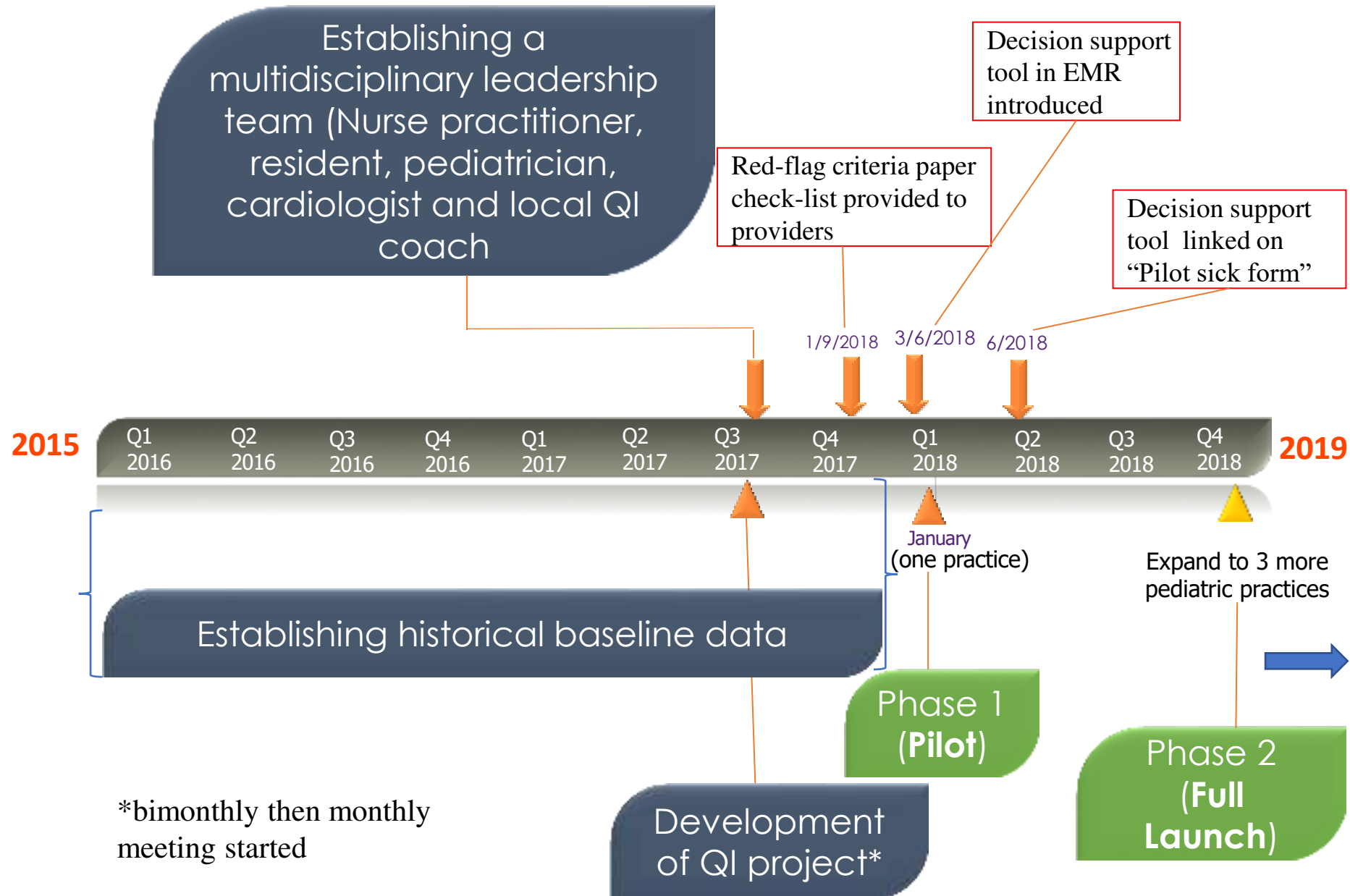
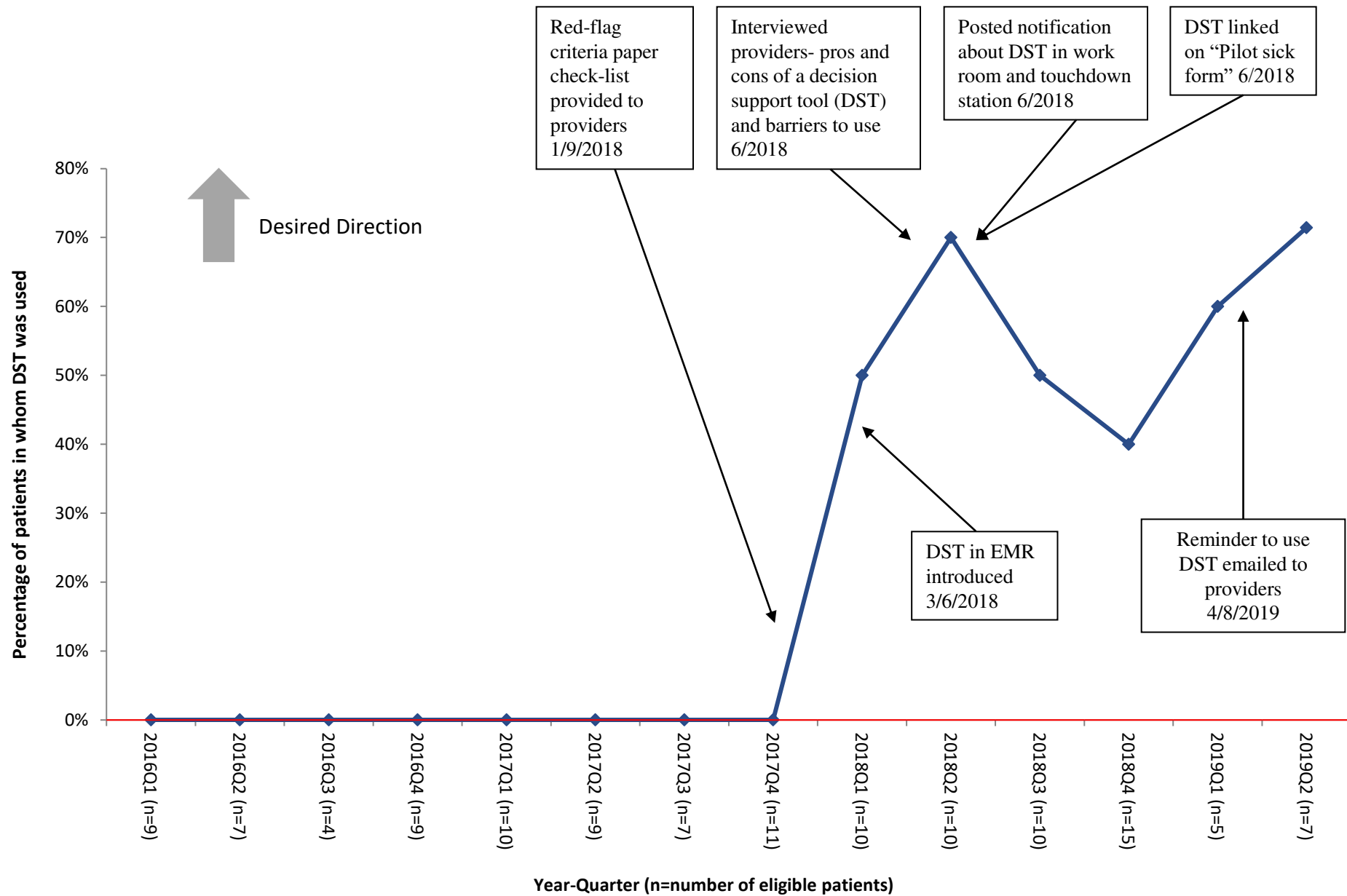




