Utilizing Data and Machine Learning to Change Predictive Analytics into Prescriptive Analytics

National Cancer Policy Forum Workshop

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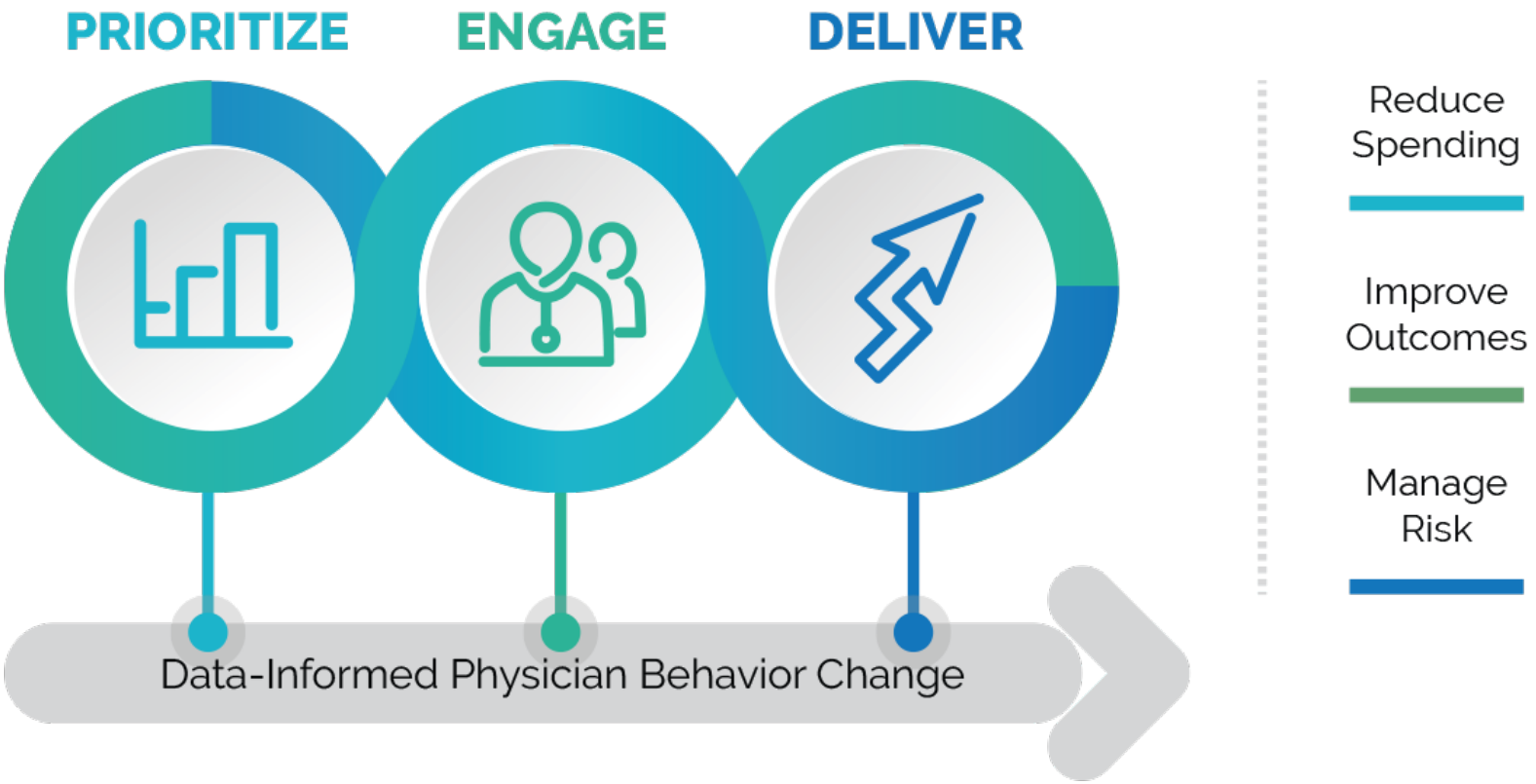
- 5 locations around Tacoma, Washington
- 12 MDs, 13 APPs, & >250 employees
- OCM with CMS & 5 commercial VBC contracts-80% of patients
- NWMS Research has 35+ open Phase I-III studies

NWMS Vision for Value-Based Care

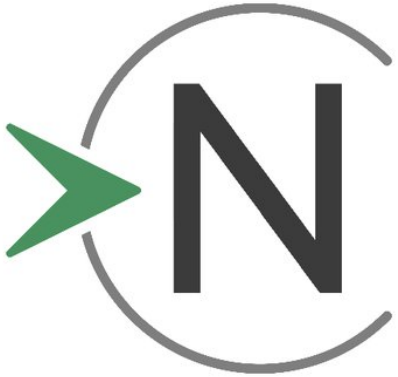
Develop a new patient-centered oncology care model focused on providing the highest quality patient care while driving down the cost of cancer care.

Create innovative solutions around quality reporting that drive practice transformation and efficiency.

