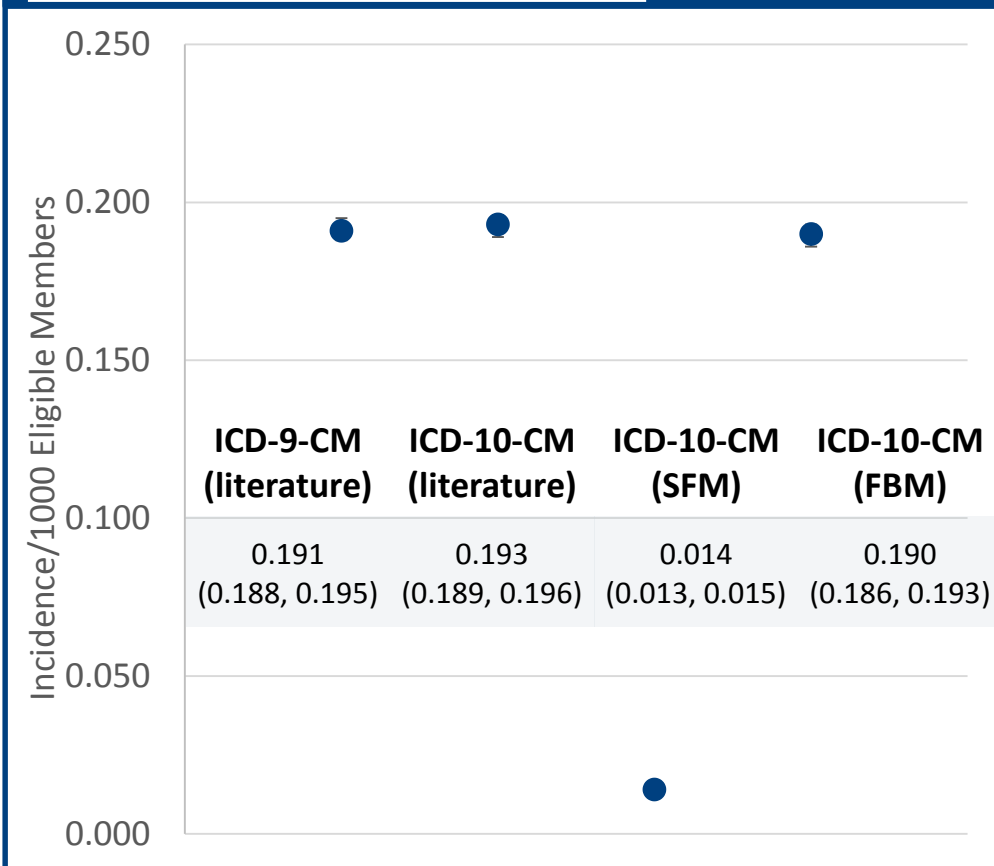**Incidence per 1,000 Eligible Members of Ischemic Stroke between October 2010- August 2016, by Outcome Definition**



Legend:
- ICD-9-CM codes from an Algorithm, 183 day washout
- ICD-10-CM codes from an Algorithm, 183 day washout
- ICD-10-CM codes from SFM, 183 day washout

SFM

# Ischemic stroke: coding-era analysis

**Incidence of various AMI definitions per 1000 eligible members using a *90 day washout,* Jan-Mar 2015 vs. Jan-Mar 2016**
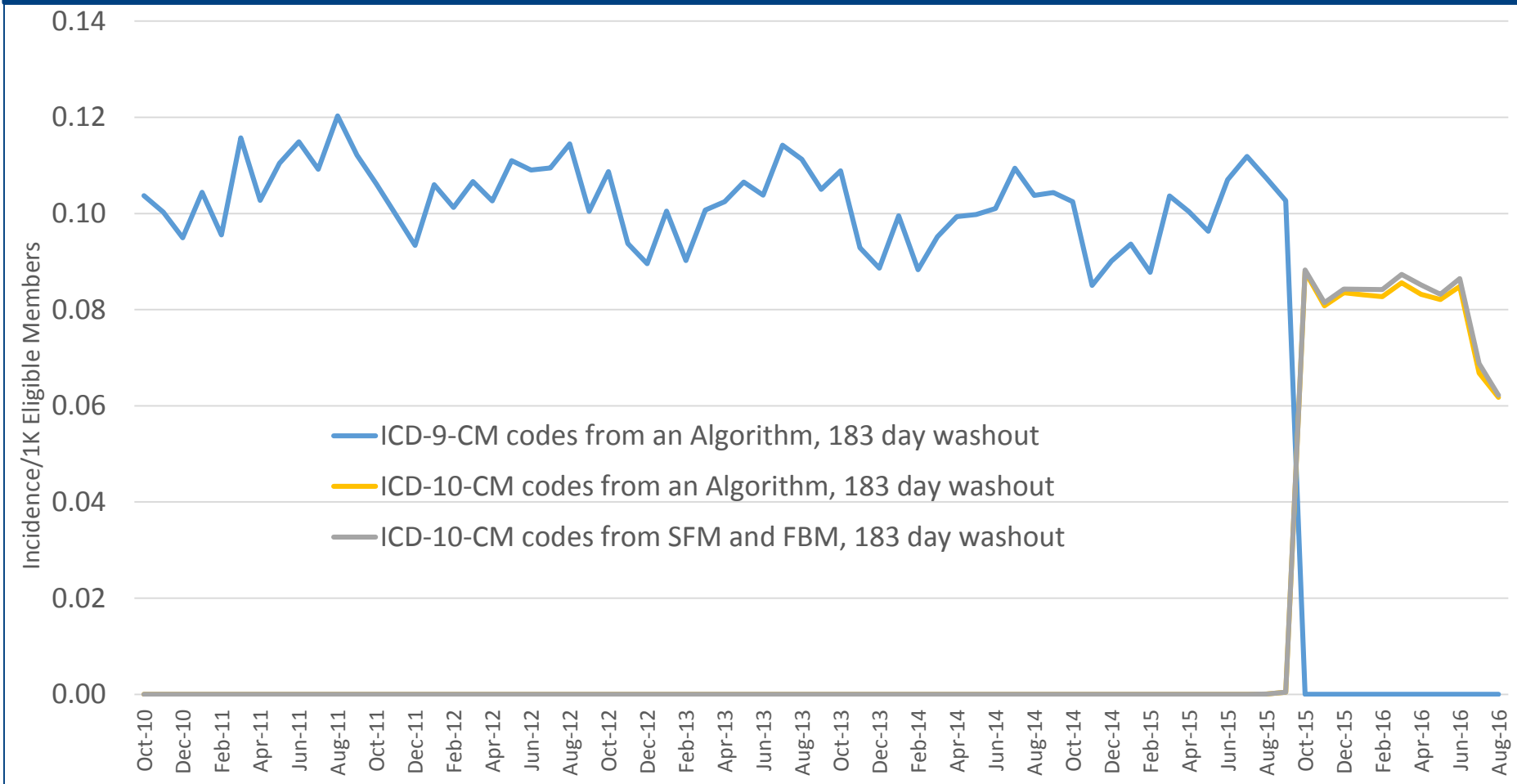
| Definition | ICD-9-CM Code Count | ICD-10-CM Code Count |
|---|---|---|
| Algorithm* | 10 | 119 |
| SFM | 10 | 12 |
| FBM | 10 | 91 |

- Most common code:
- ❖ *I63.9: cerebral infarction unspecified*
  - Not included in SFM (**800 events**)
  - Included in Algorithm & FBM: (**11K events**)

| | ICD-9-CM (literature) | ICD-10-CM (literature) | ICD-10-CM (SFM) | ICD-10-CM (FBM) |
|---|---|---|---|---|
| | 0.191 (0.188, 0.195) | 0.193 (0.189, 0.196) | 0.014 (0.013, 0.015) | 0.190 (0.186, 0.193) |