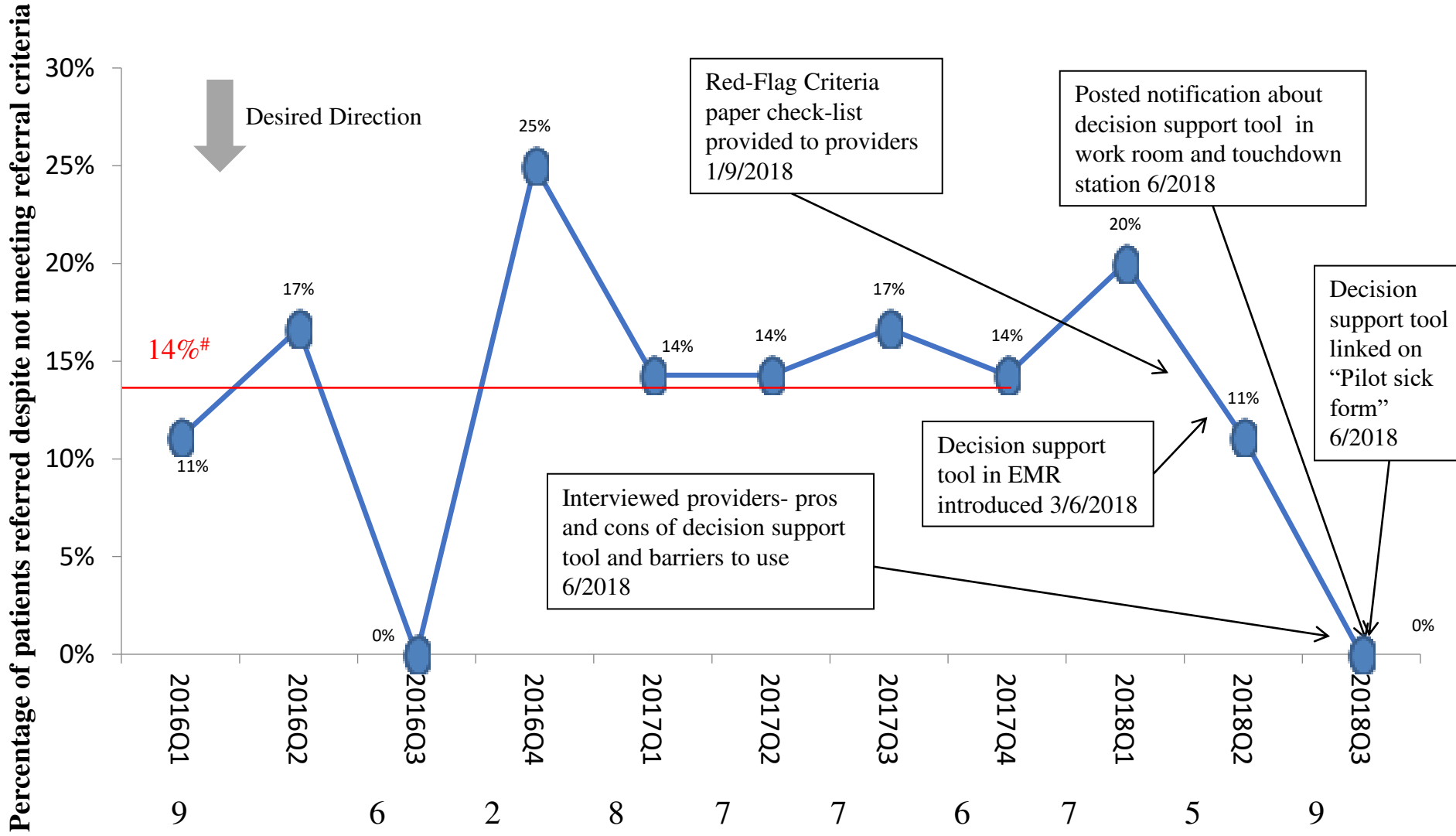
Phase I Pilot data





Process measure: Improve Utilization of Decision Support Tool (DST) (red-flags for referral)

Goal: Decrease low probability referrals for cardiac disease explaining chest pain