Behavior Change Concept

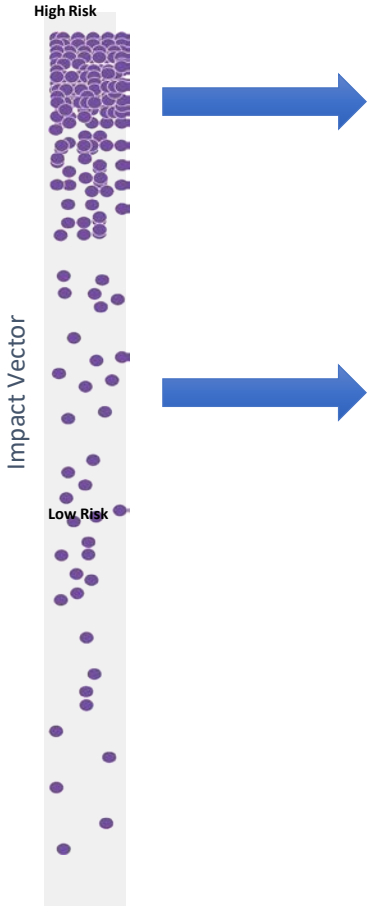


Using technology to drive change



How AI Machine Works

AI takes predictive analytics to the next level by using other factors such as socioeconomic data to identify patients who would have otherwise been unrecognized as high risk



Predictive Analytics

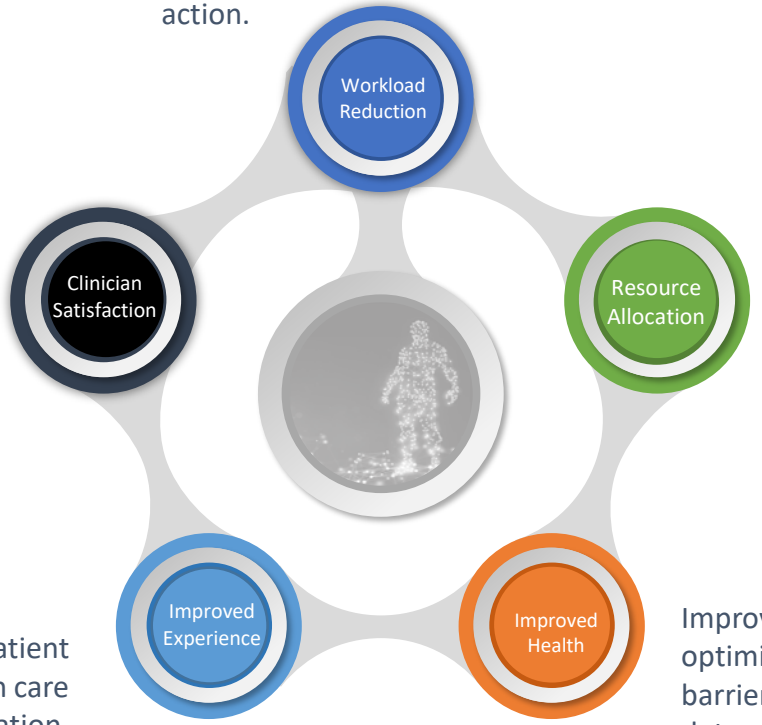
- Mostly 'Obvious' patients that clinicians already know
- Less likely to change the outcome so less business impact

Jvion AI Machine

- Combines 'patients with risk' + 'where outcome can likely be changed'
- Finds which intervention is most applicable for each patient making this actionable

True Patient Impact & Clinical Benefits

Workload reduction by narrowing clinician's focus on meaningful action.



Overall improvement in clinician satisfaction through narrowing of clinician focus for greater patient impact.

Strategic allocation of resources through patient risk propensities (i.e. care managers, palliative care referrals, etc.).

Improved patient experience through care optimization.

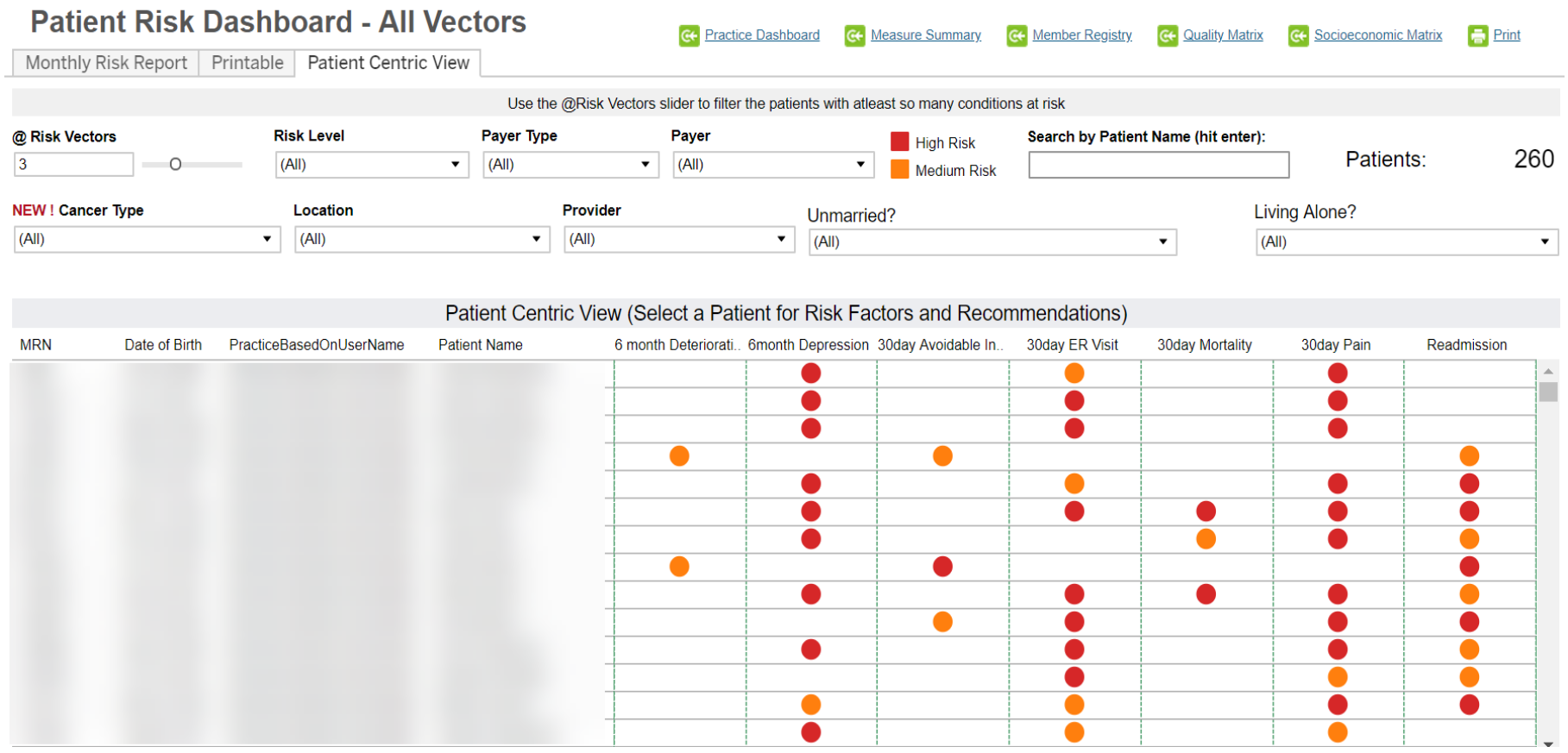
Improved patient outcomes by optimizing care, addressing unknown barriers to care (socioeconomic determinants of health).