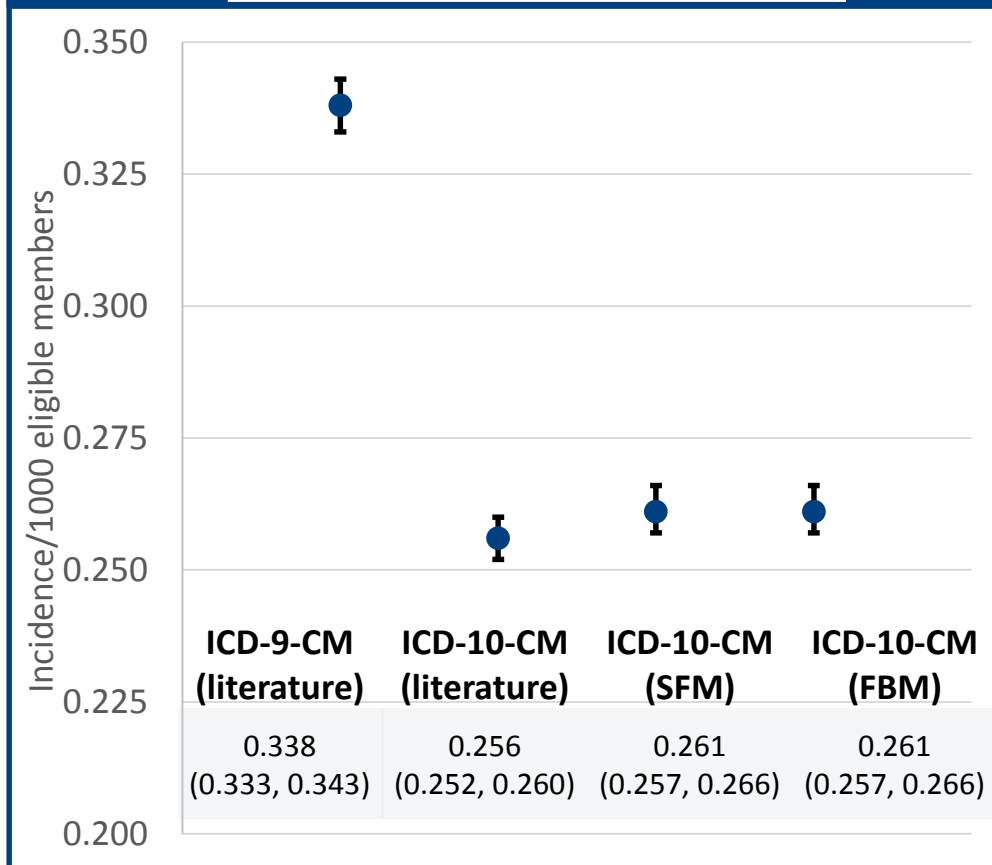# Angioedema: trend analysis



**Incidence per 1,000 Eligible Members of Angioedema between October 2010- August 2016, by Outcome Definition**

Legend:
- ICD-9-CM codes from an Algorithm, 183 day washout
- ICD-10-CM codes from an Algorithm, 183 day washout
- ICD-10-CM codes from SFM and FBM, 183 day washout

# Angioedema: coding-era analysis

**Incidence of various angioedema definitions per 1000 eligible members using a *90 day washout,* Jan-Mar 2015 vs. Jan-Mar 2016**



| | ICD-9-CM (literature) | ICD-10-CM (literature) | ICD-10-CM (SFM) | ICD-10-CM (FBM) |
|---|---|---|---|---|
| | 0.338 (0.333, 0.343) | 0.256 (0.252, 0.260) | 0.261 (0.257, 0.266) | 0.261 (0.257, 0.266) |

| Definition | ICD-9-CM Code Count | ICD-10-CM Code Count |
|---|---|---|
| Algorithm* | 1 | 1 |
| Washout | 1 | 3 |
| SFM | 1 | 1 |
| FBM | 1 | 1 |

- One ICD-9-CM code (**19K events**)
  - ❖ *995.1: Angioneurotic edema not elsewhere classified*

- Three ICD-10-CM codes (**15K events**)
  - ❖ *T78.3XXA: Angioneurotic edema, initial encounter*
  - ❖ *T78.3XXD: Angioneurotic edema, subsequent encounter*
  - ❖ *T78.3XXS: Angioneurotic edema, sequela*

*\*Toh S et al, Johnsen SP et al, Gupta R et al*

# Other findings

- Algorithms that included commonly reported diagnosis codes generally performed similarly

- In general, FBM performed better than SFM

- Rates consistent in both eras across 11 diverse, participating health plans

# Strengths and limitations

- Strengths:
  - Variety and size of the Sentinel distributed database
  - Reproducibility

- Limitations:
  - Analysis only includes selected HOIs
  - Coding practices may change over time
  - Investigation focused on conditions as outcomes

# Recommendations

- Continue to monitor trends as ICD-10-CM data accumulate

- Assess trend analysis for inferential analyses within cohorts

- Consider sensitivity analyses for outcome definitions
  - Forward-backward mapping may be reasonable substitute
  - Internationally validated algorithms should be tested
  - Clinical expertise should be leveraged

- If possible, chart validation is ideal

# Acknowledgements

- Co-authors
  - Catherine Panozzo, Emily Welch, Jane Huang, Qoua Her, Catherine Rogers, Max Ehrmann, Talia Menzin, Nicole Haug, Katherine Freitas, Darren Toh

- Sentinel Applied Surveillance Core
  - University of Iowa: Ryan Carnahan, Elizabeth Chrischilles
  - University of Pennsylvania: Sean Hennessy, Charles Leonard

- Many thanks are due to the Data Partners who provided data used in this analysis

# Thank you!

# Extra Slides

# ICD-10-CM vs. ICD-9-CM

## The Differences will make a Difference

It is important to understand the major improvements and changes between ICD-9 and ICD-10 diagnosis codes.

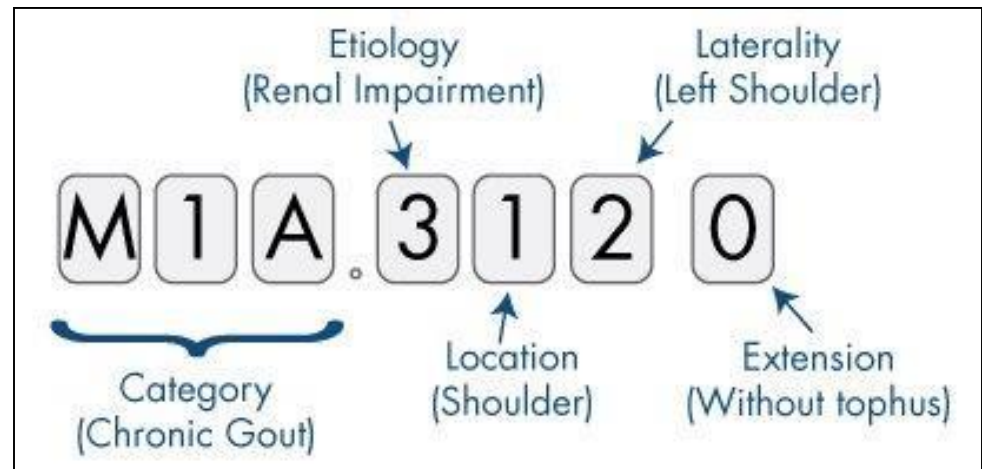| ICD-9-CM Diagnosis Codes | ICD-10-CM Diagnosis Codes |
|---|---|
| No Laterality | Laterality – Right or Left account for >40% of codes |
| 3-5 digits<br>• First digit is alpha (E or V) or numeric<br>• Digits 2-5 are numeric<br>• Decimal is placed after the third character | 7 digits<br>• Digit 1 is alpha; Digit 2 is numeric<br>• Digits 3–7 are alpha or numeric<br>• Decimal is placed after the third character |
| No placeholder characters | "X" placeholders |
| 14,000 codes | 69,000 codes to better capture specificity |
| Limited Severity Parameters | Extensive Severity Parameters |
| Limited Combination Codes | Extensive Combination Codes to better capture complexity |
| 1 type of Excludes Notes | 2 types of Excludes Notes |

http://www.roadto10.org/icd-10-basics

# ICD-10-CM

## ICD-10-CM Code Structure

ICD-10 diagnosis codes have between 3 and 7 characters:



ALHPA (NOT U) — 1st DIGIT
NUMERIC — 2nd DIGIT, 3rd DIGIT
CATEGORY

CHARACTERS 3 –7 CAN BE ANY COMBINATION OF ALPHA OR NUMERIC
4th DIGIT, 5th DIGIT, 6th DIGIT
ETIOLOGY, ANATOMICAL SITE, SEVERITY

7th DIGIT
EXTENSION

## Example

1 of >300 ICD-10-CM codes for gout →

*Note: In contrast, only 15 ICD-9-CM codes for gout (e.g., 274.02)*



M 1 A . 3 1 2 0

Etiology (Renal Impairment)
Laterality (Left Shoulder)
Category (Chronic Gout)
Location (Shoulder)
Extension (Without tophus)

Example courtesy of Kevin Haynes, HealthCore

http://www.roadto10.org/icd-10-basics
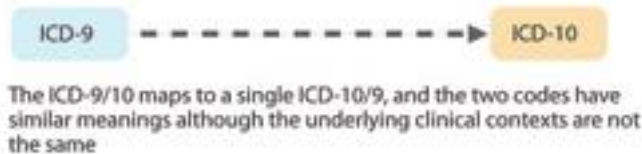
# How do GEMs work?



