# State of the Art Care of MPNs

## New Drugs in Hematology - Bologna 2016

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# Disclosures

- Consultancy: Novartis, Shire, Ariad

- Research Funding: Incyte, Gilead, CTI, Genentech, Promedior, NS Pharma, Pfizer, Pharmessentia

## Session I: Classical Ph1-neg myeloproliferative neoplasms

*Chairmen: F. Passamonti, A.M. Vannucchi*

**11.00 a.m.** Status of the art of treatment - *R.A. Mesa*

**11.25 a.m.** Ruxolitinib in myelofibrosis - *F. Passamonti*

**11.40 a.m.** Ruxolitinib in polycitemia vera - *A.M. Vannucchi*

**11.55 a.m.** New JAK2 inhibitors in MPNs and combination therapy - *F. Cervantes*

**12.10 p.m.** Interferons in MPNs - *H.C. Hasselbalch*

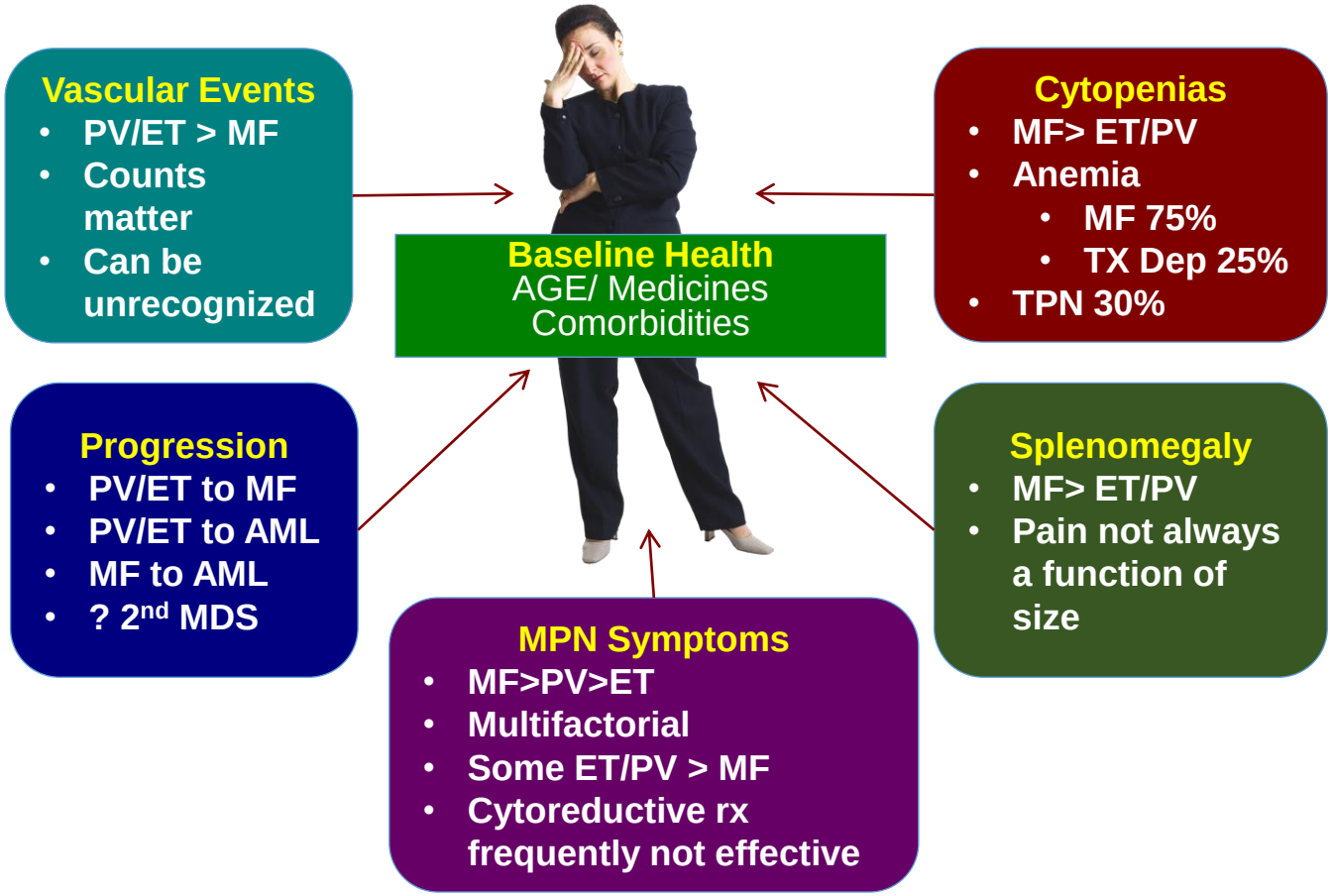
**12.25 p.m.** Newer drugs for myelofibrosis - *G. Barosi*

# “State of the Art” Care of MPN Patients

- What is your patients disease burden?
- What is your patients risk?
- What are your treatment goals?
- What are the unmet needs “new drugs” in hematology need to address?
- Who is a clinical trial patient in MPNs in 2016 vs. standard therapy?
- Future directions

# Assessing MPN Burden

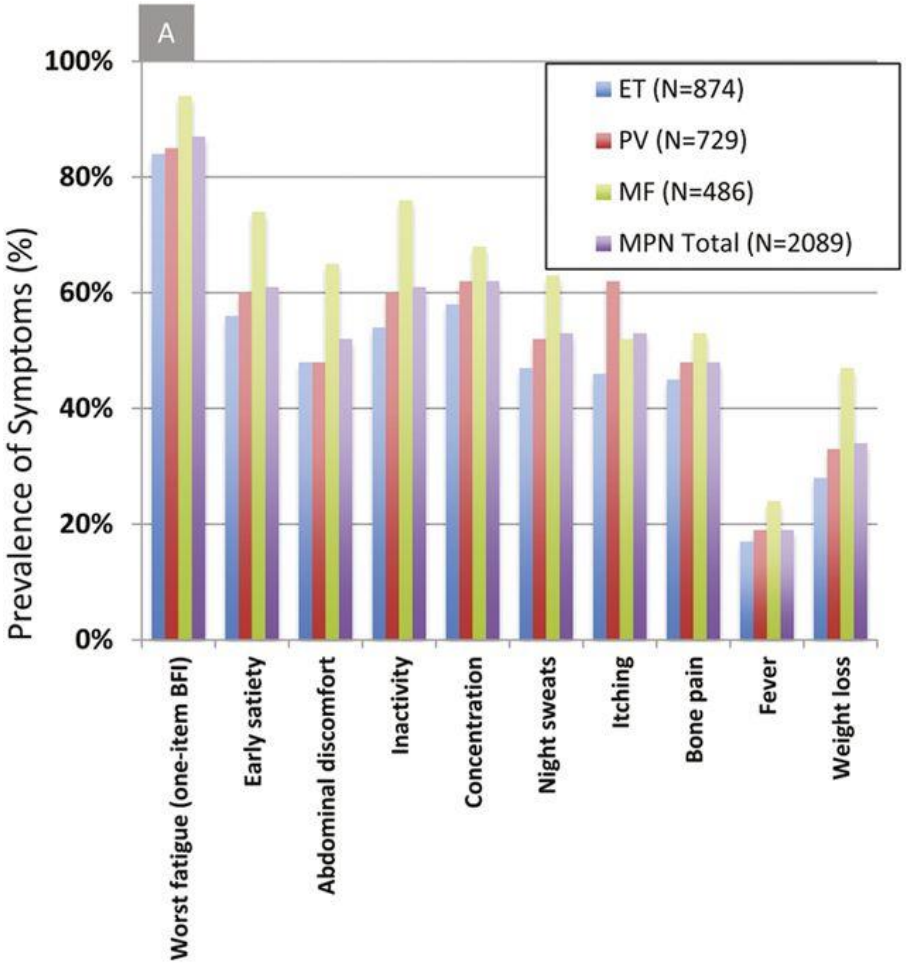
*WHO Diagnosis Does Not Tell Whole Story*