Composition of the Oncology Specialty Vectors

ONCOLOGY VECTORS DEEP DIVE

Vector	Description
30-day Mortality	Patients at risk of mortality within 30-days of prediction
30-day Pain Management	Patients at risk of having severe/moderate pain within 30-days
6-month Depression	Patients at risk of having a depression diagnosis within 6-months
6-month Deterioration	Patients at risk of deterioration of ADL levels (at least 2 levels) within 6-months
30-day Avoidable Admission	Patients at risk of an avoidable IP admission within 30-days
30-day ED Visit	Patients at risk of an ED visit within 30-days
Readmission	Patients at multiple admissions within 3-months

Patient Portal View: Patient Centric View



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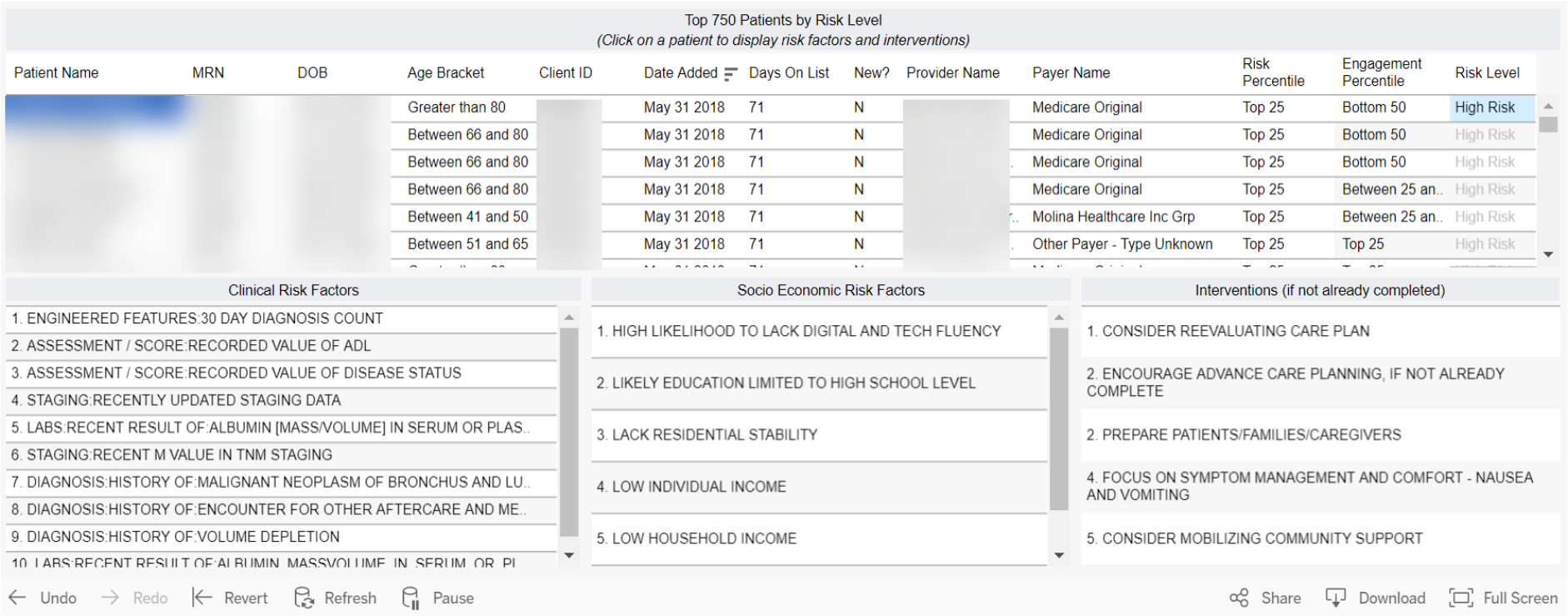
Patient Portal View Example: High Risk #1 – 30 day Mortality



Top 750 Patients by Risk Level

(Click on a patient to display risk factors and interventions)

Patient Name	MRN	DOB	Age Bracket	Client ID	Date Added	Days On List	New?	Provider Name	Payer Name	Risk Percentile	Engagement Percentile	Risk Level
[redacted]			Greater than 80		May 31 2018	71	N		Medicare Original	Top 25	Bottom 50	High Risk
			Between 66 and 80		May 31 2018	71	N		Medicare Original	Top 25	Bottom 50	High Risk
			Between 66 and 80		May 31 2018	71	N		Medicare Original	Top 25	Bottom 50	High Risk
			Between 66 and 80		May 31 2018	71	N		Medicare Original	Top 25	Between 25 an..	High Risk
			Between 41 and 50		May 31 2018	71	N		Molina Healthcare Inc Grp	Top 25	Between 25 an..	High Risk
			Between 51 and 65		May 31 2018	71	N		Other Payer - Type Unknown	Top 25	Top 25	High Risk