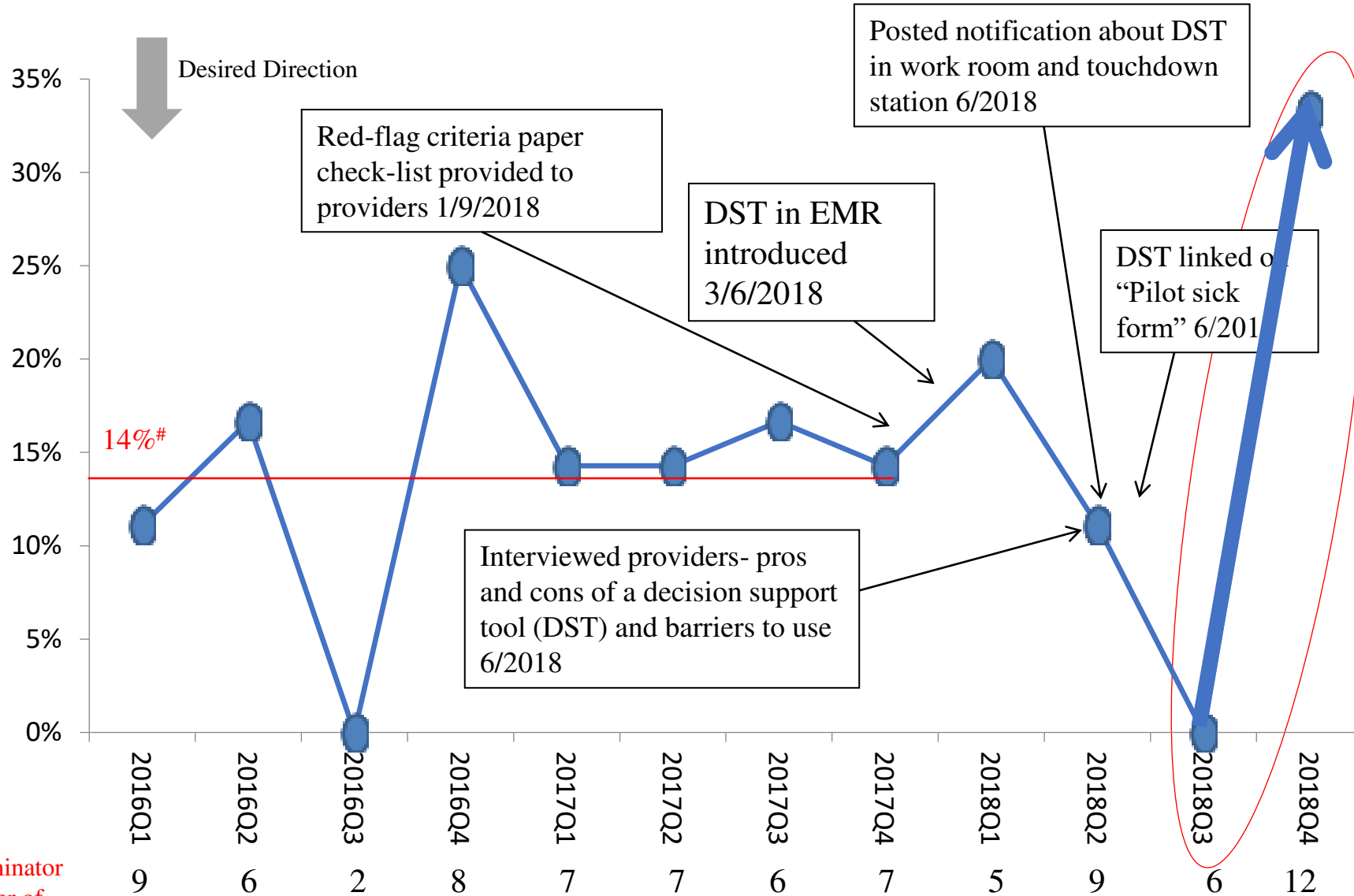


Denominator (number of eligible patients)

Median

Goal: Decrease low probability referrals for cardiac disease explaining chest pain

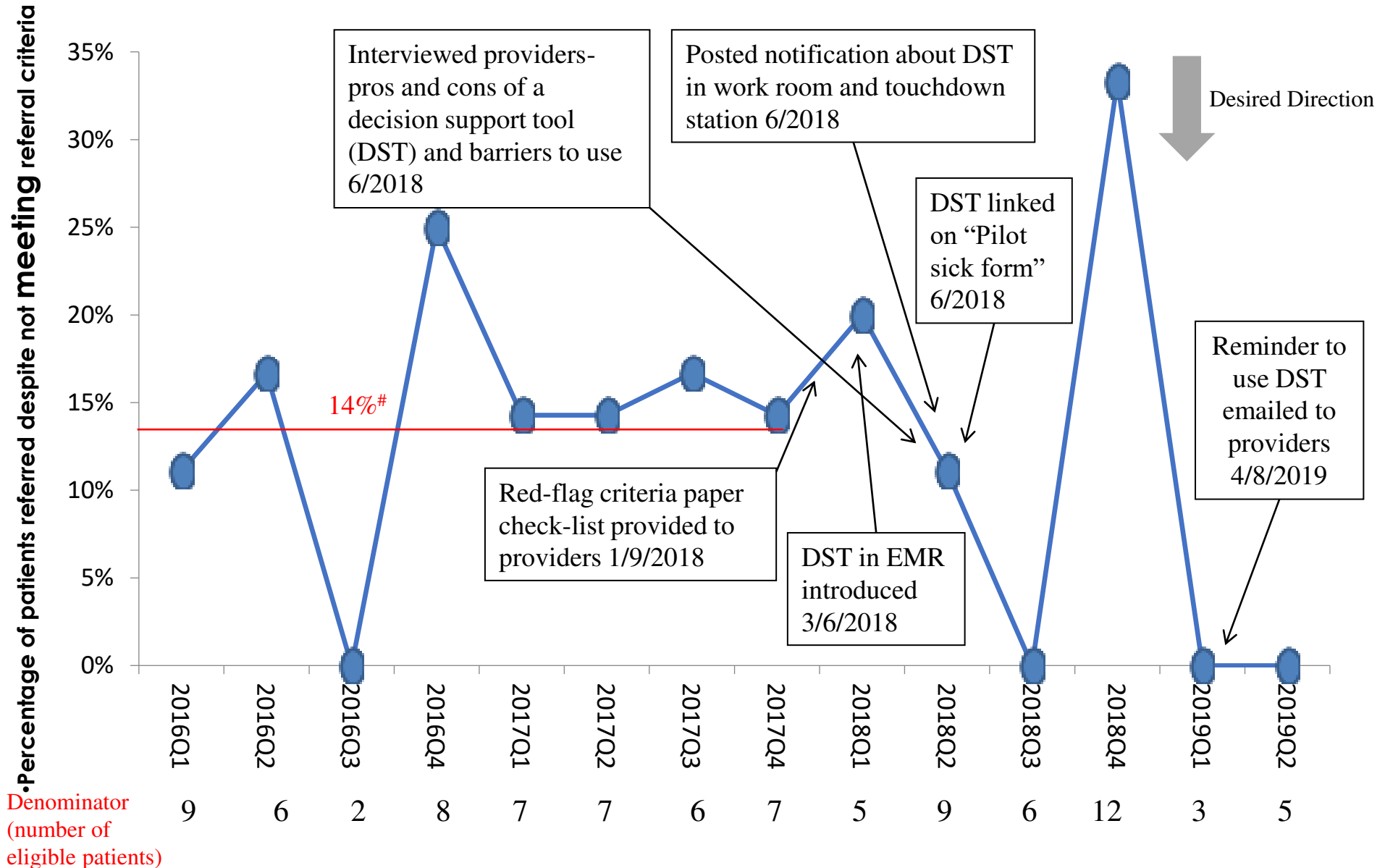
Percentage of patients referred despite not meeting criteria



Median
 (number of eligible patients)

Median

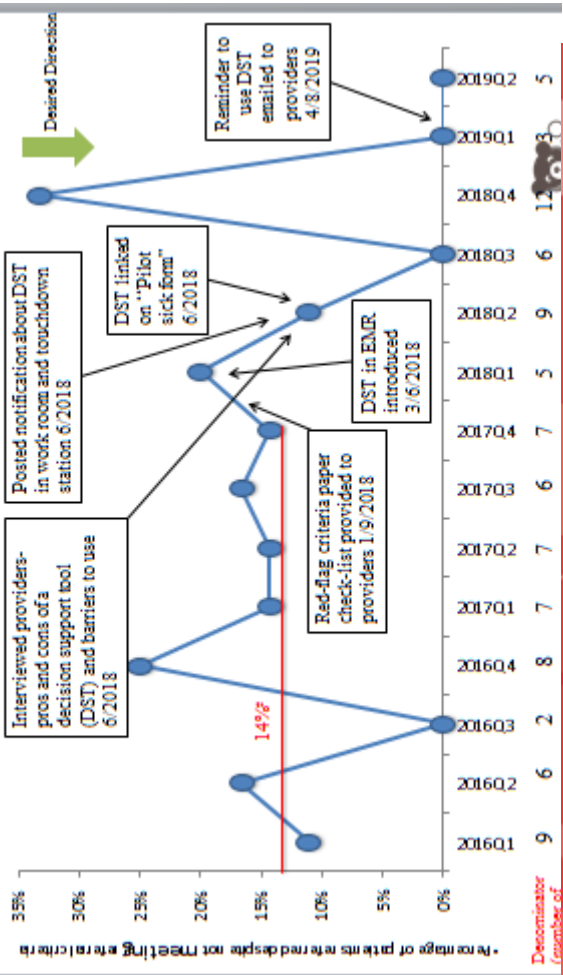
Goal: Decrease low probability referrals for cardiac disease explaining chest pain