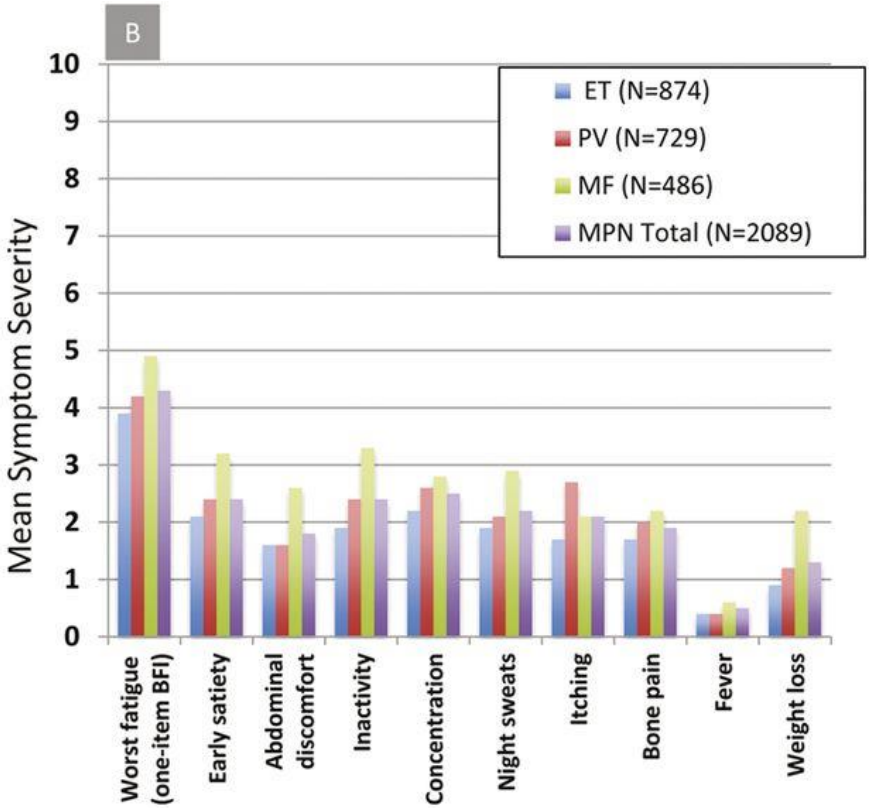




# Classic Signs and Symptoms of MPN

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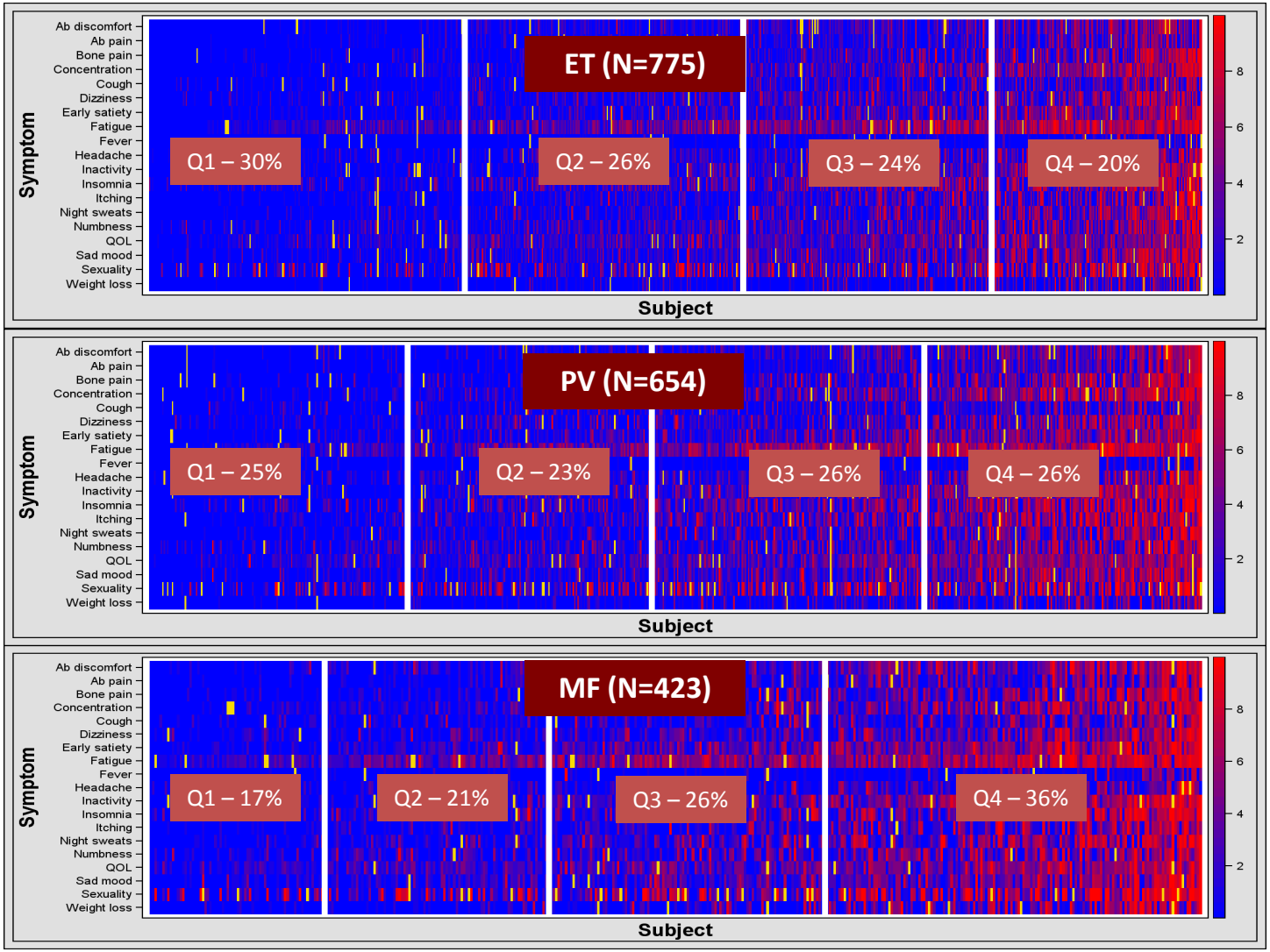
Geyer H L , and Mesa R A Blood 2014;124:3529-3537

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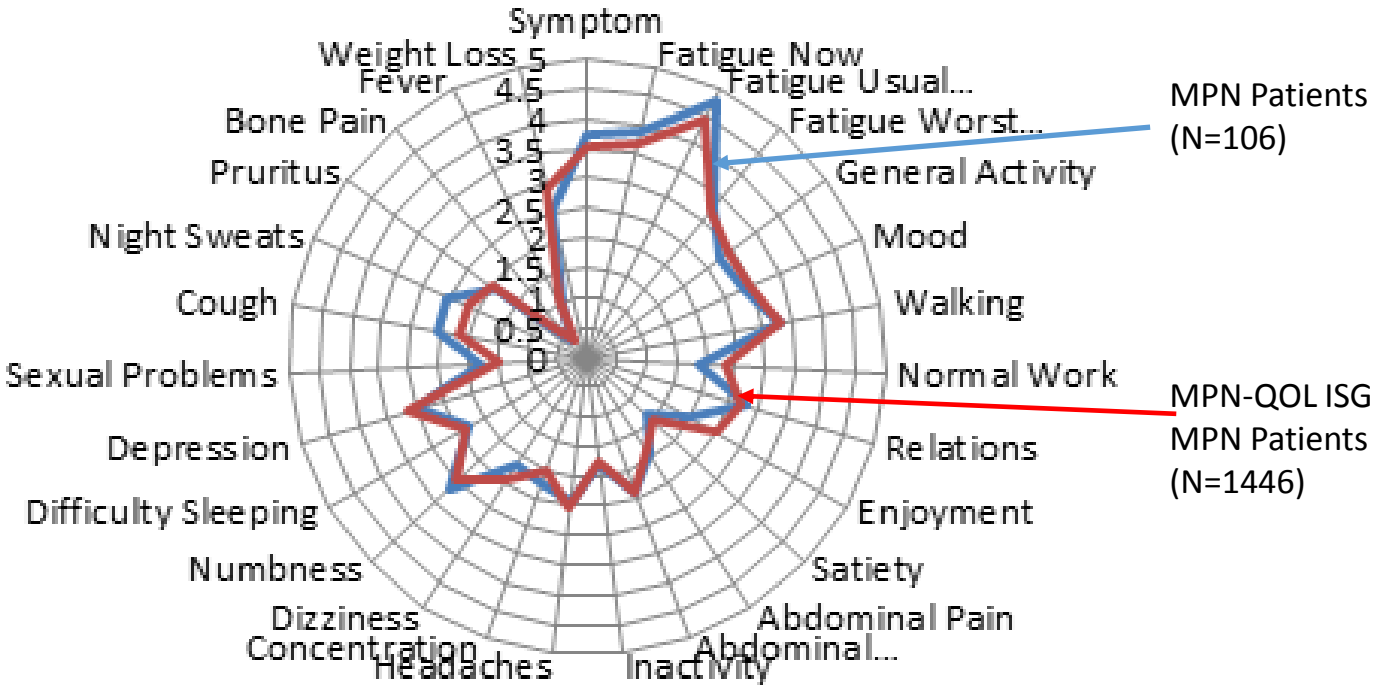
Scherber et.al.
ASH 2013

## What is MPN Symptom Burden in Patients vs. General Population?

*MOSAICC Population Vs. MPN-QOL ISG*




Anderson et. al. ASH 2015

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# MPN Symptom Burden is Significant, and Worse Than General Population