Clinical Risk Factors	Socio Economic Risk Factors	Interventions (if not already completed)
1. ENGINEERED FEATURES:30 DAY DIAGNOSIS COUNT	1. HIGH LIKELIHOOD TO LACK DIGITAL AND TECH FLUENCY	1. CONSIDER REEVALUATING CARE PLAN
2. ASSESSMENT / SCORE:RECORDED VALUE OF ADL	2. LIKELY EDUCATION LIMITED TO HIGH SCHOOL LEVEL	2. ENCOURAGE ADVANCE CARE PLANNING, IF NOT ALREADY COMPLETE
3. ASSESSMENT / SCORE:RECORDED VALUE OF DISEASE STATUS	3. LACK RESIDENTIAL STABILITY	2. PREPARE PATIENTS/FAMILIES/CAREGIVERS
4. STAGING:RECENTLY UPDATED STAGING DATA	4. LOW INDIVIDUAL INCOME	4. FOCUS ON SYMPTOM MANAGEMENT AND COMFORT - NAUSEA AND VOMITING
5. LABS:RECENT RESULT OF:ALBUMIN [MASS/VOLUME] IN SERUM OR PLAS..	5. LOW HOUSEHOLD INCOME	5. CONSIDER MOBILIZING COMMUNITY SUPPORT
6. STAGING:RECENT M VALUE IN TNM STAGING		
7. DIAGNOSIS:HISTORY OF:MALIGNANT NEOPLASM OF BRONCHUS AND LU..		
8. DIAGNOSIS:HISTORY OF:ENCOUNTER FOR OTHER AFTERCARE AND ME..		
9. DIAGNOSIS:HISTORY OF:VOLUME DEPLETION		
10. LABS:RECENT RESULT OF:ALBUMIN [MASS/VOLUME] IN SERUM OR PL..		

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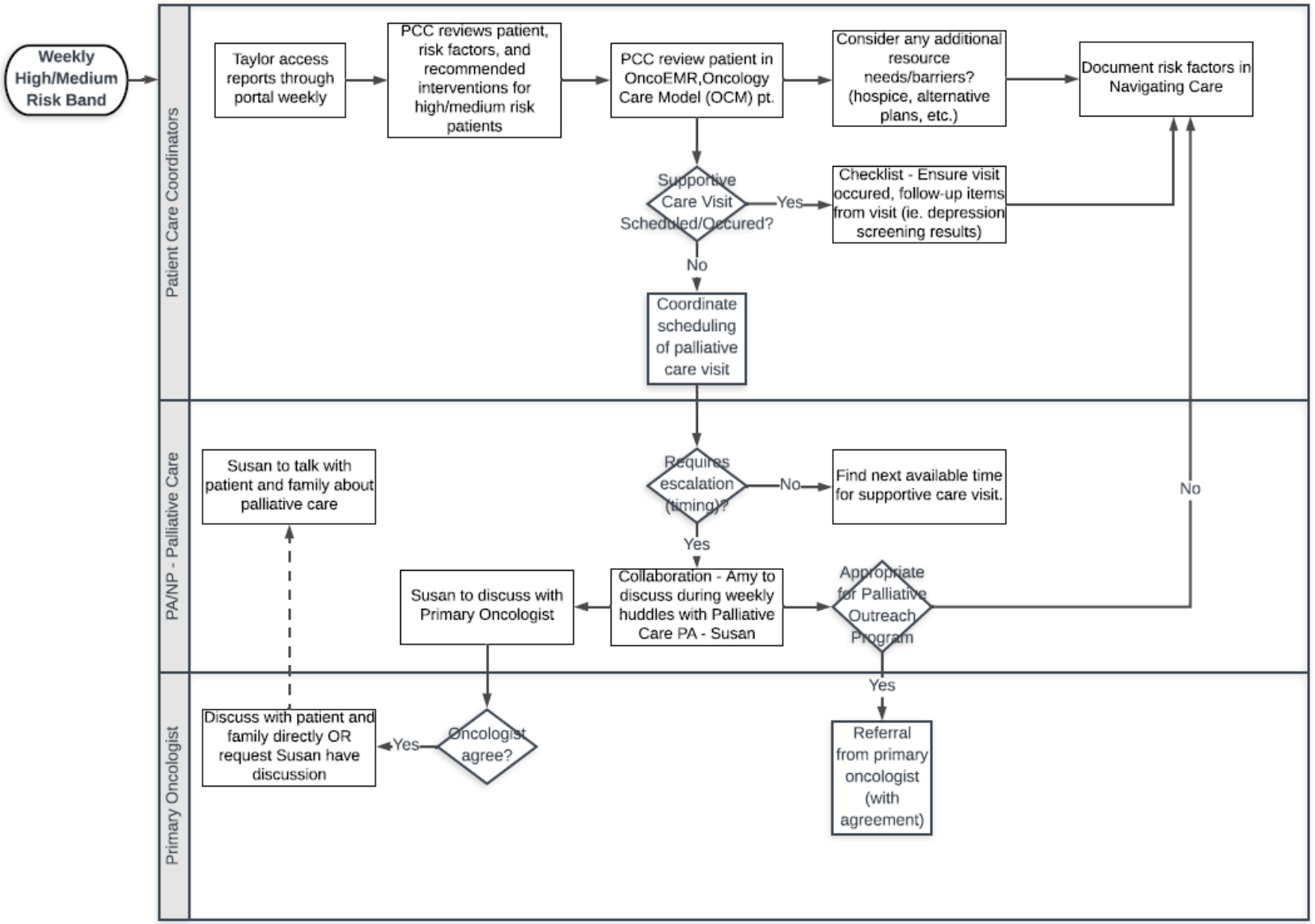
NWMS - Cardinal Health - 30 day Mortality