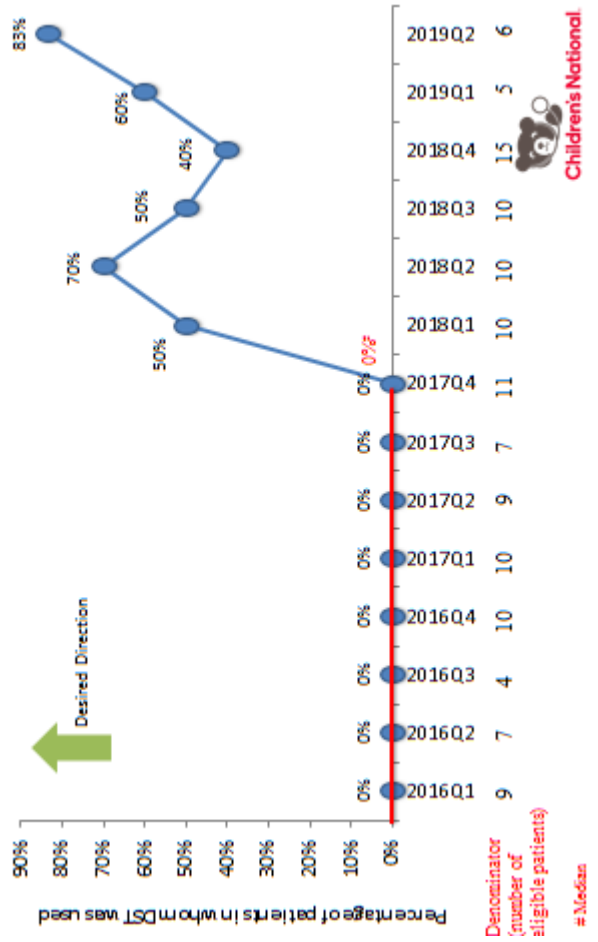
Denominator (number of eligible patients)

Median

Goal: Decrease low probability referrals for cardiac disease explaining chest pain



Process measure: Improve Utilization of Decision Support Tool (DST) (red-flags for referral)



Harahsheh et al. 2019 AAP National meeting poster



Phase II

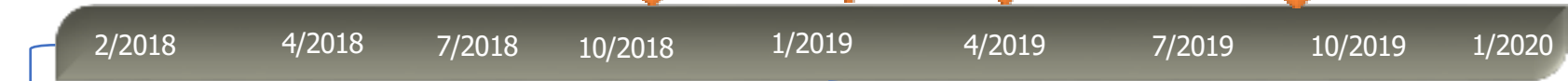
Establishing a multidisciplinary leadership team (Nurse practitioner, resident, pediatricians, cardiologist and local QI coach)

Chest pain MOC orientation session

Decision Support Tool (DST) added to provider's "Personal Forms" in EMR

Monthly Reminder to use DST emailed to providers

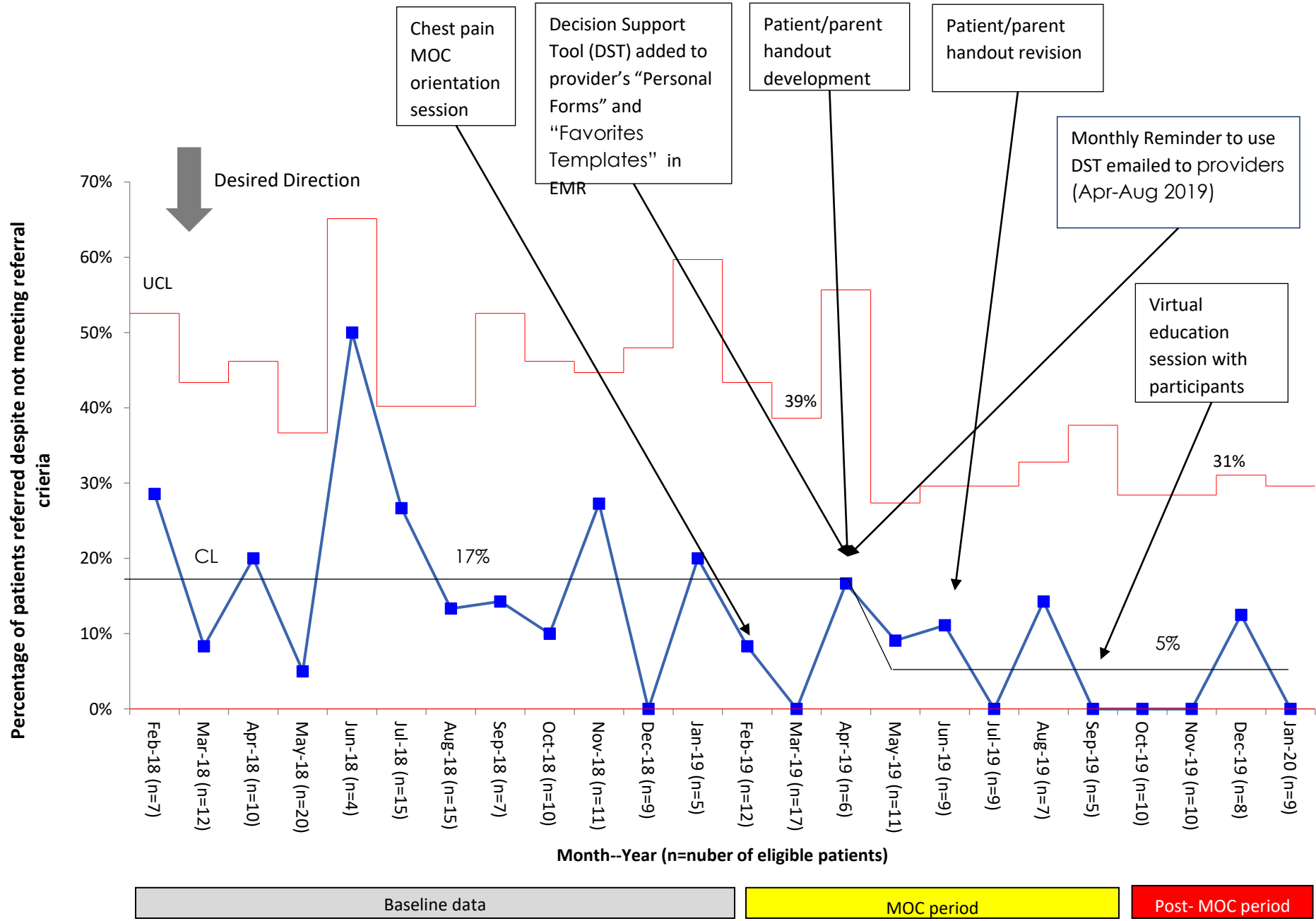
Virtual education session with participants