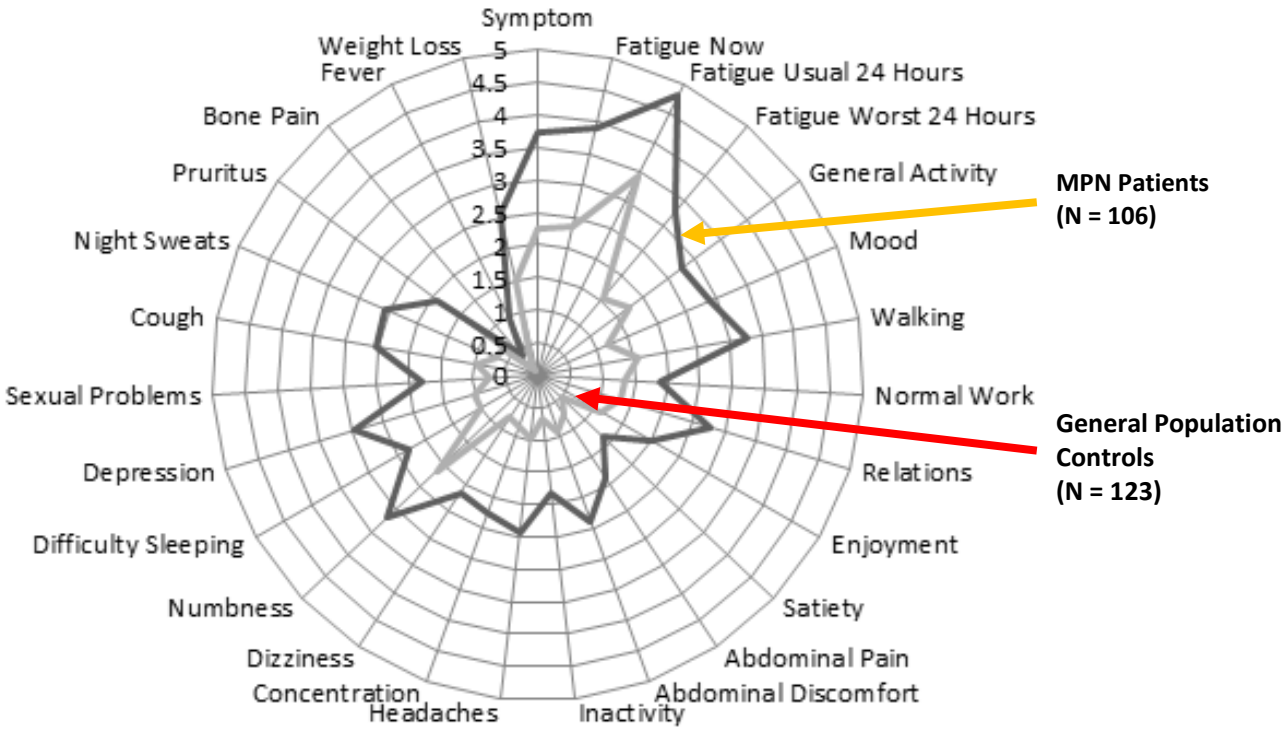


Image courtesy of Ruben A. Mesa, MD

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# Definitions

## HRQOL in MPNs?

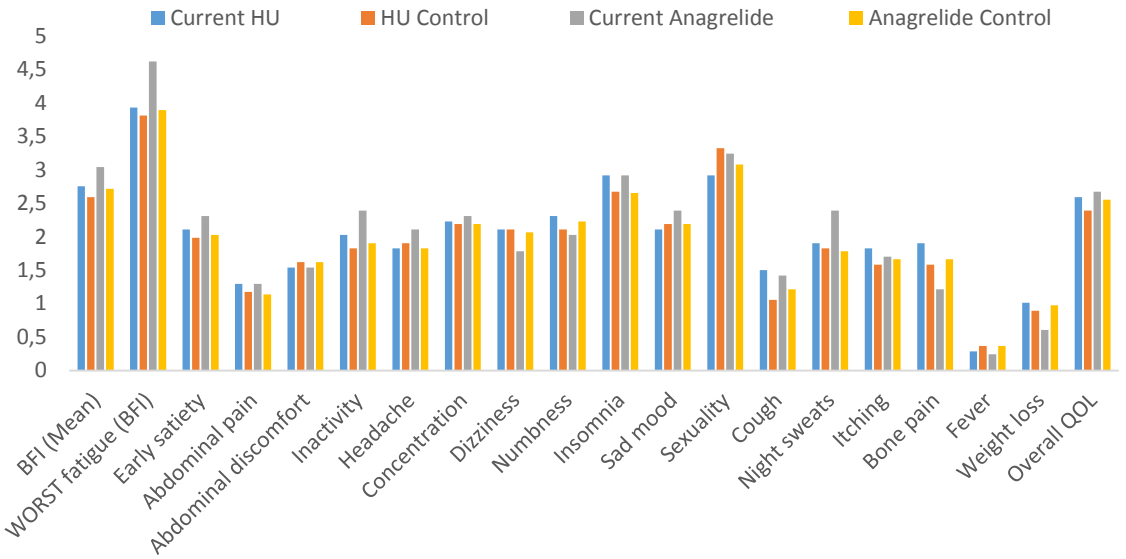
$\Sigma$

- MPN related symptoms
- Medication related toxicities
- Problems from prior MPN complications
- Stressors from having their MPN
  - Financial
  - Emotional
  - Intrapersonal
- Co-morbidities
- Hassle of medical care

## Lesson 1 MPN Symptoms ASH 2015:

### *Current ET Therapies Seem to Have Minimal Impact on Symptom Burden*

- ET Patients (N = 843)
  - Impact HU or anagrelide on symptom burden
  - In non-randomized assessment similar symptom burden despite HU or anagrelide

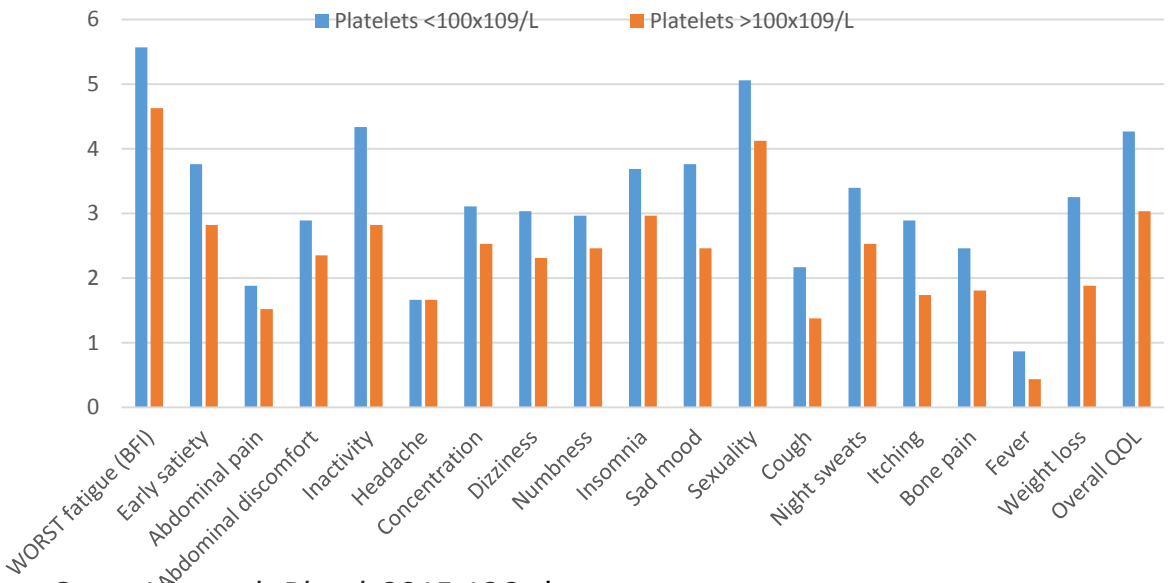



Geyer HL, et al. *Blood.* 2015;126 abstract xx.

## Lesson 2 MPN Symptoms ASH 2015:

### *MF Patients with Thrombocytopenia Have Worse Prognosis and Symptom Burden*

- MF Patients (N = 418)
  - Symptom burden stratified by platelets
  - Much higher symptom burden in those with platelets <100 x $10^9$/L




Geyer HL, et al. *Blood.* 2015;126 abstract xx.