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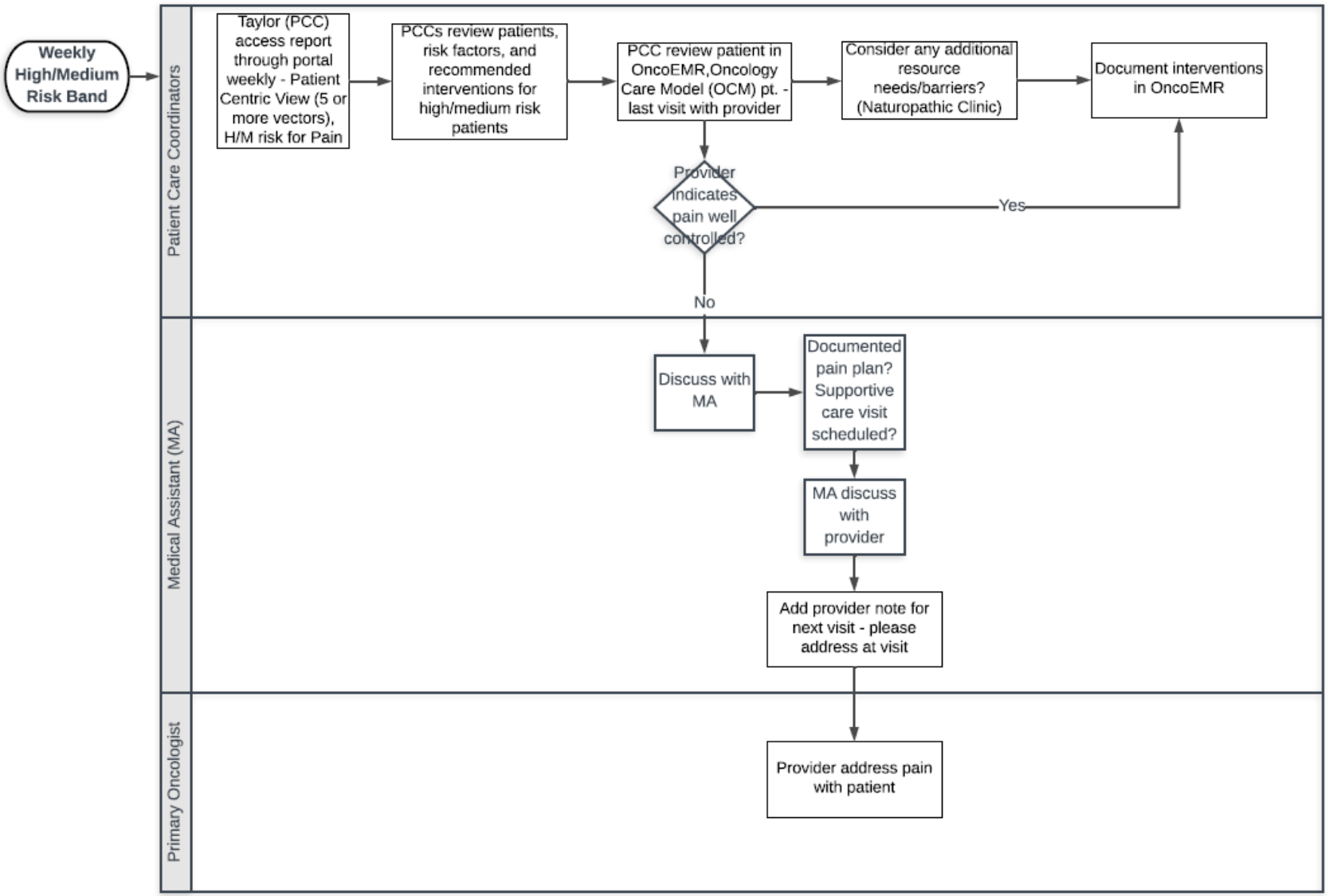
NWMS - Cardinal Health - Pain Management



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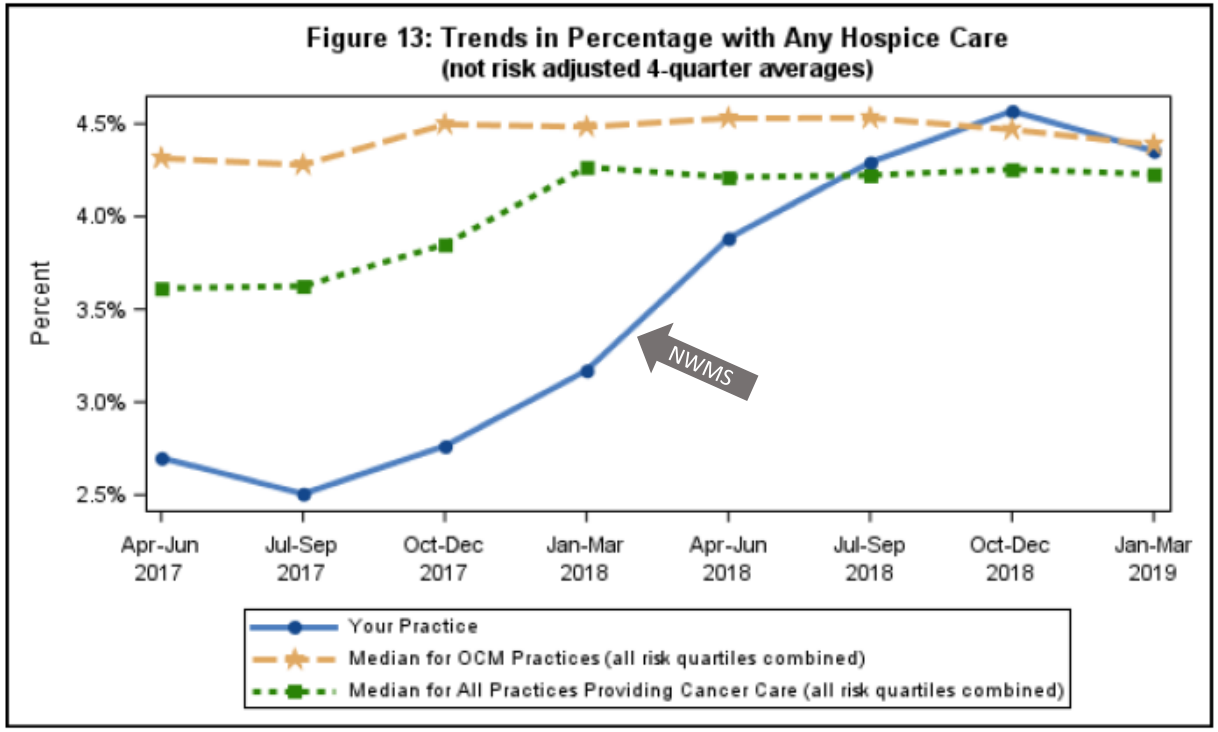
Continual Practice Improvement