1:1, Cluster, Combination, and Complex

1:1 Exact Map

ICD-9 ⟶ ICD-10

The ICD-9/10 maps to a single ICD-10/9 and both codes have the exact clinical meaning

1:1 Approximate Map

ICD-9 ⤏ ICD-10

The ICD-9/10 maps to a single ICD-10/9, and the two codes have similar meanings although the underlying clinical contexts are not the same

1: Many Combination ('ANDs')

Scenario-1: ICD-9 → ICD-10 + ICD-10 + ICD-10 (Choicelist-1, Choicelist-2, Choicelist-3)
OR
Scenario-2: ICD-10 + ICD-10 + ICD-10 (Choicelist-1, Choicelist-2, Choicelist-3)

The ICD-9/10 maps to a group of ICD-10/9 codes, which must be taken together in order to have a similar clinical meaning to the ICD-9/10 codes

1: Many Approximate Cluster ('ORs')

ICD-9 → OR → ICD-10 / OR → ICD-10 / OR → ICD-10

The ICD-9/10 maps to multiple ICD-10/9 codes. However, only one of these ICD codes will be required
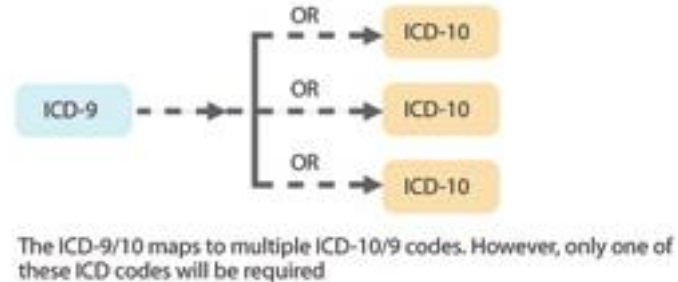
1: Many Complex ('ANDs' and 'ORs')

Scenario-1: OR → ICD-10 + ICD-10 (Choicelist-1, Choicelist-2)
ICD-9 → OR → ICD-10
OR → ICD-10

The mapping consists of both combinations and alternative mappings

http://bok.ahima.org/doc?oid=106975#.V6kvbvkrLDc
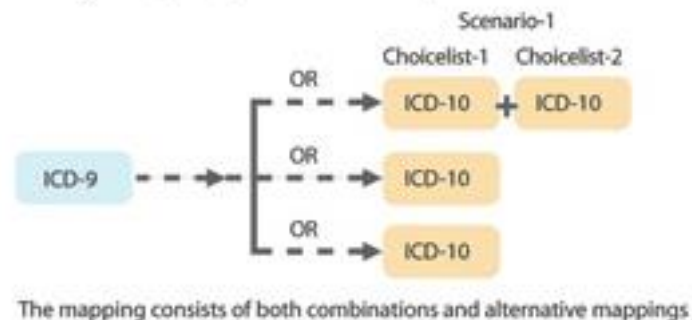
# Defining clinical concepts with ICD-10-CM

- Published algorithms
  - International studies, includes other ICD-10 variants (e.g., ICD-10-CA vs ICD-10-CM)

- ICD-9-CM → ICD-10-CM translations using General Equivalence Mappings (GEMs)
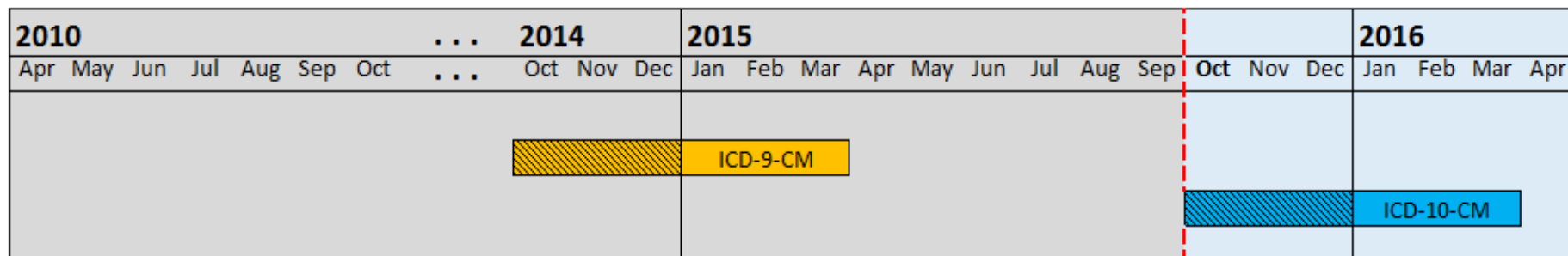  - Simple forward mapping (SFM)
  - Forward-backward mapping (FBM)

Fung et al, eGEMs 2016;4(1):Article 4

# Summary of results

| Outcome definition | Number of incident events | Number of eligible members | Number of member-years | Incidence per 1,000 eligible members (95% CI) | Incidence per 1,000 member-years |
|---|---|---|---|---|---|
| **Acute myocardial infarction** | | | | | |
| ICD-9-CM algorithm | 16,629 | 57,668,750 | 13,555,553 | 0.288 (0.284, 0.293) | 1.227 (1.208, 1.245) |
| ICD-10-CM algorithm | 16,780 | 57,453,227 | 13,778,048 | 0.292 (0.288, 0.297) | 1.218 (1.2, 1.236) |
| ICD-10-CM SFM | 16,391 | 57,453,627 | 13,778,265 | 0.285 (0.281, 0.290) | 1.190 (1.172, 1.208) |
| ICD-10-CM FBM | 16,781 | 57,452,861 | 13,777,818 | 0.292 (0.288, 0.297) | 1.218 (1.2, 1.237) |
| **Angioedema** | | | | | |
| ICD-9-CM algorithm | 19,486 | 57,677,701 | 13,565,531 | 0.338 (0.333, 0.343) | 1.436 (1.416, 1.457) |
| ICD-10-CM algorithm | 14,719 | 57,464,145 | 13,789,293 | 0.256 (0.252, 0.260) | 1.067 (1.05, 1.085) |
| ICD-10-CM SFM | 15,020 | 57,465,350 | 13,790,286 | 0.261 (0.257, 0.266) | 1.089 (1.072, 1.107) |
| ICD-10-CM FBM | 15,020 | 57,465,350 | 13,790,286 | 0.261 (0.257, 0.266) | 1.089 (1.072, 1.107) |
| **Ischemic stroke** | | | | | |
| ICD-9-CM algorithm | 11,011 | 57,634,007 | 13,535,439 | 0.191 (0.188, 0.195) | 0.813 (0.798, 0.829) |
| ICD-10-CM algorithm | 11,058 | 57,430,577 | 13,763,591 | 0.193 (0.189, 0.196) | 0.803 (0.789, 0.819) |
| ICD-10-CM SFM | 791 | 57,447,546 | 13,777,259 | 0.014 (0.013, 0.015) | 0.057 (0.054, 0.062) |
| ICD-10-CM FBM | 10,898 | 57,421,718 | 13,758,294 | 0.190 (0.186, 0.193) | 0.792 (0.777, 0.807) |

# Selected results:  AMI (2)

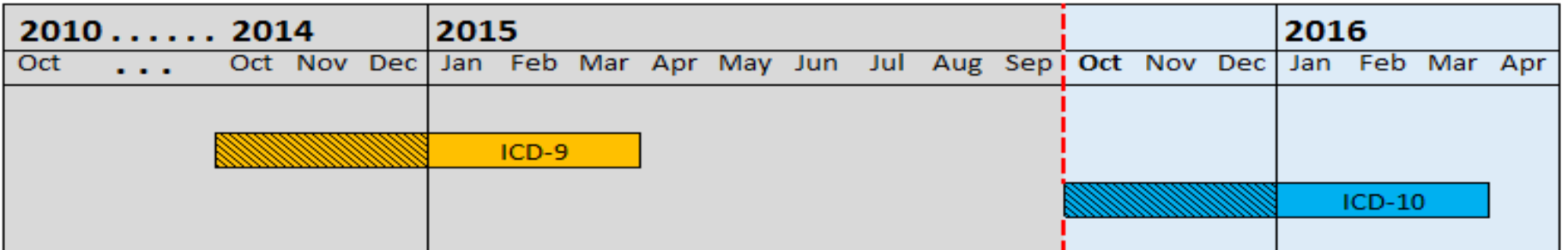**Incidence of various AMI definitions per 1000 eligible members using a *90 day washout,* <u>Jan-Mar 2015 vs. Jan-Mar 2016</u>**

| Outcome definition | Number of incident events | Number of eligible members | Number of member-years | Incidence per 1,000 eligible members (95% CI) |
|---|---|---|---|---|
| ICD-9-CM algorithm from literature | 16,629 | 57,668,750 | 13,555,553 | 0.288 (0.284, 0.293) |
| ICD-10-CM algorithm from literature | 16,780 | 57,453,227 | 13,778,048 | 0.292 (0.288, 0.297) |
| ICD-10-CM SFM | 16,391 | 57,453,627 | 13,778,265 | 0.285 (0.281, 0.290) |
| ICD-10-CM FBM | 16,781 | 57,452,861 | 13,777,818 | 0.292 (0.288, 0.297) |

| 2010 | | | | | | | ... | 2014 | | | 2015 | | | | | | | | | | 2016 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Apr | May | Jun | Jul | Aug | Sep | Oct | ... | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr |