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# Lesson 3 MPN Symptoms ASH 2015:

## *Duration of MPN Has a Significant Impact on Symptom Burden*

| Item Mean (SD) | Early (N = 757) | Middle (N = 353) | Late (N = 333) | Total (N = 1443) | *P* Value |
|---|---|---|---|---|---|
| **BFI (Mean)** | **3.1 (2.29)** | **3.3 (2.29)** | **3.5 (2.36)** | **3.2 (2.31)** | **.04** |
| WORST Fatigue (BFI) | 4.3 (2.83) | 4.5 (2.76) | 4.7 (2.84) | 4.4 (2.82) | - |
| Early satiety | 2.4 (2.80) | 2.5 (2.77) | 2.7 (2.63) | 2.5 (2.76) | - |
| Abdominal pain | 1.4 (2.24) | 1.5 (2.33) | 1.5 (2.24) | 1.5 (2.26) | - |
| Abdominal discomfort | 1.8 (2.37) | 1.9 (2.53) | 2.0 (2.49) | 1.8 (2.44) | - |
| Inactivity | 2.3 (2.70) | 2.4 (2.62) | 2.5 (2.73) | 2.4 (2.69) | - |
| Headache | 1.8 (2.48) | 1.8 (2.45) | 1.5 (2.21) | 1.8 (2.42) | - |
| **Concentration** | **2.3 (2.71)** | **2.8 (2.83)** | **2.8 (2.84)** | **2.5 (2.78)** | **.007** |
| Dizziness | 2.0 (2.54) | 2.1 (2.62) | 2.0 (2.46) | 2.0 (2.54) | - |
| Numbness | 2.5 (2.79) | 2.6 (2.77) | 2.4 (2.73) | 2.5 (2.77) | - |
| **Insomnia** | **2.8 (3.02)** | **3.2 (3.11)** | **3.3 (3.05)** | **3.0 (3.05)** | **.02** |
| Sad mood | 2.3 (2.70) | 2.4 (2.72) | 2.5 (2.70) | 2.4 (2.70) | - |
| **Sexuality** | **2.9 (3.37)** | **3.2 (3.53)** | **3.7 (3.70)** | **3.2 (3.50)** | **.002** |
| **Cough** | **1.4 (2.18)** | **1.5 (2.41)** | **1.8 (2.40)** | **1.5 (2.29)** | **.03** |
| **Night sweats** | **1.9 (2.76)** | **2.4 (2.97)** | **2.5 (2.82)** | **2.2 (2.84)** | **.002** |
| **Itching** | **2.0 (2.87)** | **2.3 (2.85)** | **2.5 (3.09)** | **2.2 (2.92)** | **.02** |
| Bone pain | 1.9 (2.72) | 1.8 (2.60) | 2.2 (2.93) | 2.0 (2.75) | - |
| Fever | 0.3 (1.06) | 0.4 (1.25) | 0.4 (1.16) | 0.4 (1.13) | - |
| Weight loss | 1.1 (2.25) | 1.0 (2.10) | 1.2 (2.35) | 1.1 (2.24) | - |
| **Overall QOL** | **2.7 (2.45)** | **3.1 (2.54)** | **3.0 (2.44)** | **2.9 (2.47)** | **.03** |
| **MPN-SAF TSS** | **20.3 (16.32)** | **21.6 (15.95)** | **23.7 (16.31)** | **21.4 (16.27)** | **.008** |

**Early: 0-5 y**
**Middle: 6-10 y**
**Late: ≥11 y**

*P* values calculated via ANOVA F-Test

Scherber R, et al. *Blood (Annual Meeting Abstracts)*. 2015;126 abstract 4073.

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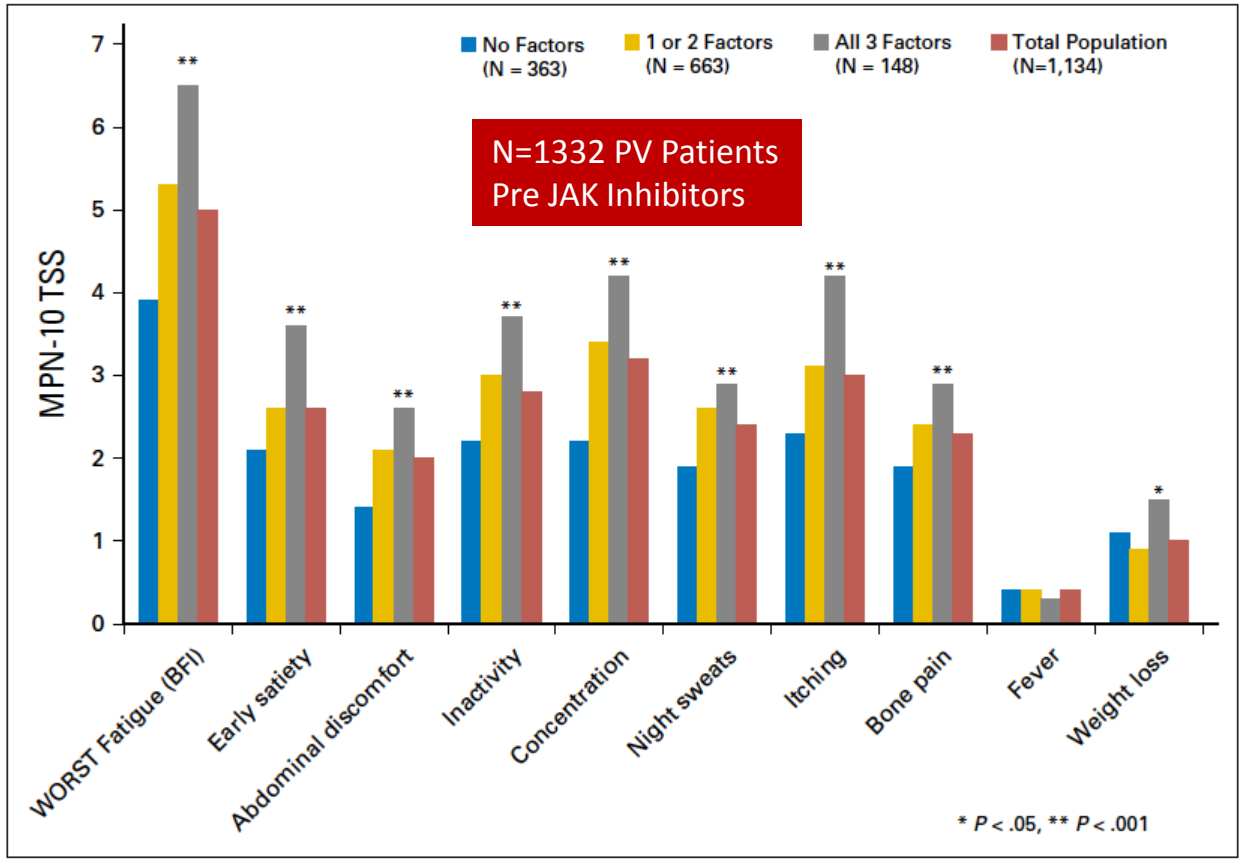
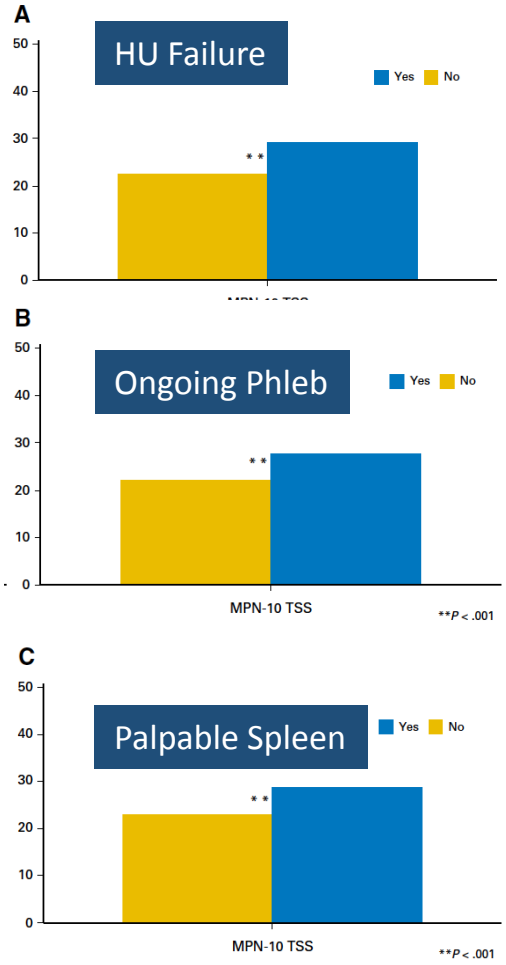
# Symptomatic Profiles of Patients With Polycythemia Vera: Implications of Inadequately Controlled Disease

JOURNAL OF CLINICAL ONCOLOGY | ORIGINAL REPORT

Geyer et. al. JCO 2015

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# State of the Art MPNs - Concept 1

1. An accurate and serial assessment of MPN symptom burden is important

# "State of the Art" Care of MPN Patients

- What is your patients disease burden?
- What is your patients risk?
- What are your treatment goals?
- What are the unmet needs "new drugs" in hematology need to address?
- Who is a clinical trial patient in MPNs in 2016 vs. standard therapy?
- Future directions

# Assessing MPN Patient Risk

| | IPSET (ET—3 groups) *Survival thrombosis risk* | PV Risk (4 groups) *Survival leukemia rates* | DIPSS (PMF—4 groups) *Survival* |
|---|---|---|---|
| **Age, years** | ≥ 60 (2 pts) vs < 60 | ≥ 67 (5 pts) 57-66 (2 pts), < 60 (0) | ≥ 65 (1 pt) vs < 65 |
| **Leukocytes** | ≥ 11 (1 pt) vs < 11 x $10^9$/L | ≥ 15 (1 point) vs < 15 x $10^9$/L | > 25 (1 pt) vs ≤ 25 x $10^9$/L |
| **Hemoglobin** | | | < 10 (2 pts) vs ≥ 10 g/dL |
| **Constitutional symptoms** | | | Present[a] (1pt) vs absent |
| **Blasts** | | | ≥ 1% (1pt) vs < 1% |
| **Prior thrombosis** | Yes (1 point) vs No | Yes (1 Point) vs No | |
| **Risk group point cutoffs** | 0; 1-2; 3-4 pts | 0; 1-2; 3; 4 pts | 0; 1-2; 3-4; ≥ 4 pts |
| | *Blood 2012* | *Leuk 2014* | *Blood 2010* |

[a] 10% weight loss over prior 6 months, night sweats, unexplained fever.