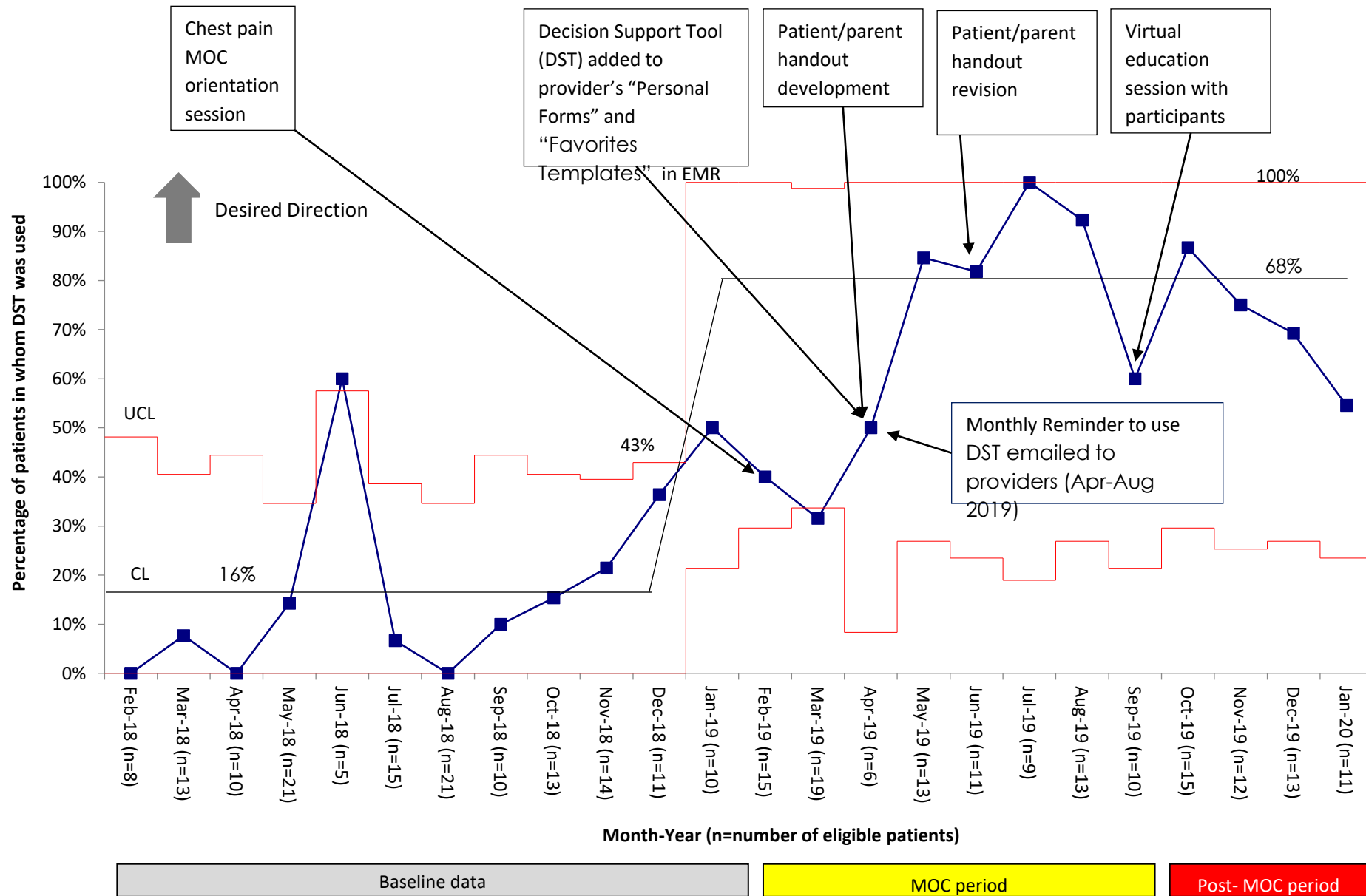
Establishing historical baseline data

MOC intervention period

Post MOC period



Outcome Goal: Decrease low probability referrals for cardiac disease explaining chest pain



Process measure: Improve Utilization of Decision Support Tool (DST) red-flags for referral



**Balancing measure-
Patient safety- missing
life threatening event
and/or incidental
cardiac finding**

referral

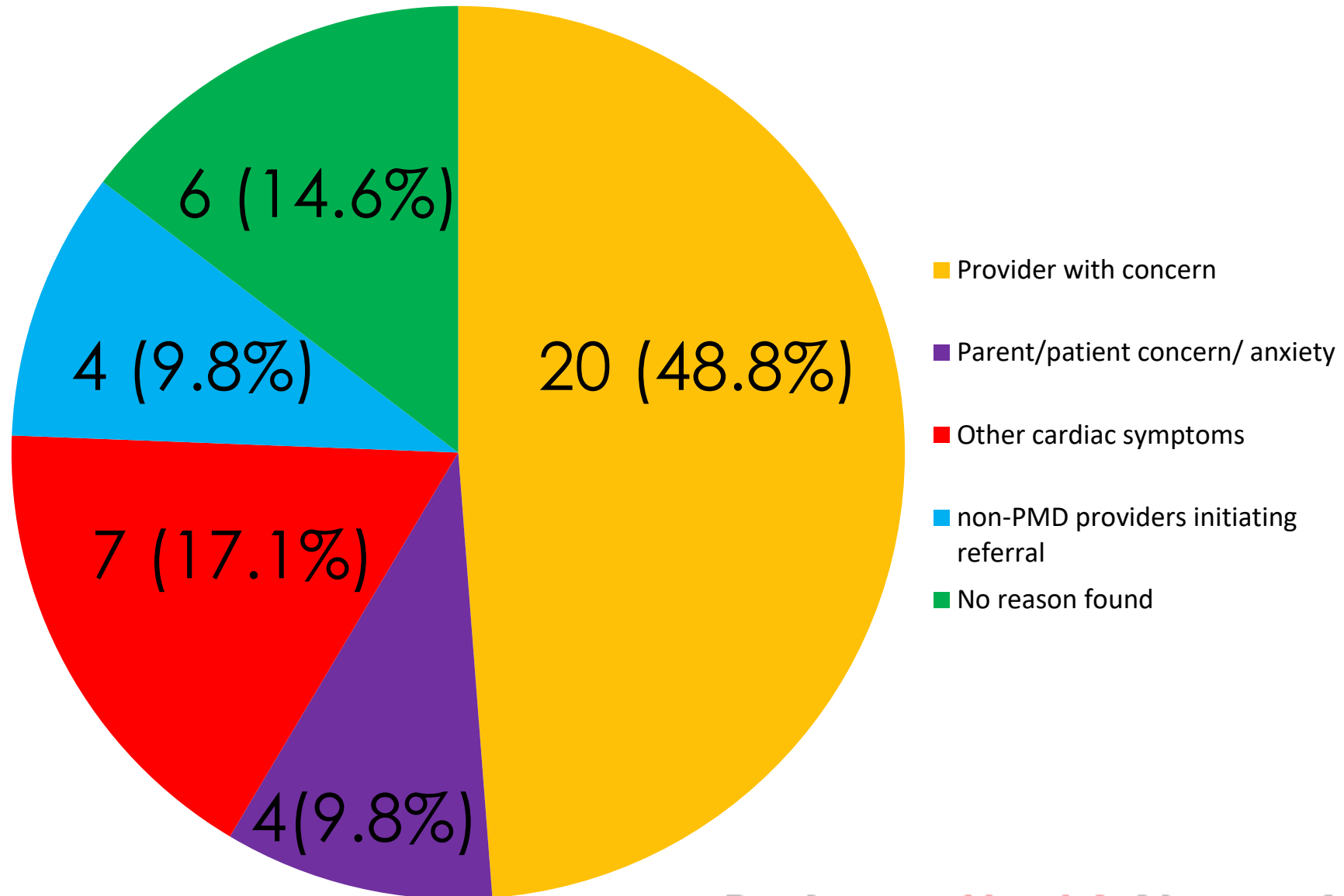
Median follow up time of 0.94
(Interquartile range 0.3-1.6) years
Mean follow up 1.1 ± 0.9 years