-Implementation team consists of Medical Director, Quality Director, Case Manager Nurses and Patient Care Coordinators

-Other multidisciplinary team members are added as needed for patient care

-Primary implementation team makes continual workflow modifications to improve efficiency (hired Acute Care Advanced Practice Provider)

End of life performance



2016: 36.4% less hospice utilization than peers

2019: 3.1% less hospice utilization than peers

How we improved:

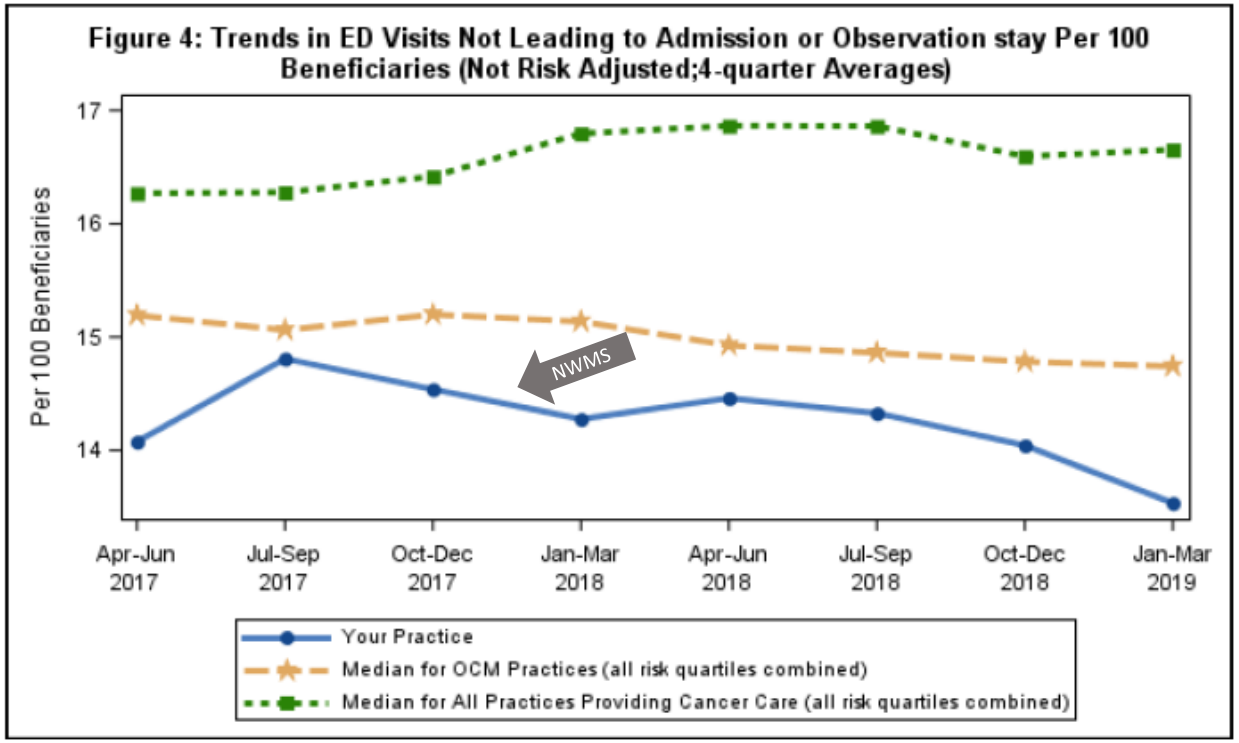
-Advanced care planning visits for all stage 3&4
-Supportive(Palliative) care visits for all stage 3&4
-Complex conversations training for providers and staff
-Using Artificial intelligence to identify high risk patients

OCM Data

ED Visits Not Leading to Admission

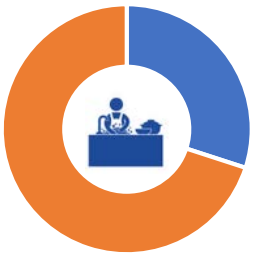
2015-2019

22.2% Reduction in ED visits



April 2017-March 2019

Oncology Vectors: Operational to Direction of Impact



6-month Deterioration

- **Up to 30% reduction** in loss of function/ADLs (ECOG)