# Next Generation Sequencing Hematologic Neoplasms

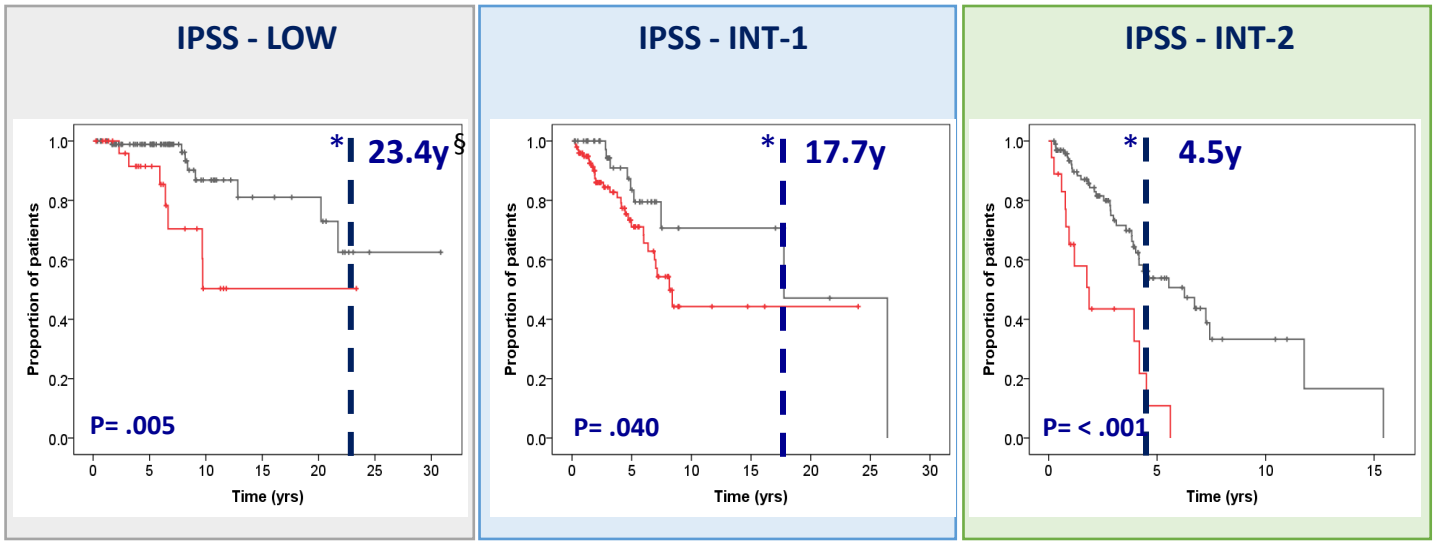
| GENE | EXONS | GENE | EXONS | GENE | EXONS |
|---|---|---|---|---|---|
| *ASXL1* | 11-14 | *GATA2* | 4-8 | *PTPN11* | 3, 4, 12, 13 |
| *BCOR* | 5-16 | *IDH1* | 4 | *RUNX1* | 4-10 |
| *BRAF* | 15 | *IDH2* | 4 | *SETBP1* | 6 – partial |
| *CALR* | 9 | *JAK2* | 12-16 | *SF3B1* | 14-17 |
| *CBL* | 8,9* | *KIT* | 8-11, 17 | *SRSF2* | 1, 2 |
| *CEBPA* | 1 | *KRAS* | 2, 3 | *TERT* | 2-16 |
| *CSF3R* | 14, 17 | *MPL* | 10, 11 | *TET2* | 3-11 |
| *DNMT3A* | 8-23 | *MYD88* | 5 | *TP53* | 4-9 |
| *ETV6* | 3-8 | *NOTCH1* | 26, 27, 34 | *U2AF1* | 2, 7, 9 |
| *EZH2* | 3-21 | *NPM1* | 9, 11, 12 | *WT1* | 1-11 |
| *FLT3* | 14-20 | *NRAS* | 2, 3 | *ZRSR2* | 1-11 |
| *GATA1* | 2, 4 | *PHF6* | 2-10 | | |

# MIPSS: Molecular International Prognostic Score System

| MULTIVARIATE ANALYSIS | | | Weighted value |
|---|---|---|---|
| Variables | HR (95% CI) | P | |
| Age >60yrs | 3.8 (2.60-5.51) | <0.0001 | 1.5 |
| Hb <100g/L | 1.4 (1.01-1.99) | 0.04 | 0.5 |
| Constitutional Symptoms | 1.5 .(1.13-2.16) | 0.007 | 0.5 |
| PLT <200x$10^9$/L | 2.5 (1.77-3.42) | <0.0001 | 1.0 |
| Triple Negativity | 3.9 (2.20-6.80) | <0.0001 | 1.5 |
| JAK2/MPL mutation | 1.8 (1.11-2.90) | 0.016 | 0.5 |
| ASXL1 mutation | 1.4 (1.06-1.99) | 0.02 | 0.5 |
| SRSF2 mutation | 1.7 (1.08-2.58) | 0.02 | 0.5 |

Vannucchi et. al. ASH 2014

# MIPSS Permits to Refine Prognostic Stratification Within the IPSS Categories

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# NGS and Myeloid Mutations/ Other Prognosis

- >80% of PMF patients have a non JAK2/CALR/MPL mutation
- The greater the number the worse the prognosis
- ASXL1, CBL, RUNX1, SRSF2 have independent adverse prognostic impact
- With allo outcomes may improve with SRSF2, EZH2, IDH1 mutations
  - May not improve with ASXL1, U2AF1, IDH2, DNMT3A

Tefferi et. al. ASH 2015; Guggliemi et. al. ASH 2015, Kroger et. al. ASH 2015

# State of the Art MPNs - Concept 2

1. An accurate and serial assessment of MPN symptom burden is important
2. Risk, of thrombosis and mortality, is assessed by combination of clinical and molecular features (evolving)

# "State of the Art" Care of MPN Patients

- What is your patients disease burden?
- What is your patients risk?
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## Response Criteria for MPNs 2014 (All ≥ 12 Weeks)

ET/PV – ELN (Barosi et. al. *Blood 2013*)  MF – IWG-MRT (Tefferi et. al. *Blood 2013*)

| | Complete Remission | Partial Remission | Clinical Improvement | Other |
|---|---|---|---|---|
| ET | • Resolve ET Signs<br>• ≥ 10 pt. MPN10 ↓<br>• Near normal counts<br>• No Prog. or Vascular<br>• BM rem & ≤Gr 1 MF | • Resolve ET Signs<br>• ≥ 10 pt. MPN10 ↓<br>• Near normal counts<br>• No Prog. or Vascular | | Peripheral Blood Granulocytes<br>• CR – Eradicated mutation<br>• PR - ≥50% ↓, *≥ 20% baseline* |
| PV | • Resolve PV Signs<br>• ≥ 10 pt. MPN10 ↓<br>• Near normal counts<br>• No Prog. or Vascular<br>• BM rem & ≤Gr 1 MF | • Resolve PV Signs<br>• ≥ 10 pt. MPN10 ↓<br>• Near normal counts<br>• No Prog. or Vascular | | Peripheral Blood Granulocytes<br>• CR – Eradicated mutation<br>• PR - ≥50% ↓, *≥ 20% baseline* |
| MF | • Resolve MF Signs<br>• Resolve MF sympts<br>• Near normal counts<br>• BM rem & ≤Gr 1 MF | Like MF CR but<br>• Hb (between 85 and 100 g/L)<br>• PLT (between 50-100 x 10(9)/L) | • Anemia (2g/dl or T.I.)<br>• Spleen (Based on BL)<br>• Symptoms (≥ 50%↓) | • Molecular (ET/PV Criteria)<br>• Cytogenetic<br>• CR – Normal<br>• PR - ≥ 50%↓ |

N.B. ET/PV – Progression is MF/MDS/ or AML
MF – Progression based on spleen growth or AML

# Acute vs. Chronic Neoplasms

| ACUTE Neoplasm (AML, DLBCL, Some MF) | CHRONIC Neoplasm (ET, PV, Some MF) |
| --- | --- |
| • Life threatening in < 2 years<br>• Disease eradication most critical goal<br>• Significant toxicity acceptable to extend life<br>• Quality of life frequently a casualty of therapy | • Survival ranges from normal to diminished but at least 5 years<br>• Diminishment of disease morbidity a key goal<br>• QOL and acceptability of toxicity a key issue<br>• Cure a goal, but not at any price |