ICD-9-CM

ICD-10-CM

# Selected results: angioedema (2)

**Incidence of various angioedema definitions per 1000 eligible members using a *90 day washout,* Jan-Mar 2015 vs. Jan-Mar 2016**

| Outcome definition | Number of incident events | Number of eligible members | Number of member-years | Incidence per 1,000 eligible members (95% CI) |
|---|---|---|---|---|
| ICD-9-CM algorithm from literature | 19,486 | 57,677,701 | 13,565,531 | 0.338 (0.333, 0.343) |
| ICD-10-CM algorithm from literature | 14,719 | 57,464,145 | 13,789,293 | 0.256 (0.252, 0.260) |
| ICD-10-CM SFM | 15,020 | 57,465,350 | 13,790,286 | 0.261 (0.257, 0.266) |
| ICD-10-CM FBM | 15,020 | 57,465,350 | 13,790,286 | 0.261 (0.257, 0.266) |

| 2010 . . . . . . 2014 | | | | 2015 | | | | | | | | | | | | | 2016 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct | . . . | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr |

ICD-9

ICD-10

# Selected results:  ischemic stroke findings

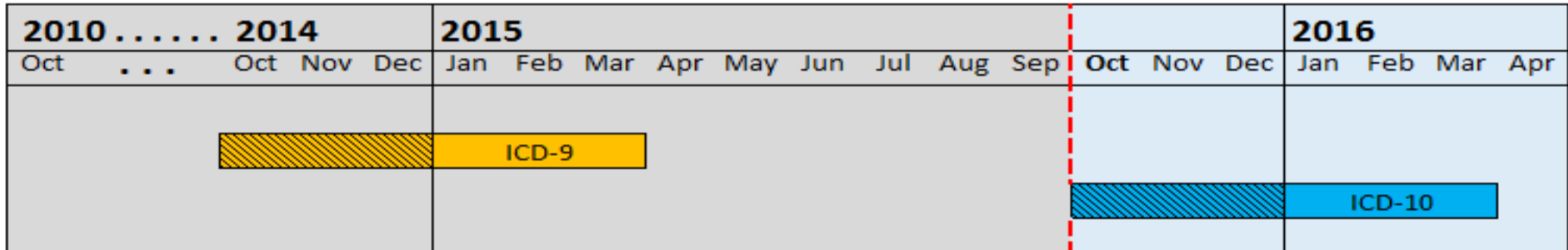| Definition | ICD-9-CM Code Count | ICD-10-CM Code Count |
|---|---|---|
| Algorithm * | 10 | 119 |
| SFM | 10 | 12 |
| FBM | 10 | 91 |

- I63.9, cerebral infarction unspecified, NOT captured by the SFM definition

- This code represented 24-38% of the ischemic stroke codes submitted by data partners

- The Algorithm (n=119 codes) and FBM (n=91 codes) identified I63.9 as well as many additional codes

*Andrade et al, Tirschwell et al,  Kokotailo et al, Tolonen et al

# Selected results: ischemic stroke (2)

**Incidence of various ischemic stroke definitions per 1000 eligible members using a _90 day washout,_ Jan-Mar 2015 vs. Jan-Mar 2016**

| Outcome definition | Number of incident events | Number of eligible members | Number of member-years | Incidence per 1,000 eligible members (95% CI) |
|---|---|---|---|---|
| ICD-9-CM algorithm from literature | 11,011 | 57,634,007 | 13,535,439 | 0.191 (0.188, 0.195) |
| ICD-10-CM algorithm from literature | 11,058 | 57,430,577 | 13,763,591 | 0.193 (0.189, 0.196) |
| ICD-10-CM SFM | 791 | 57,447,546 | 13,777,259 | 0.014 (0.013, 0.015) |
| ICD-10-CM FBM | 10,898 | 57,421,718 | 13,758,294 | 0.190 (0.186, 0.193) |

| 2010 . . . . . . 2014 | | | 2015 | | | | | | | | | | | | 2016 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct | . . . | Oct Nov Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr |

ICD-9

ICD-10

# Selected results:  angioedema findings

- **One ICD-9-CM code**
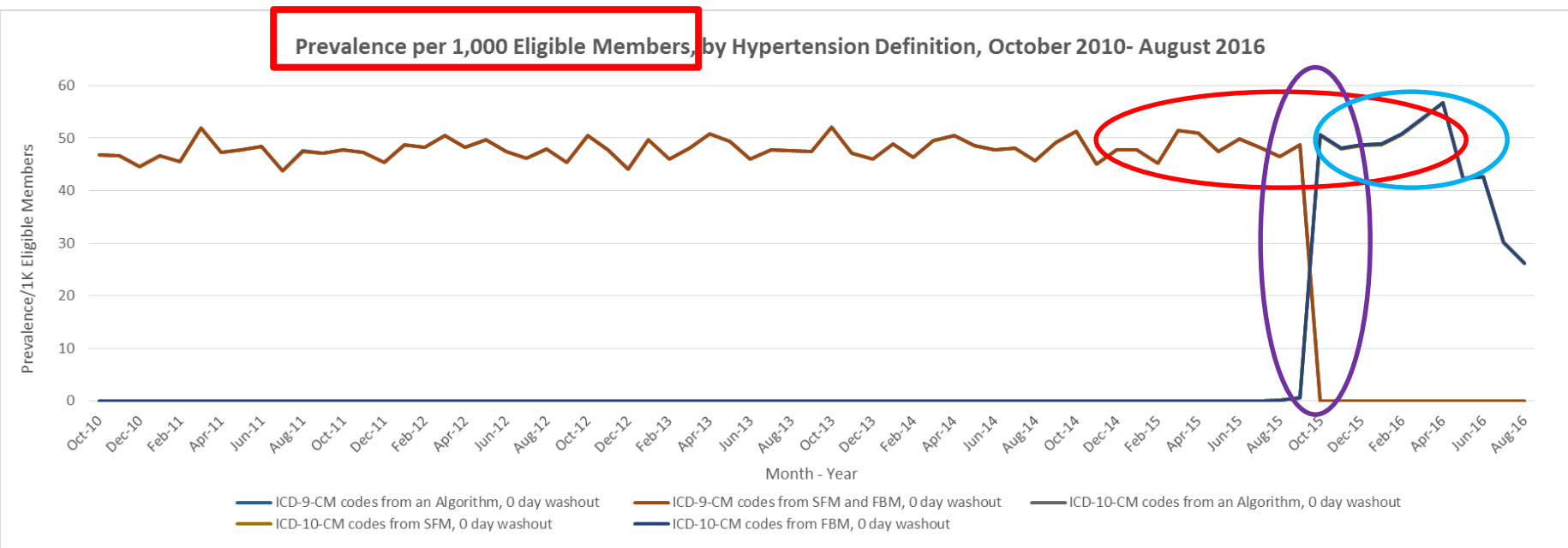  - 995.1:  Angioneurotic edema not elsewhere classified

- **Three ICD-10-CM codes**
  - T78.3XXA:  Angioneurotic edema, initial encounter
  - T78.3XXD:  Angioneurotic edema, subsequent encounter
  - T78.3XXS:  Angioneurotic edema, sequela

| Definition | ICD-9-CM Code Count | ICD-10-CM Code Count |
|---|---|---|
| Algorithm[*] | 1 | 1 |
| Algorithm (washout) | 1 | 3 |
| SFM | 1 | 1 |
| FBM | 1 | 1 |