- **First patient:**
 - Bicommissural aortic valve, right/left fusion with trivial aortic valve insufficiency
- **Second patient** (31 months after first PMD visit)
 - **Holter occasional premature ventricular beats of 2 distinct morphologies**, but no ventricular tachycardia. **probable Mobitz type II block**
- **Normal stress test with no ectopy or blocks**

- **Third patient**
 - asymptomatic WPW

Why low probability referral occur?

Reason for low probability referral in children presenting with chest pain



Reason for low probability referral in children presenting with chest pain

| Item | Number of comments (%) | Representative comments |
|---------------------------------------|------------------------|--|
| Other cardiac symptoms | 7 (17.1%) | Possible causes could be reflux, asthma, anxiety. Given stature, >95th percentile and |
| | | This appointment was ED follow-up. Although provider noted that 'low suspicion for cardiac etiology of chest pain' patient had already been referred from ED due to possible LVH on EKG |
| | | disease], but does report palpitations and had syncope (though this was non-exertional, in the context of gastroenteritis with dehydration) so referred to cardiology to r/o cardiac cause |
| | | Abnormal irregular heart rate for ECG |
| Provider with concern | 20 (48.8%) | Given localization of pain to left chest, quality of pain and no clear etiology, will refer to cardiology for further work up |
| | | for ECG to r/o abnormality not noted on exam |
| | | Costochondritis (Tietze's syndrome) referral given for cardiology given increase in symptoms, history and physical exam reassuring for [costochondritis] |
| non-PMD providers initiating referral | 4 (9.8%) | Incidental finding of LVH on EKG preformed during hospitalization for seizures. Provider noted that this chest pain incident likely precordial catch and not cardiac in etiology. |
| | | This appointment was ED follow-up. Although provider noted that 'low suspicion for cardiac etiology of chest pain' patient had already been referred from ED due to possible LVH on EKG. |
| Parent/patient concern and/or anxiety | 4 (9.8%) | Anxiety about her chest pain, would like to see Cardiology |
| | | Patient concerns |
| No reason was identified | 6 (14.6%) | |

Case 2

- 15 y.o. Jane presents with chest pain. The pain was not exercise induced, nor was it associated with other cardiac symptoms.
- It was aggravated by breathing.
- She has a normal examination including reproducible pain on palpation, benign family and past histories.
- You explain that she does not need a referral to cardiology, but her mother is quite **insistent** that she would like the referral to be sure there is nothing wrong with her heart

Items Representing Red-Flag for Referrals:

- Patient History

- Chest pain with exertion
- Exertional syncope
- Chest pain that radiates to back, jaw, left arm, or left shoulder
- Chest pain that increases with supine position
- Chest pain temporally associated with fever ($>38.4^{\circ}\text{C}$)

- Past Medical History*

- Hypercoagulable state
- Arthritis/Vasculitis
- Immobilization

- Family History

- Sudden unexplained death
- Cardiomyopathy
- Hypercoagulable state

- Physical Examination

- RR > 40
- Temperature $> 38.4^{\circ}\text{C}$
- Ill-appearing
- Painful/swollen extremities
- Non-innocent murmur
- Distant heart sounds
- Gallop
- Pulmonic component of S2
- Pericardial friction rub
- Peripheral edema



Conclusion

- This quality improvement initiative to reduce low probability cardiology referrals for children presenting to primary care practices with chest pain was **feasible, effective and safe**

Thank you

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Children's National.

May 2024

Question 1

An 8 year old girl has had retrosternal chest pain for 1 week. Her general physical examination is normal. Of the following, which feature is most likely to suggest a cardiac pathologic state needing further evaluation?

- A. Sharp, stabbing in nature
- B. Occurs only at rest
- C. Occurs only with inspiration
- D. Occurs only with exercise
- E. Associated with point tenderness

Answer 1

- **Correct Response: D**
- Red flag for referral in children with chest pain include any of the following:
 - Chest pain with exertion
 - Chest pain that radiates to back, jaw, left arm, or left shoulder
 - Chest pain that increases with supine position
 - Chest pain temporally associated with fever ($>38.4^{\circ}\text{C}$)

Question 2

- You are evaluating a 15 year old boy who presented with chest pain. The pain was not radiating and not associated with sports. The family history was reassuring and examination was normal apart from reproducible pain at left sternal border. After explaining the benign nature of chest pain, the mother became angry mandating referral to cardiology. The best next step is:

Question 2

- A. Refer to Cardiology
- B. Refer to emergency department
- C. Ask the family to see another pediatrician
- D. Obtain an ECG
- E. Determine the concerning element

Answer 2

- **Correct Response: E**
- It is absolutely important to determine the underlying agenda/ concern that families sometimes bring with common complaint. A patient with benign entity can and should be handled within the pediatrician's office (medical home). Referring to cardiology and/or obtaining testing is not appropriate as the patient has no red-flag for referral.