# "State of the Art" Care of MPN Patients

- What is your patients disease burden?
- What is your patients risk?
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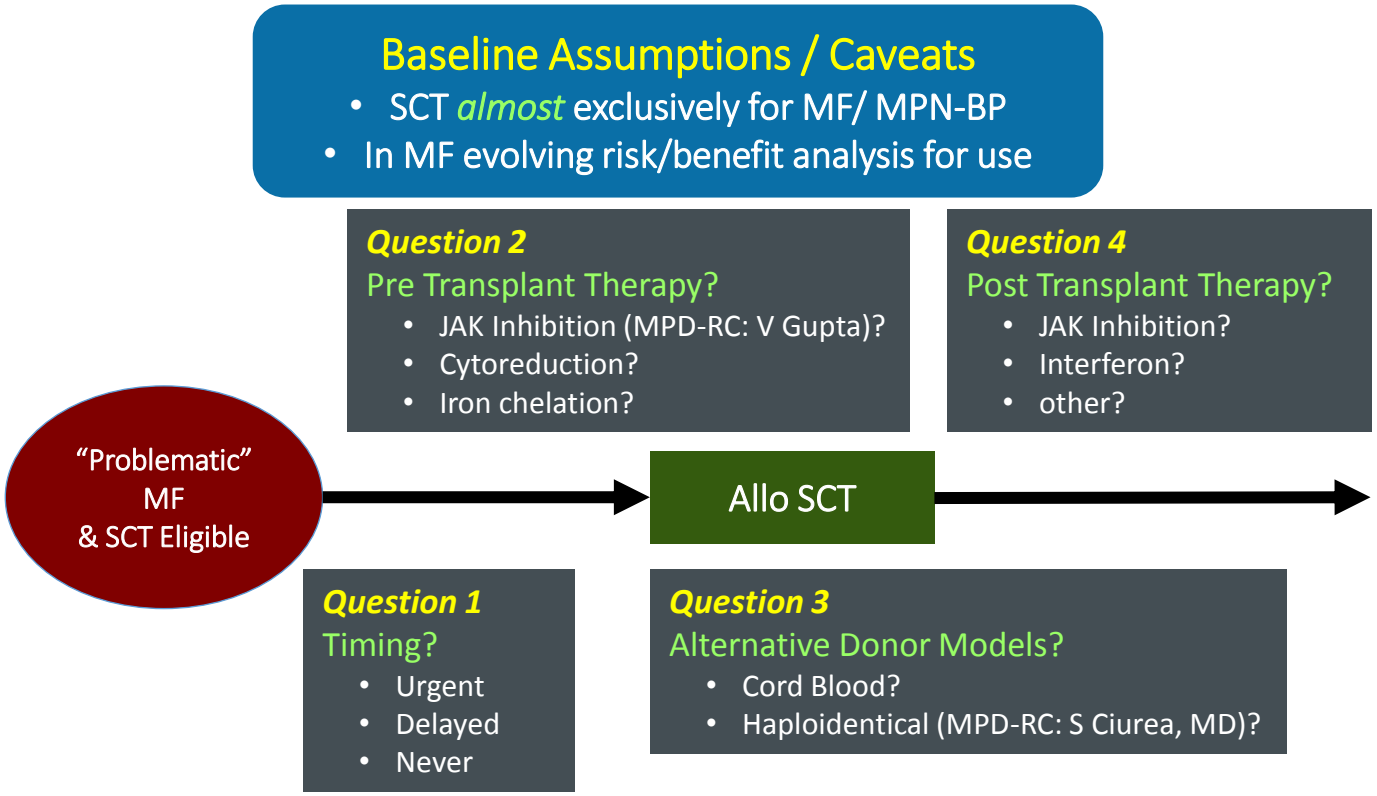
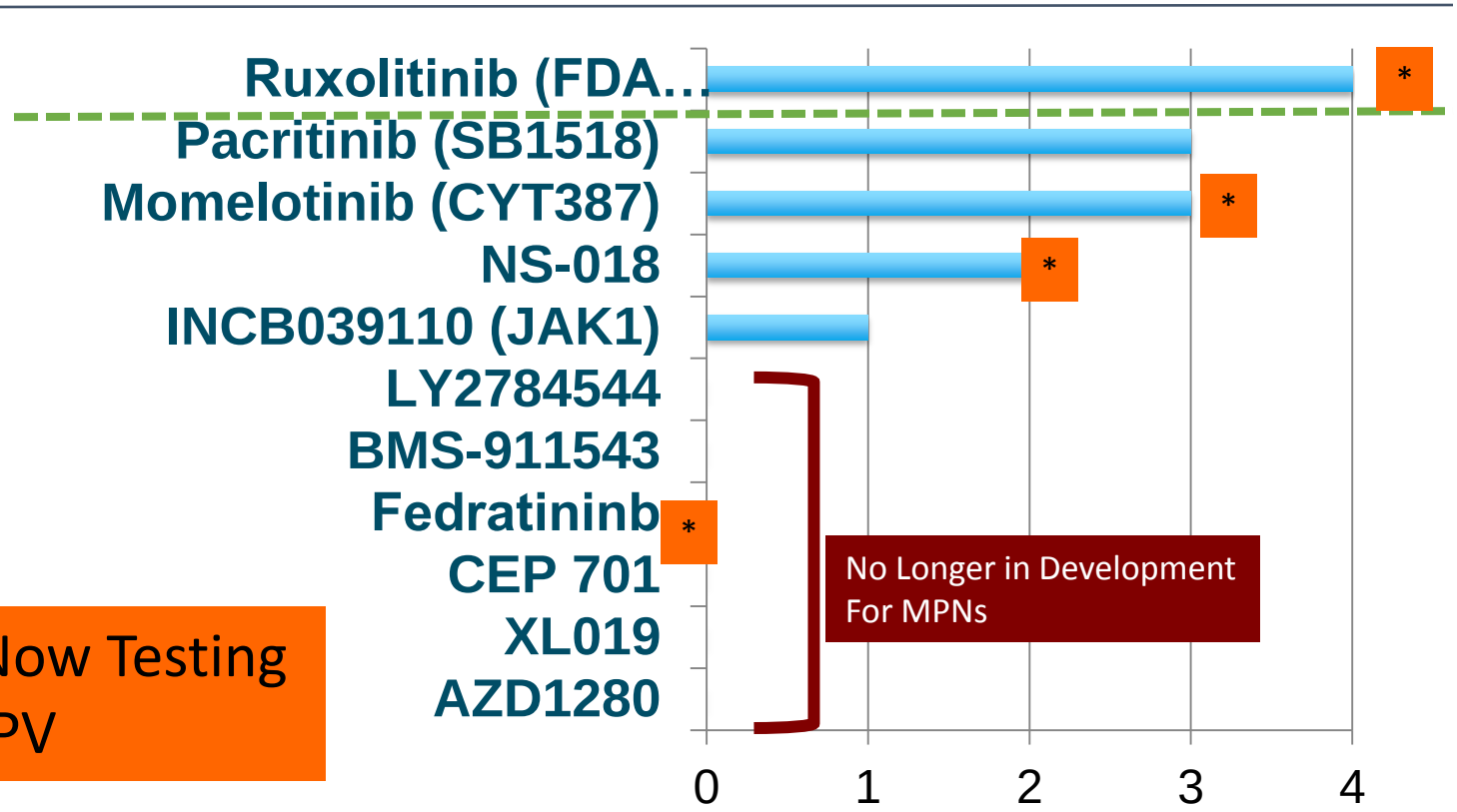
# Evolving Stem Cell Transplant Use in Myelofibrosis