6-month Depression

- **22% increase** in depression diagnoses

30-day Pain Management

- **33% reduction** in moderate and severe pain

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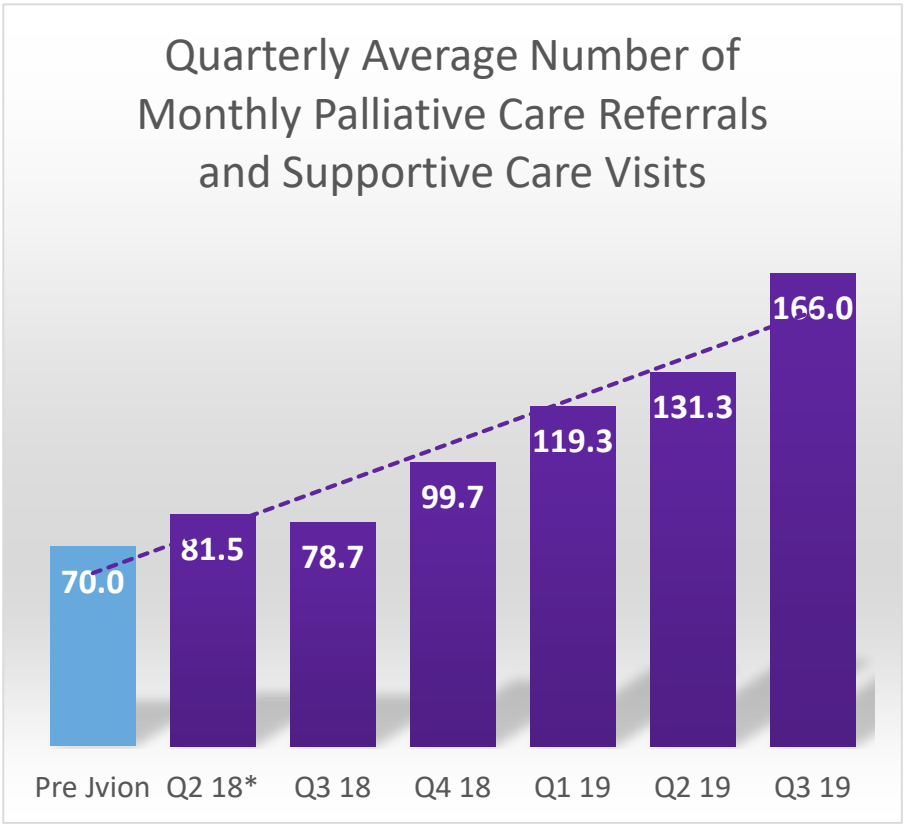
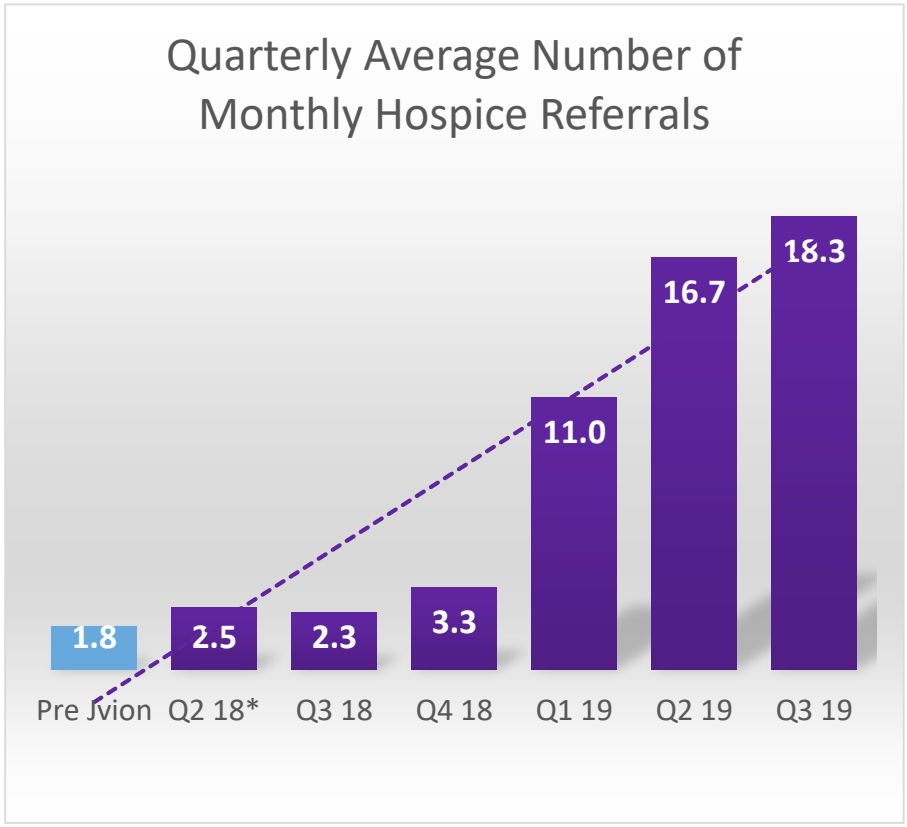
Severe Pain & Mortality Metrics