Lower incidence in ICD-10-CM era vs. ICD-9-CM era currently unexplained

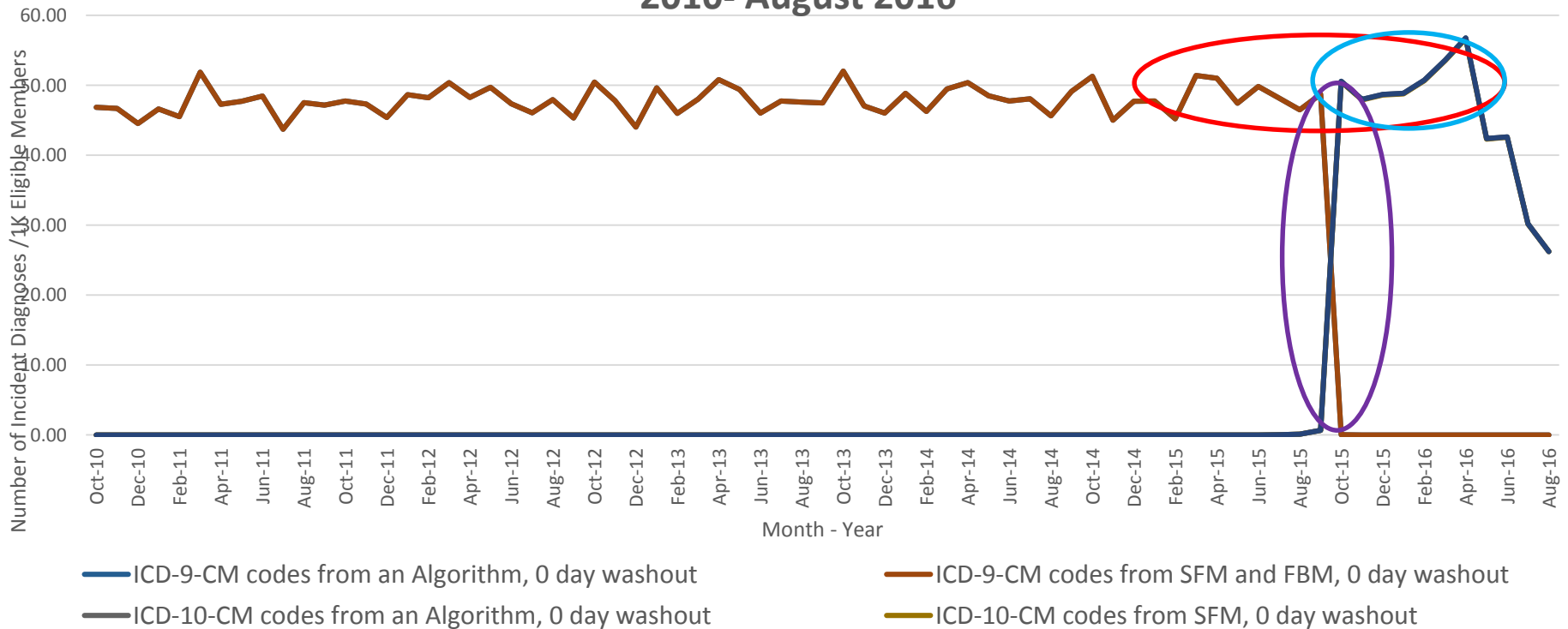*Toh S et al, Johnsen SP  et al, Gupta R et al

# Hypertension results



**Prevalence per 1,000 Eligible Members, by Hypertension Definition, October 2010- August 2016**

Legend:
- ICD-9-CM codes from an Algorithm, 0 day washout
- ICD-9-CM codes from SFM and FBM, 0 day washout
- ICD-10-CM codes from an Algorithm, 0 day washout
- ICD-10-CM codes from SFM, 0 day washout
- ICD-10-CM codes from FBM, 0 day washout

## Checking Expectations
1. Is the prevalence steady across the ICD-9 and ICD-10 eras?  Yes
2. Is there a sharp decrease of ICD-9-CM and sharp increase of ICD-10-CM codes in October 2015?  Yes
3. Are there differences between how the ICD-10-CM definitions performed?  No

# Hypertension results

**Incidence per 1,000 Eligible Members of Hypertension Definition, October 2010- August 2016**



Legend:
- ICD-9-CM codes from an Algorithm, 0 day washout
- ICD-9-CM codes from SFM and FBM, 0 day washout
- ICD-10-CM codes from an Algorithm, 0 day washout
- ICD-10-CM codes from SFM, 0 day washout

## Checking Expectations
1. Is the prevalence steady across the ICD-9 and ICD-10 eras?  Yes
2. Is there a sharp decrease of ICD-9-CM and sharp increase of ICD-10-CM codes in October 2015?  Yes
3. Are there differences between how the ICD-10-CM definitions performed?  No

# Condition #1: hypertension findings

| Definition | ICD-9-CM Code Count | ICD-10-CM Code Count |
|---|---|---|
| Algorithm* | 45 | 19 |
| SFM | 33 | 12 |
| FBM | 33 | 18 |

- I10, essential primary hypertension, included in all three ICD-10-CM definitions
- This code represented 83-95% of the hypertension codes submitted by data partners
- May explain the similar performance of the three definitions
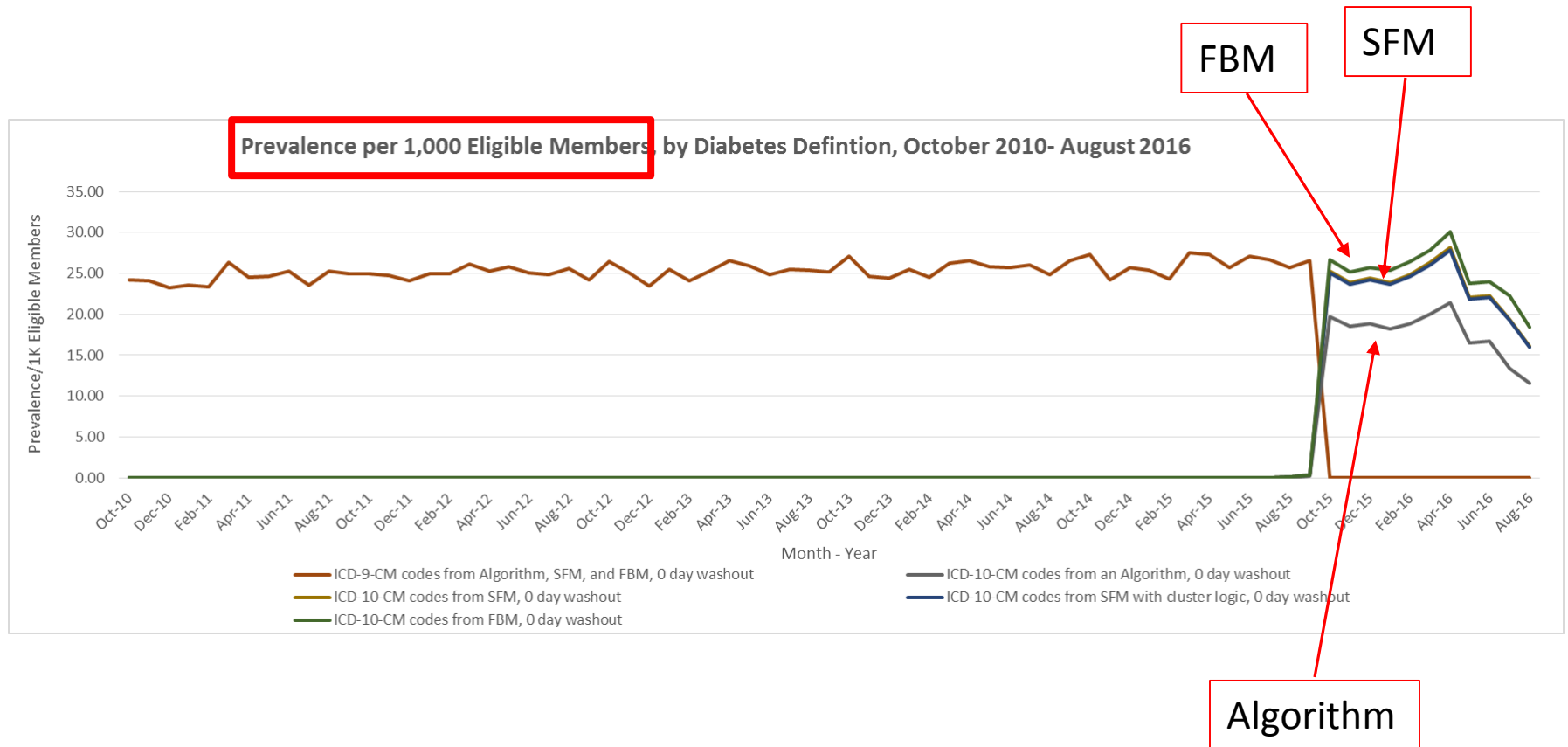
*Based on Quan H et al