# JAK Inhibitors and Status of Development

## *Myelofibrosis as lead indications*




* Now Testing in PV

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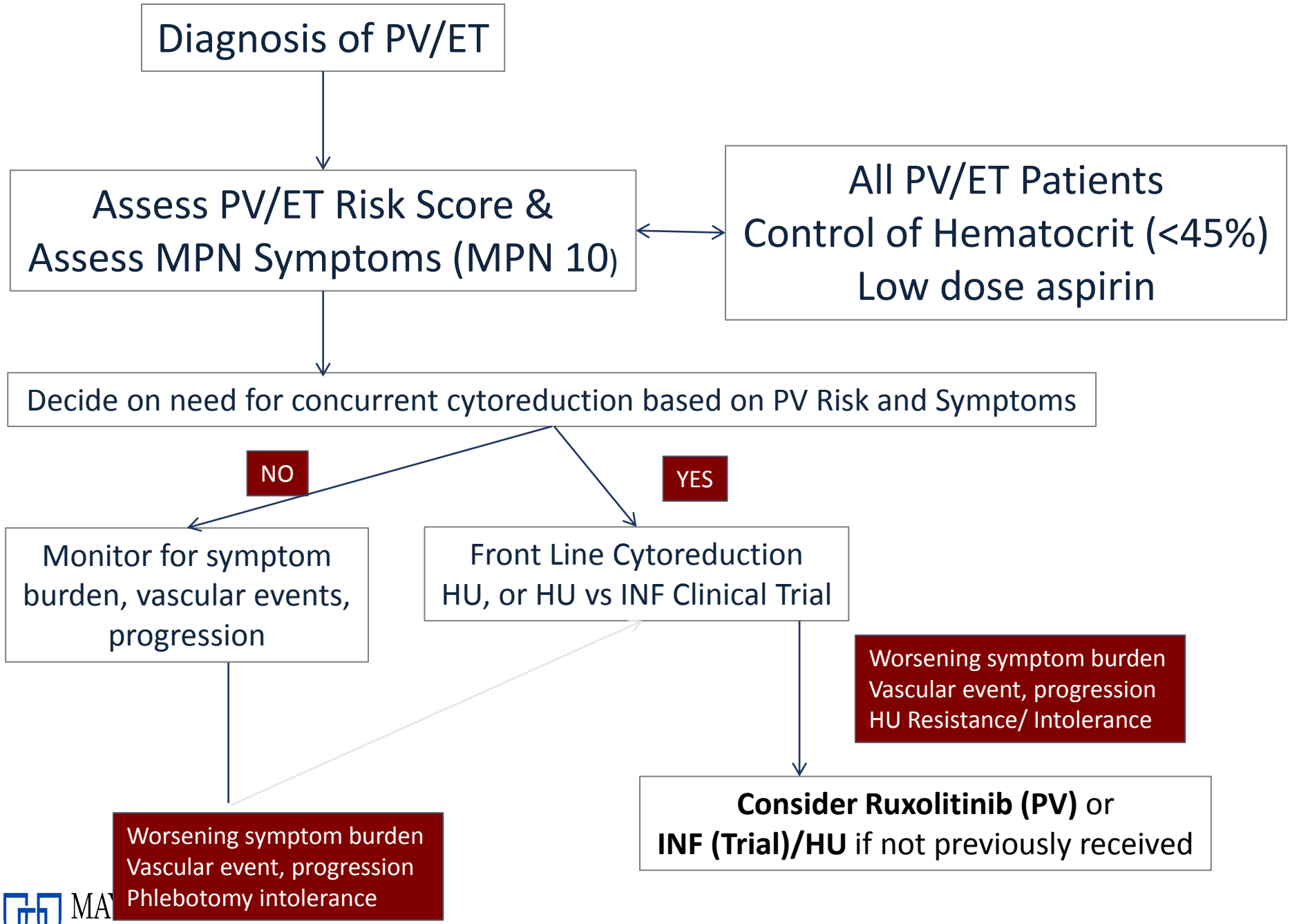


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# Proposed Algorithm of Therapy of MF in 2016

***N.B.***
Consider Rx for Prevention of Vascular Events in Appropriate Patients (Aspirin & Cytoreduction)

***Symptom Quartiles by MPN 10***
***Q1:TSS <8*** ***Q3:TSS 18-31***
***Q2:TSS 8-17*** ***Q4:TSS ≥32***

Diagnosis of MPN-MF (Primary, Post ET or Post PV Myelofibrosis)

Calculate DIPSS MF Score & Assess MPN Symptoms (MPN 10)

***JAK2 Inhibitors***
- Ruxolitinib (Jakifi/Jakivi)

(Approved for MF)
- Clinical Trial JAK2 Inhib

**Anemia Rx**
- Clinical Trials
- IMID/ Androgens/ EPO
- Splenectomy

Low Risk
Med S = 185m
***Symptom Q1-Q2***

Observation Vs. INF (Trial)

Low Risk
Med S <185m
***Symptom Q3-Q4***

Possible Role Of JAK2 Inhib (Trial) or INF (Trial)

Intermediate to High Risk
Med S = 16m (H), 35m (Int 2), 78 (Int 1)
*Assess role and timing of ALLO SCT (Donor, Risk, Candidate)*
*ALLO – Urgent, Delayed, Never*

Urgent ALLO

Proceed to ALLO (Possible JAK2 Inhib Prior) (Trial)

Delayed/Never ALLO

JAK2 Inhibitor*
*Unless anemia/ cytopenias main problem

JAK2 Single Agent Failure Refractory Cytopenias

Clinical Trials
- Ruxo Combination
- Non Ruxo JAK2
- New Targets

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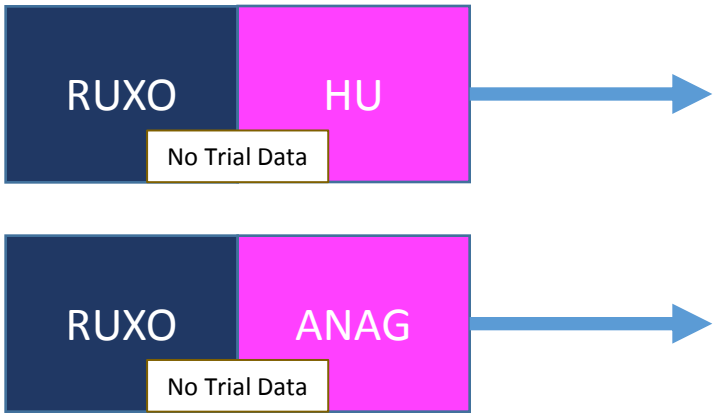
# JAKi Combinations: ET/PV/MF - Cytoreductive




OFF Label: Can be tolerated
For reduction of problematic leukocytosis or thrombocytosis

OFF Label: Can be tolerated
For reduction of problematic thrombocytosis

# JAKi and AML Therapy

- Ruxolitinib has some activity as single agent in MF to AML, and can still alleviate splenomegaly and symptoms
- Cessation of ruxolitinib, completely, for HMA or induction has not been ideal
- Cautious, off label, combinations-sequential can be considered and has been done successfully (watch the antifungals)

# State of the Art MPNs - Concept 3

1. An accurate and serial assessment of MPN symptom burden is important
2. Risk, of thrombosis and mortality, is assessed by combination of clinical and molecular features (evolving)
3. Stem Cell Transplant (MF), Ruxolitinib (MF/PV), INF (MPN), and Cytoreductives (HU/ANAG) all can be woven together in evolving and individualized care plans

# MPN "Fatigue" Project 2014

Scherber *Cancer* in Press

## *Collaborative Internet Based Trial with MPN Forum*

ANY MPN Patient
- Survey online
- MPN Forum
- MPN Advocacy
- MPN Research Foundation
- CMPD Ed Foundation

Register/ Online Consent

**Online 70 Item Survey**
- Demographics
- MPN History
- MPN-SAF (MPN10)
- Brief fatigue inventory (BFI)
- Profile of mood states (POMS-Short)
- Patient Health Questionnaire (PHQ-2)
- Mental Health Inventory (MHI-5)

### Patients

1788 MPN patients/ 1676 Eval.

ET 33%, PV 39%, MF 25%

68% Female, median age 59. MPN10 Score average 28.4 (range 0-83)

### Psych Comorbidity

23% high likelihood of depression (≥ 3 on PHQ-2)

Prior diagnosis depression (32%), anxiety (29%), stress (26%), grief (15%)

22% on therapy for mood disorder in last 6 months

### MPN Correlation

Higher BFI, MPN-SAF, MPN10 scores all correlated with increased depressive symptoms ($p<0.0001$)

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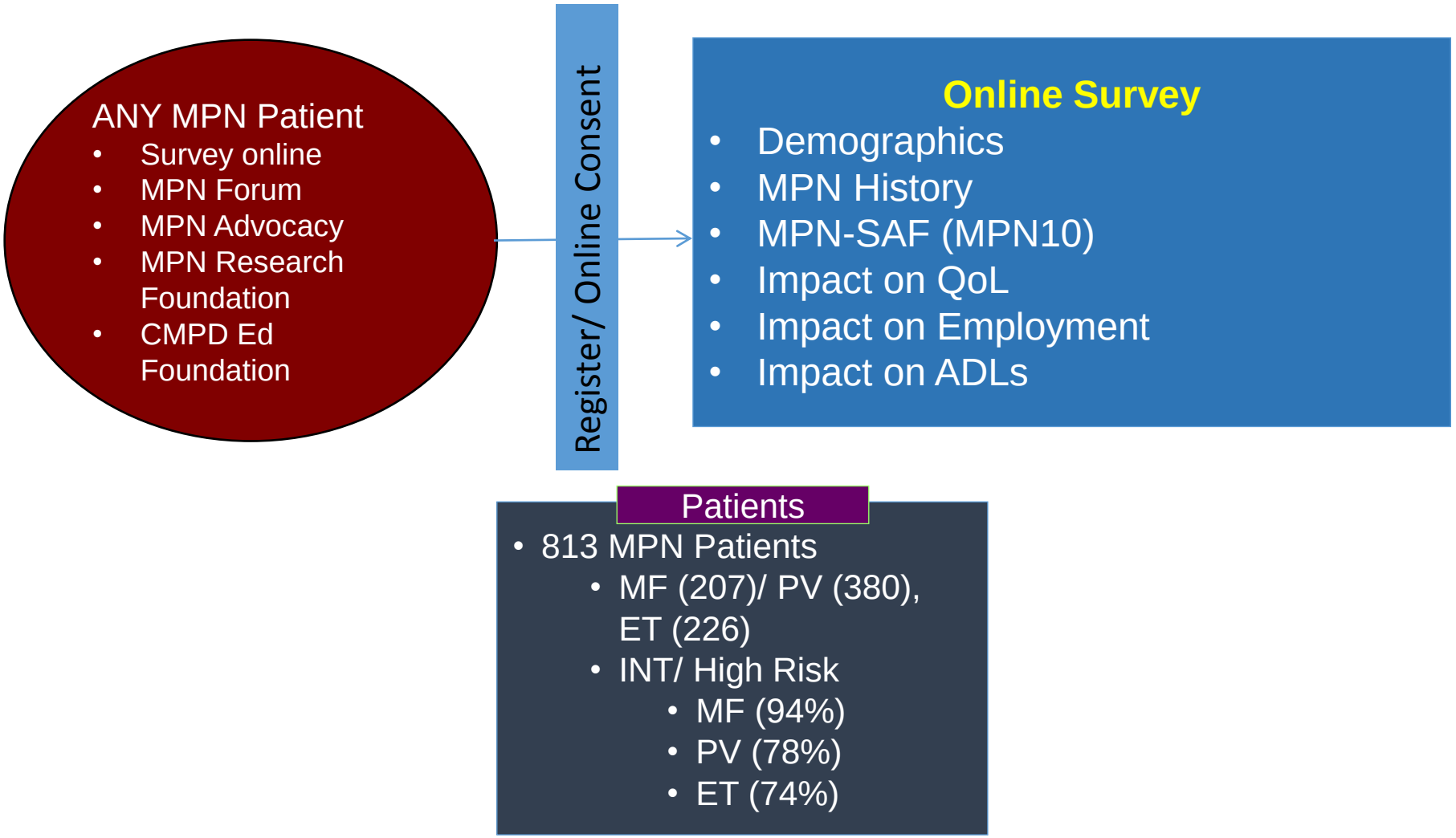
# MPN Patient Burden- Disease Impact