Question 3

- You are evaluating a 16 year old boy with chest pain. The chest pain occurred while the child was sitting. You decided not to refer the patient to cardiology. A medical student asked about cardiology referral criteria for patients presenting with chest pain. In answering the medical student which of the following is true:

Question 3

- A. The majority of patients referred to cardiology with chief complaint of chest pain have an underlying heart disease
- B. About 30% of children with noncardiac chest pain have associated panic disorder
- C. No known red-flag criteria has shown high sensitivity in identifying cardiac disease explaining chest pain
- D. All patients presenting with chest pain need to see cardiology
- E. All patients presenting with chest pain need to be exercise restricted

Answer 3

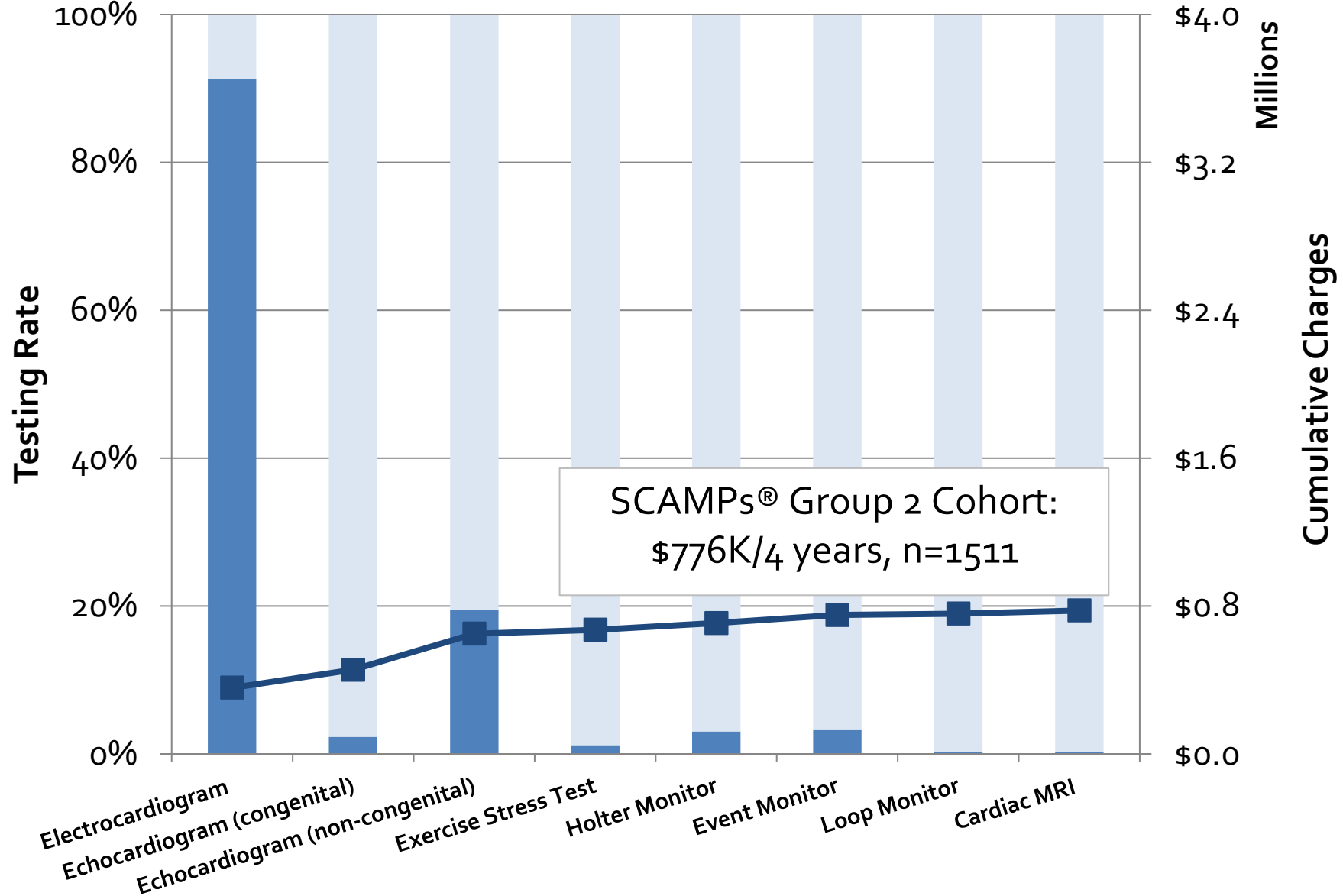
- **Correct Response: B**
- Previous reports have shown 20-47% of children with noncardiac chest pain have associated panic disorder. Patients presenting with chest pain need to be triaged by their pediatrician and only those with medical red-flag criteria for referral should be referred to cardiology and exercise restricted until cardiology evaluation is completed. 0.25% to 4% of patients presenting with chest pain have cardiac disease explaining their complaint. A medical red-flag criteria has been shown to be sensitive in identifying cardiac disease explaining chest pain