# Selected results: AMI findings

| Definition | ICD-9-CM Code Count | ICD-10-CM Code Count |
|---|---|---|
| Algorithm* | 20 | 12 |
| SFM | 20 | 6 |
| FBM | 20 | 14 |

- ICD-10-CM codes identified by the three approaches all included the most frequently used codes

- Thus, SFM (n=6 codes) performed as well as the Algorithm (n=12 codes) and FBM (n=14 codes)
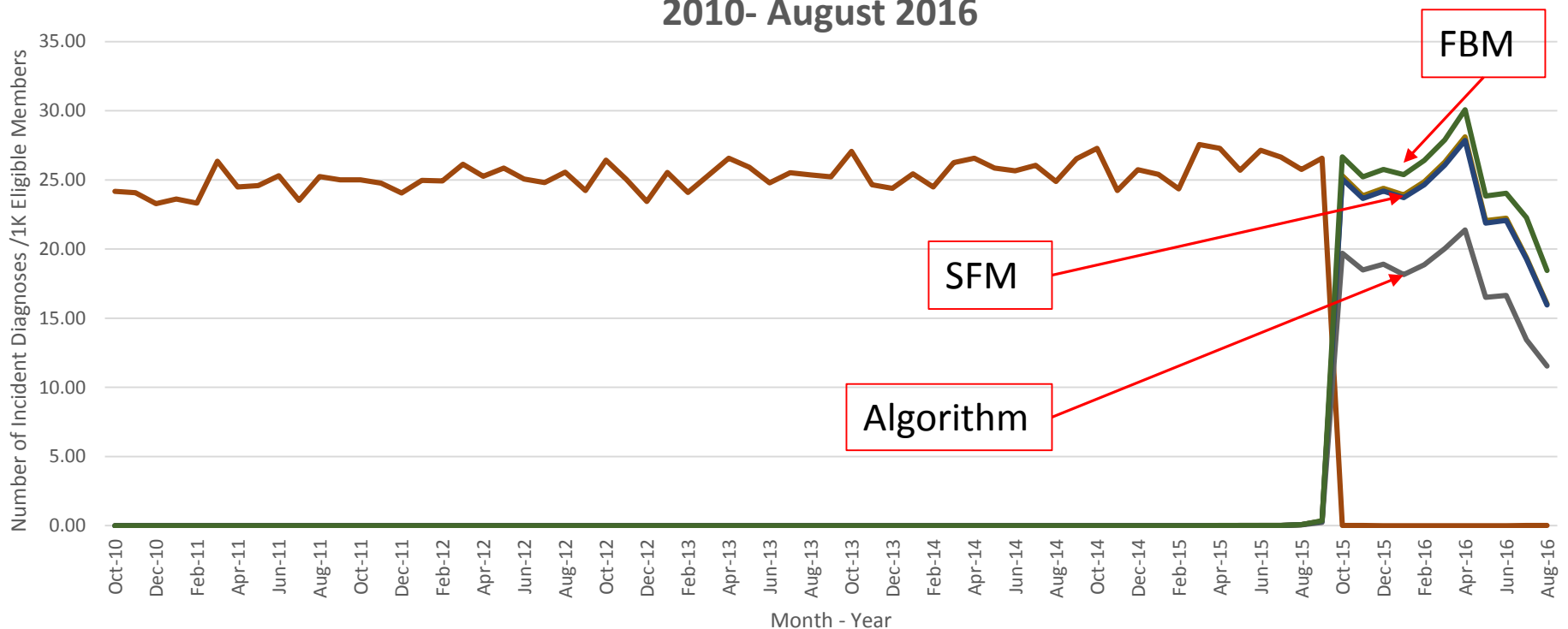
*Cutrona et al 2013

# Condition #2: diabetes results

# Condition #2:  diabetes results



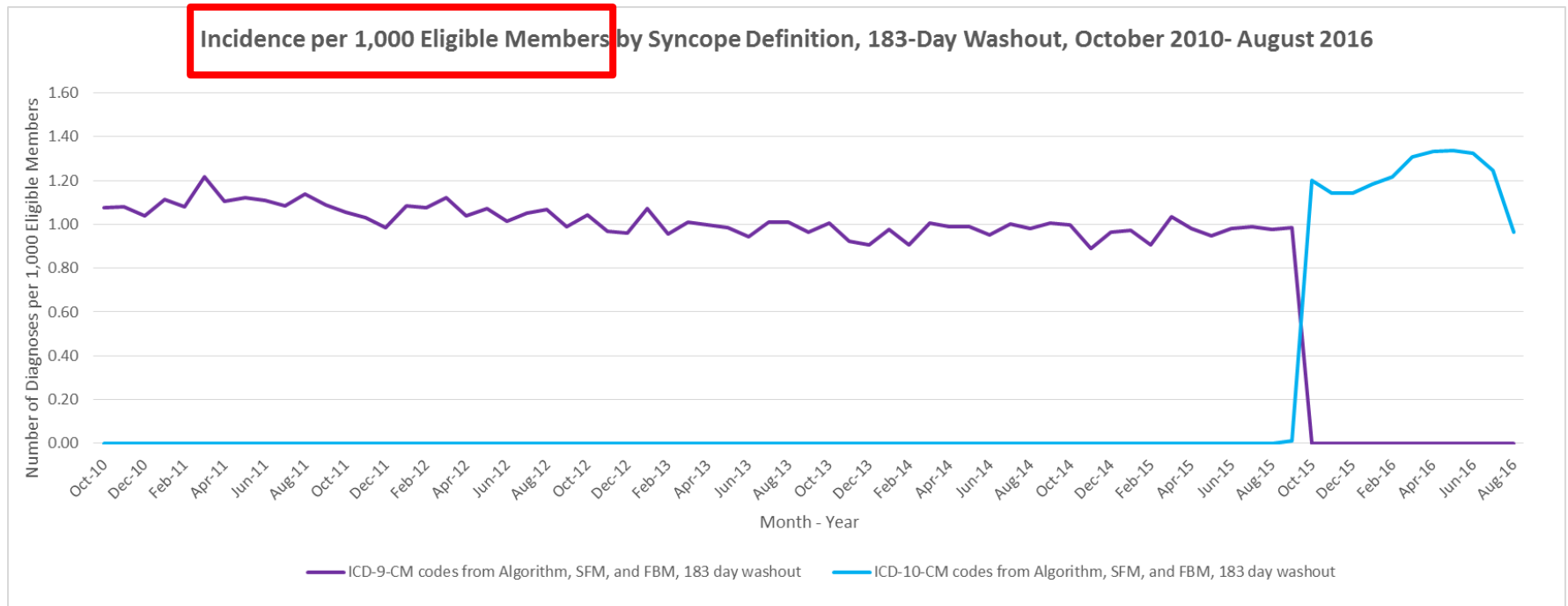**Incidence per 1,000 Eligible Members of Diabetes Definition, October 2010- August 2016**

Legend:
- ICD-9-CM codes from Algorithm, SFM, and FBM, 0 day washout
- ICD-10-CM codes from an Algorithm, 0 day washout
- ICD-10-CM codes from SFM, 0 day washout
- ICD-10-CM codes from SFM with cluster logic, 0 day washout
- ICD-10-CM codes from FBM, 0 day washout