High & Medium Risk





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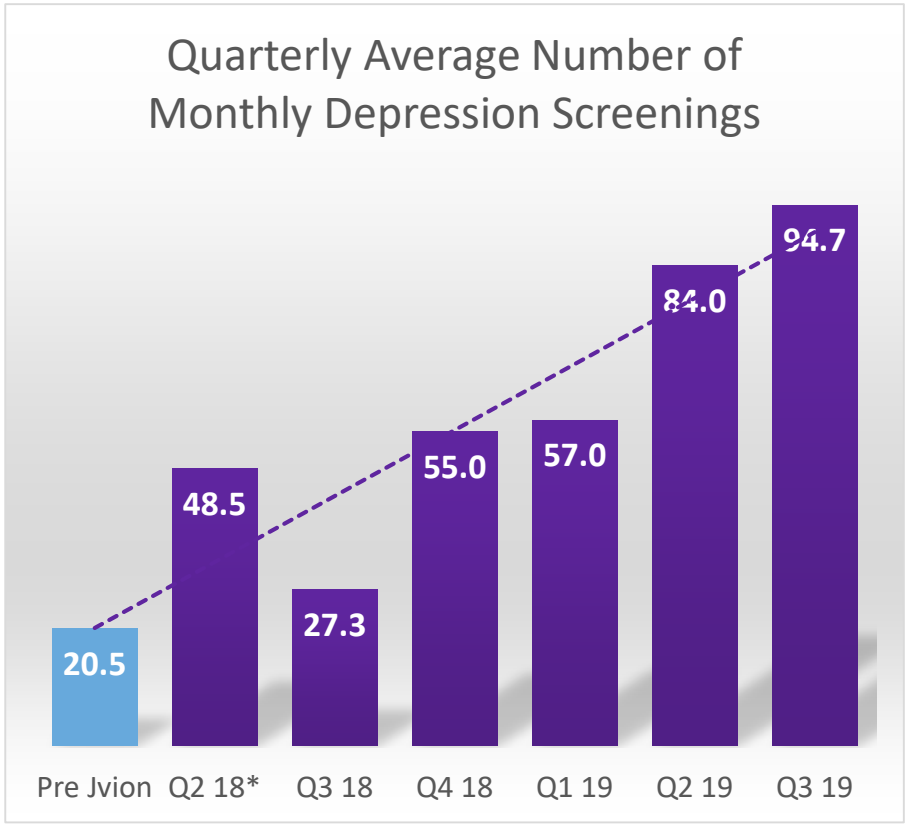
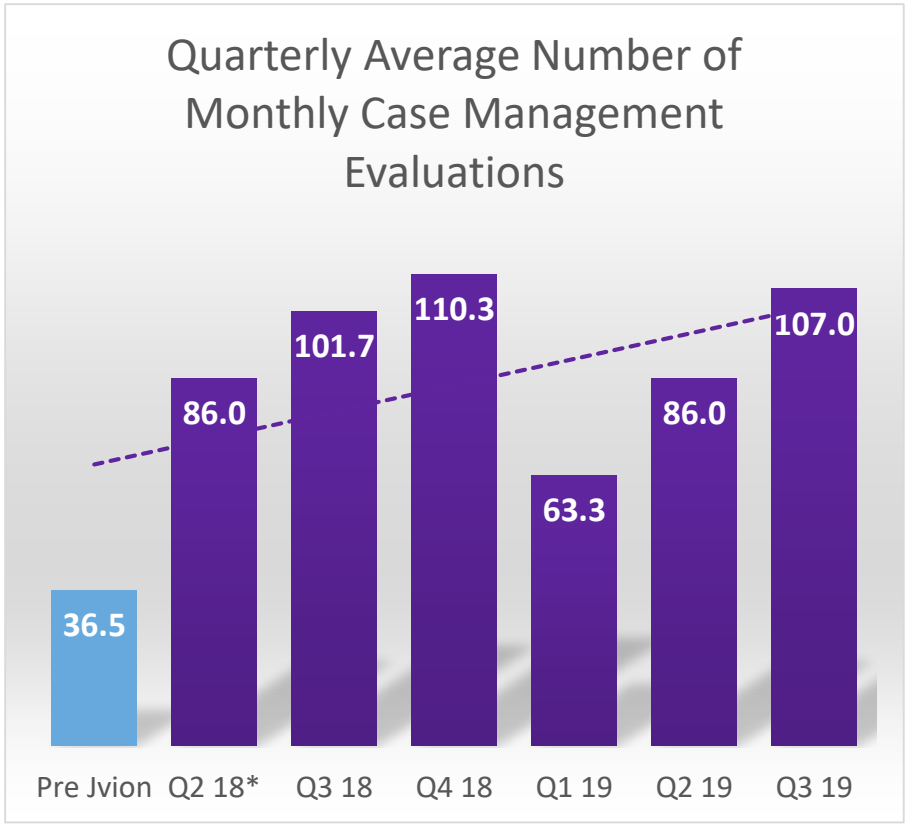
Depression Screenings & Case Management Evaluations

High & Medium Risk





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30 Day Mortality- Patient Story

- Weekly results with patient identification- Tuesday **(D1)**
- Check results from Mon/Tue night and bring patient to clinic on Wednesday **(D2)**
- Acute problems-
  - New severe pancytopenia-Val-GCY
  - Progressive cough and SOB-RSV
  - Recurrent and severe diarrhea-CMV, GVHD, C.Diff
- Hospitalization (Direct Admit)-Wednesday **(D2)** after several hours of discussion with LTFU, local hospital
- Diagnoses:
  - CMV-Foscarnet
  - GVHD-HD steroids
  - RSV: Supportive care, imaging
- Tuesday **(D8)**: Medium risk

Recommendations:
- Focus on symptom management and comfort - nausea and vomiting
- Consider antimicrobial, antifungal, antiviral prophylaxis according to guidelines
- Encourage advance care planning, if not already complete
- Consider referral to appropriate health care professionals
- Focus on symptom management and comfort - dyspnea

Clinical Risk Factors:
- Assessment / Score: Recorded value of disease status
- Diagnosis: History of: Abnormalities of breathing
- Diagnosis: History of: Other disorders of muscle
- Diagnosis: History of: Volume depletion
- Disease status: Recent updated disease status value
- Labs: Recent result of: Albumin, blood
- Labs: Recent result of: Granulocytes per 100 white blood cells, blood
- Labs: Recent result of: Hemoglobin, blood
- Labs: Recent result of: Monocytes, blood
- Labs: Recent result of: Neutrophils, blood
- Labs: Recent result of: Sodium, blood
- Medication: History / Current prescription: Antibiotics of concern
- Medication: History / Current prescription: Corticosteroid
- Medication: History / Current prescription: Glucocorticoids
- Vitals: Recent body height
- Vitals: Recent body weight
- Vitals: Recent diastolic blood pressure
- Vitals: Recent heart rate
- Vitals: Recent systolic blood pressure

Socioeconomic Risk Factors:
- Likely education limited to high school level
- Lives in high density area and has higher exposure to pollutants