Family of metrics tracked

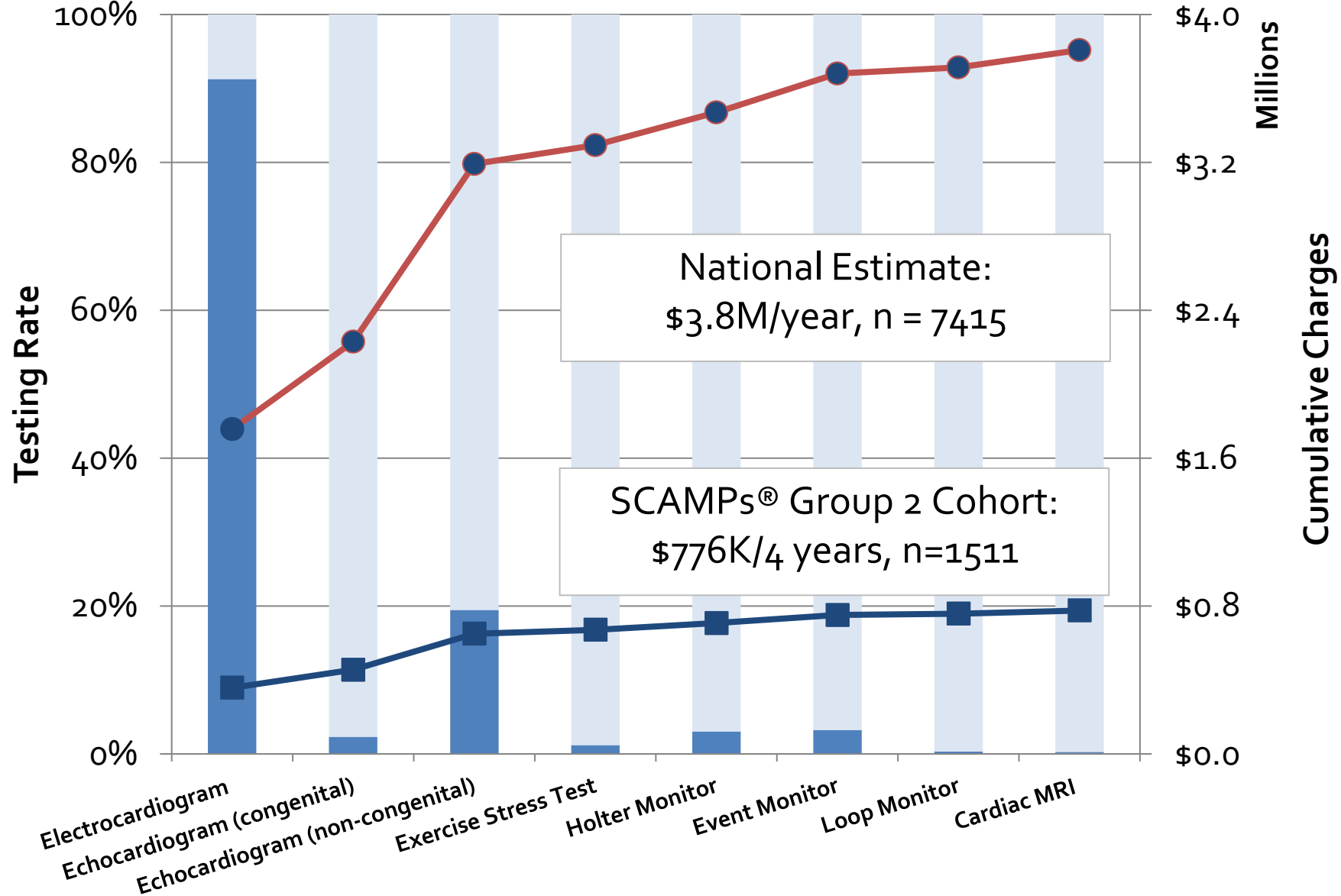
| Goal | Metric | Numerator | Denominator | Frequency of obtaining data | Data source | Planned goal |
|---|---|--|--|-----------------------------|--|---------------------------------------|
| Outcome Goal: Decrease low probability referrals when evaluating a pediatric patient presenting with chest pain | Low probability referrals | Number of patients with no red-flag for cardiology referral (All elements in HPI, PMH, Family history and examination) but referred to cardiology | Number of patients who presents to the PCP office with chest pain and no red-flag for cardiology referral within the measurement period | Monthly | EMR at CNP&A EMR –CNHS (Cardiology visits) | Decrease by 50% of the baseline level |
| Process measure: Improve primary pediatrician’s utilization of red-flags for referral tool when evaluating a pediatric patient presenting with chest pain | Complete red-flag-referral tool | Number of patients with a complete red-flag item tool (All elements in HPI, PMH, Family history and examination) | Number of patients who presents to the PCP office with chest pain within the measurement period | Monthly | EMR at CNP&A | Increase to 80% |
| Balancing measure- Patient safety | Missing life threatening event | Number of patients found to have life threatening event despite not having any red-flag for cardiology referral | Number of patients who presents to the PCP office with chest pain and have no red-flag for cardiology referral within the measurement period | Every 6 months | EMR at CNP&A EMR –CNH (Cardiology visits, Emergency department) | |
| | Incidental finding of cardiac disease (not cause of chest pain) | Number of Referrals Leading to Incidental finding of cardiac disease (not cause of chest pain) despite not having any red-flag for cardiology referral | Number of patients who presents to the PCP office with chest pain and have no red-flag for cardiology referral within the measurement period | Every 6 months | EMR at CNP&A I EMR –CNH (Cardiology visits) | |

Charges of low probability cardiology referrals

Testing Rate and Total Charges (US2014\$)

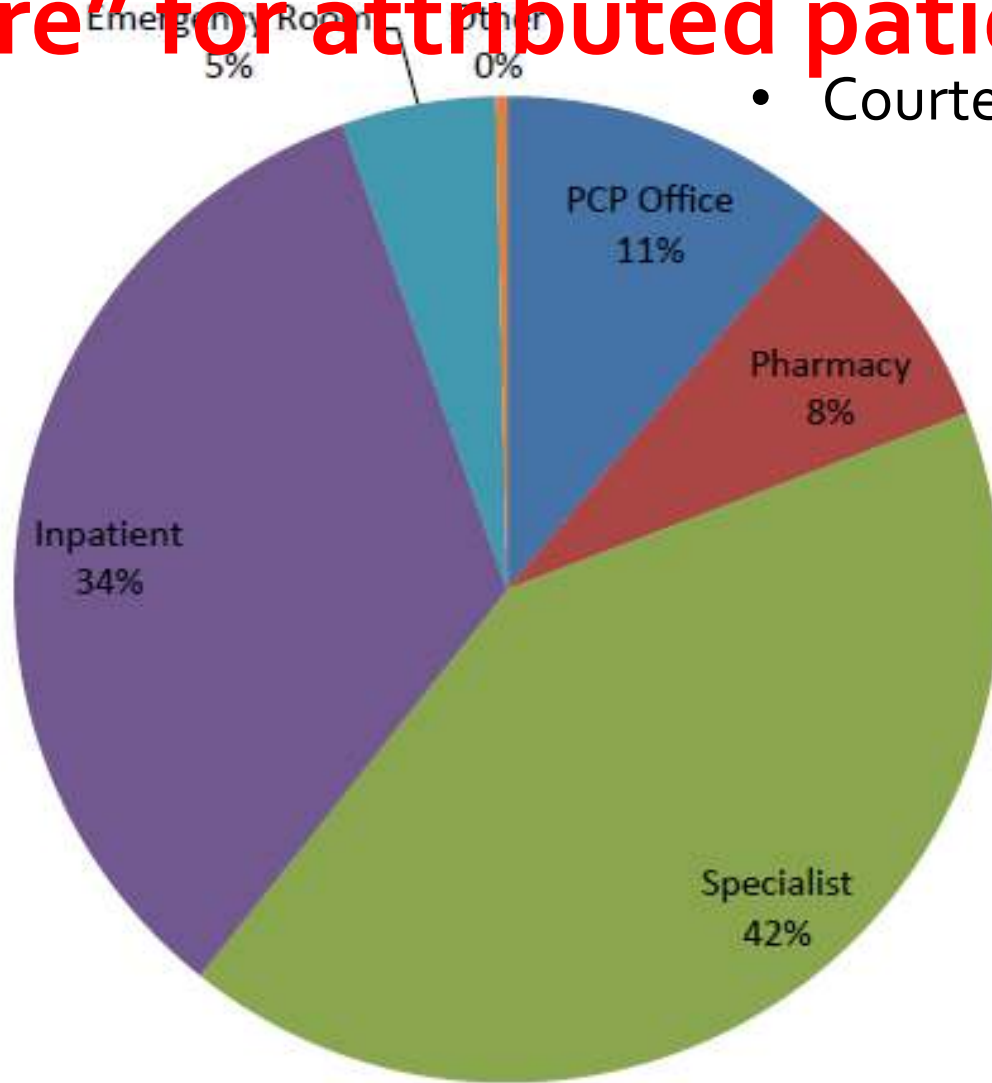


Testing Rate and Total Charges (US2014\$)



Pediatricians increasingly “accountable” for “total cost of care” for attributed patients

- Courtesy of Mark Weissman



CareFirst Sample Pediatric PCMH Expense