# Condition #2: diabetes findings

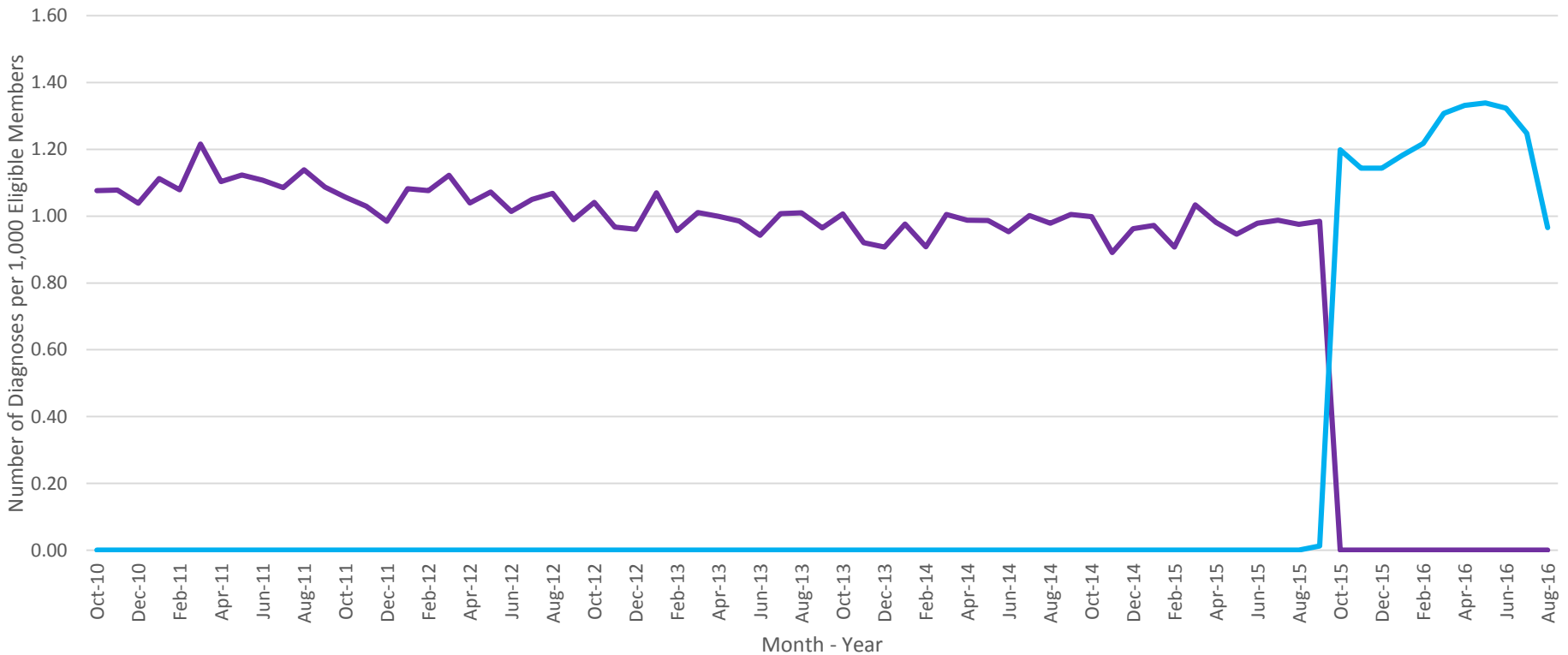| Definition | ICD-9-CM Code Count | ICD-10-CM Code Count |
|---|---|---|
| Algorithm | 51 | 25 |
| SFM, no clusters | 51 | 51 |
| SFM, clusters | 51 | 51 |
| FBM | 51 | 254 |

- SFM and FBM performed similarly even though FBM identified 5x as many codes (254 vs. 51)
- Many of the additional codes pulled by FBM were highly specific, 7-digit codes that may not be used in practice
    - E.g., E10.37X1, Type I DM with diabetic macular edema, resolved following treatment, right eye
- Only two clusters which may explain the minimal impact of adding them
    - E.g., E11.65 AND E11.21, Type II DM with hyperglycemia AND Type II DM with diabetic nephropathy

# Condition #5: syncope results



Incidence per 1,000 Eligible Members by Syncope Definition, 183-Day Washout, October 2010- August 2016

# Condition #5:  syncope results



Incidence per 1,000 Eligible Members by Syncope Definition, 183-Day Washout

— ICD-9-CM codes from Algorithm, SFM, and FBM, 183 day washout

— ICD-10-CM codes from Algorithm, SFM, and FBM, 183 day washout

# Condition #5: syncope results

**Incidence of sycope definitions per 1000 eligible members using a *90 day washout,* Jan-Mar 2015 vs. Jan-Mar 2016**

| Outcome definition | Number of incident events | Number of eligible members | Number of member-years | Incidence per 1,000 eligible members (95% CI) |
|---|---|---|---|---|
| **2015** | | | | |
| ICD-9-CM codes from Algorithm, SFM, and FBM, 90 day washout | 115,757 | 31,209,998 | 7,350,651 | 3.71 |
| **2016** | | | | |
| ICD-9-CM codes from Algorithm, SFM, and FBM, 90 day washout | 124,805 | 31,955,722 | 7,612,506 | 3.91 |

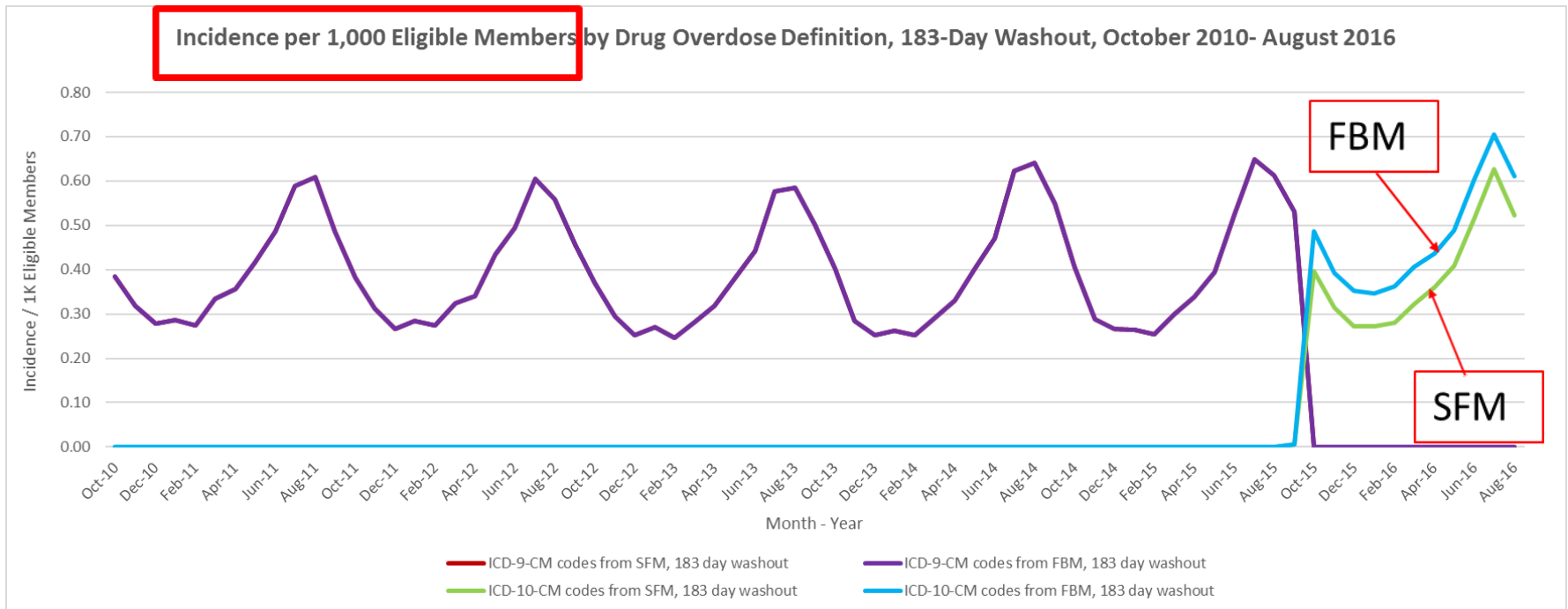| Scenario | 2010 Oct | (Nov-10 to Sep-14) | 2014 Oct | Nov | Dec | 2015 Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | 2016 Jan | Feb | Mar | Apr | Washout (d) | ICD version used to define Incidence with respect to | Event |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | | | | | | ▓ | ▓ | ▓ | | | | | | | | | | | | | | 90 | 9 | 9 |
| 4 | | | | | | | | | | | | | | | | | | ▓ | ▓ | ▓ | | 90 | 10 | 10 |

# Condition #5: syncope findings

- One ICD-9-CM code
  - 780.2: syncope and collapse
- One ICD-10-CM code
  - R55: syncope and collapse

| Definition | ICD-9-CM Code Count | ICD-10-CM Code Count |
|---|---|---|
| Algorithm* | 1 | 1 |
| SFM | 1 | 1 |
| FBM | 1 | 1 |

- Despite a one-to-one mapping and identical clinical concepts, the incidence in the ICD-10 era was higher than the ICD era

- Higher incidence in ICD-10 era vs. ICD-9 era currently unexplained

*Jette et al 2010

# Condition #6: drug overdose results



Incidence per 1,000 Eligible Members by Drug Overdose Definition, 183-Day Washout, October 2010- August 2016

Legend:
- ICD-9-CM codes from SFM, 183 day washout
- ICD-9-CM codes from FBM, 183 day washout
- ICD-10-CM codes from SFM, 183 day washout
- ICD-10-CM codes from FBM, 183 day washout

# Condition #6: drug overdose results

**Incidence per 1,000 Eligible Members by Drug Overdose Definition, 183-Day Washout**
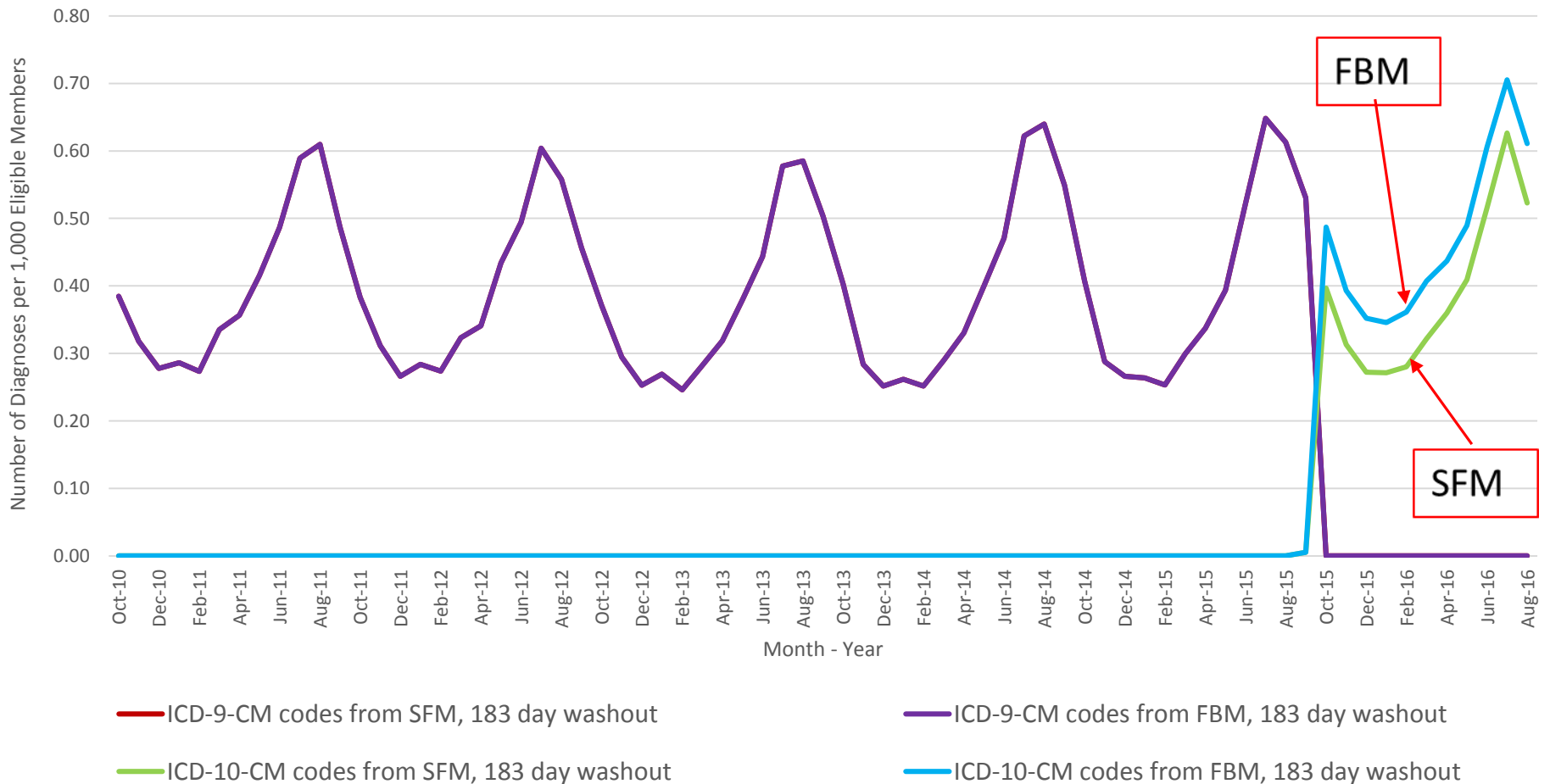
# Condition #6: drug overdose results

**Incidence of various drug overdose definitions per 1000 eligible members using a *90 day washout,* <u>Jan-Mar 2015 vs. Jan-Mar 2016</u>**

| Outcome definition | Number of incident events | Number of eligible members | Number of member-years | Incidence per 1,000 eligible members (95% CI) |
|---|---|---|---|---|
| **2015** | | | | |
| ICD-9-CM codes from SFM and FBM, 90 day washout | 29,200 | 31,225,534 | 7,373,366.00 | 0.94 |
| **2016** | | | | |
| ICD-9-CM codes from SFM, 90 day washout | 28,175 | 31,974,813 | 7,638,328.71 | 0.88 |
| ICD-9-CM codes from FBM, 90 day washout | 35,778 | 31,974,169 | 7,636,432.09 | 1.12 |

| | 2010 | | | 2014 | | | 2015 | | | | | | | | | | | 2016 | | | | | ICD version used to define | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | (Nov-10 to Sep-14) | | | | | | | | | | | | | | | | | | | | Incidence with respect to | Event |
| Scenario | Oct | | | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | Washout (d) | |
| 3 | | | | | | | | | | | | | | | | | | | | | | | 90 | 9 | 9 |
| 4 | | | | | | | | | | | | | | | | | | | | | | | 90 | 10 | 10 |

# Condition #6:  drug overdose findings

| Definition | ICD-9-CM Code Count | ICD-10-CM Code Count |
|---|---:|---:|
| SFM | 459 | 1214 |
| FBM | 459 | 1301 |

- Same seasonal pattern of drug overdose replicated in ICD-10 era
  - Currently uncertain why seasonality exists

- Month-year incidence similar between eras, despite >2-fold increase in the number of ICD-10-CM codes used in the SFM and FBM definitions
  - All ICD-10-CM codes had 7-digits

# Condition #6: drug overdose sample codes

| Code | Description |
|------|-------------|
| M1A.10X1 | Lead-induced chronic gout, unspecified site, with tophus (tophi) |
| T36.0X1A | Poisoning by penicillins, accidental (unintentional), initial encounter |
| T36.0X2A | Poisoning by penicillins, intentional self-harm, initial encounter |
| T36.0X3A | Poisoning by penicillins, assault, initial encounter |
| T36.0X4A | Poisoning by penicillins, undetermined, initial encounter |
| T36.1X1A | Poisoning by cephalosporins and other beta-lactam antibiotics, accidental (unintentional), initial encounter |
| T36.1X2A | Poisoning by cephalosporins and other beta-lactam antibiotics, intentional self-harm, initial |
| T36.1X3A | Poisoning by cephalosporins and other beta-lactam antibiotics, assault, initial encounter |
| T36.1X4A | Poisoning by cephalosporins and other beta-lactam antibiotics, undetermined, initial encounter |
| T36.2X1A | Poisoning by chloramphenicol group, accidental (unintentional), initial encounter |
| T36.2X2A | Poisoning by chloramphenicol group, intentional self-harm, initial encounter |
| T36.2X3A | Poisoning by chloramphenicol group, assault, initial encounter |
| T36.2X4A | Poisoning by chloramphenicol group, undetermined, initial encounter |
| T36.3X1A | Poisoning by macrolides, accidental (unintentional), initial encounter |
| T36.3X2A | Poisoning by macrolides, intentional self-harm, initial encounter |
| T36.3X3A | Poisoning by macrolides, assault, initial encounter |
| T36.3X4A | Poisoning by macrolides, undetermined, initial encounter |
| T36.4X1A | Poisoning by tetracyclines, accidental (unintentional), initial encounter |
| T36.4X2A | Poisoning by tetracyclines, intentional self-harm, initial encounter |
| T36.4X3A | Poisoning by tetracyclines, assault, initial encounter |
| T36.4X4A | Poisoning by tetracyclines, undetermined, initial encounter |
| T36.5X1A | Poisoning by aminoglycosides, accidental (unintentional), initial encounter |
| T36.5X2A | Poisoning by aminoglycosides, intentional self-harm, initial encounter |
| T36.5X3A | Poisoning by aminoglycosides, assault, initial encounter |
| T36.5X4A | Poisoning by aminoglycosides, undetermined, initial encounter |
| T36.6X1A | Poisoning by rifampicins, accidental (unintentional), initial encounter |
| T36.6X2A | Poisoning by rifampicins, intentional self-harm, initial encounter |