## *2014 Landmark Study*

Mesa et. al. BMC Cancer 2016;16:167

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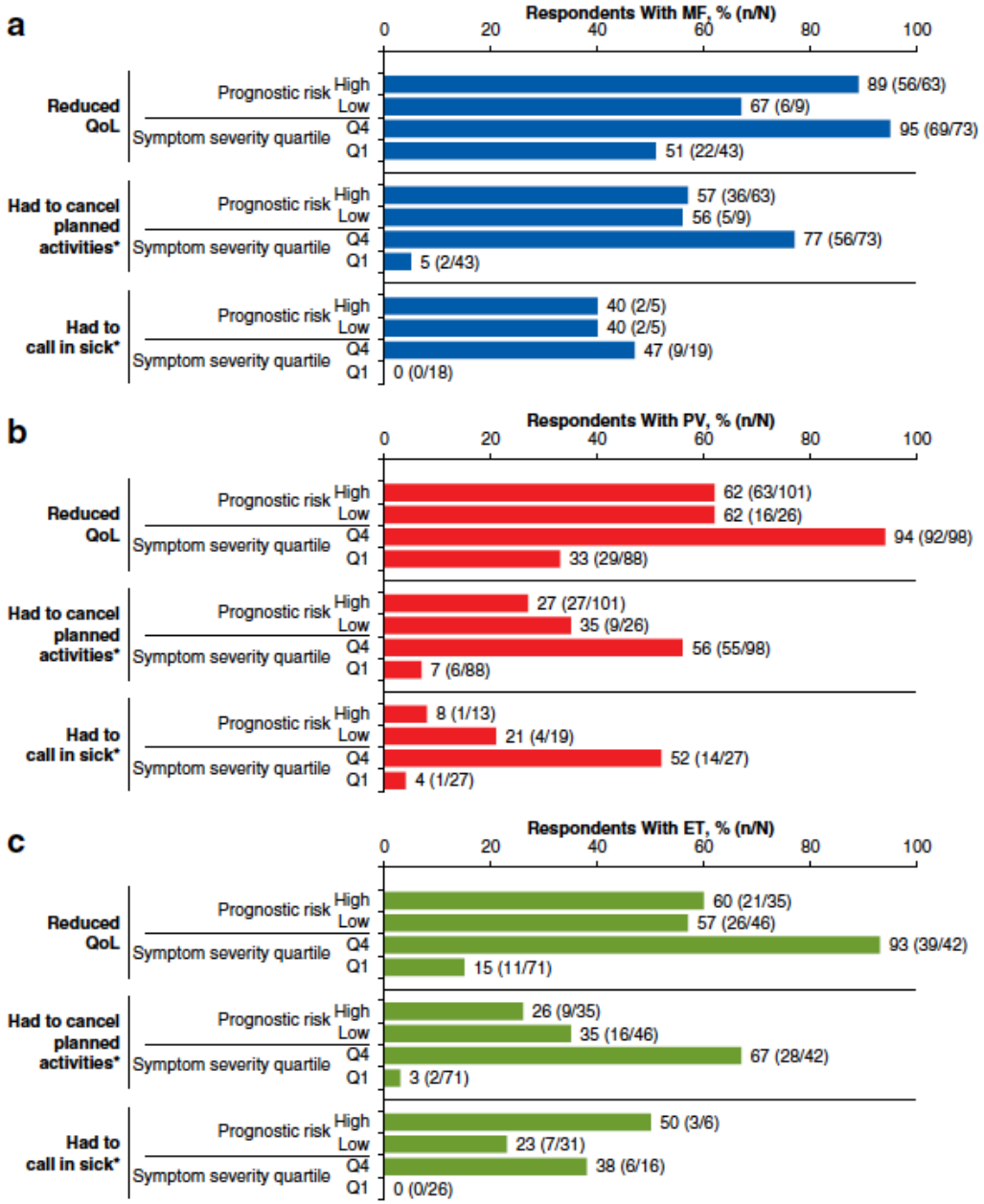



**Fig. 1** Impact of MPNs on QoL, work, and activities of daily living. MPN impact was stratified by calculated prognostic risk score and symptom severity quartile in respondents with (**a**) MF, (**b**) PV, and (**c**) ET. ET = essential thrombocythemia; MF = myelofibrosis; MPN = myeloproliferative neoplasm; PV = polycythemia vera; Q1 = quartile 1; Q4 = quartile 4; QoL = quality of life. * ≥ 1 day in the preceding 30 days

Mesa et. al. BMC Cancer 2016;16:167

# Symptoms ever experience by MF patients vs most heard by physicians

**PATIENT**

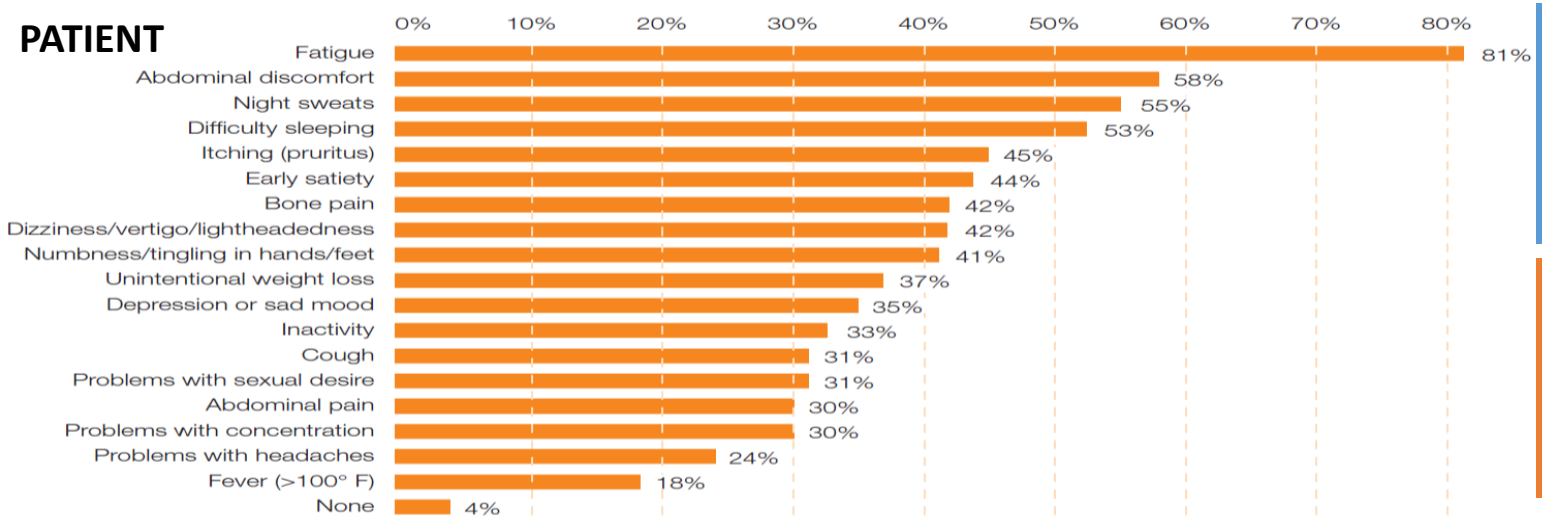



Figure 1. Question 8: Have you ever had any of the following symptoms? (n = 207)

ET Patients Top 5 symptoms:
- Fatigue (71%)
- Bruising (52%)
- Numbness/tingling in hands and feed (50%)
- Difficulty sleeping (49%)
- Dizziness/vertigo (49%)

PV PatientsTop 5 symptoms:
- Fatigue (74%)
- Itching (57%)
- Difficulty sleeping (55%)
- Day/night sweats (48%)
- Dizziness/vertigo (45%)

**PHYSICIAN**

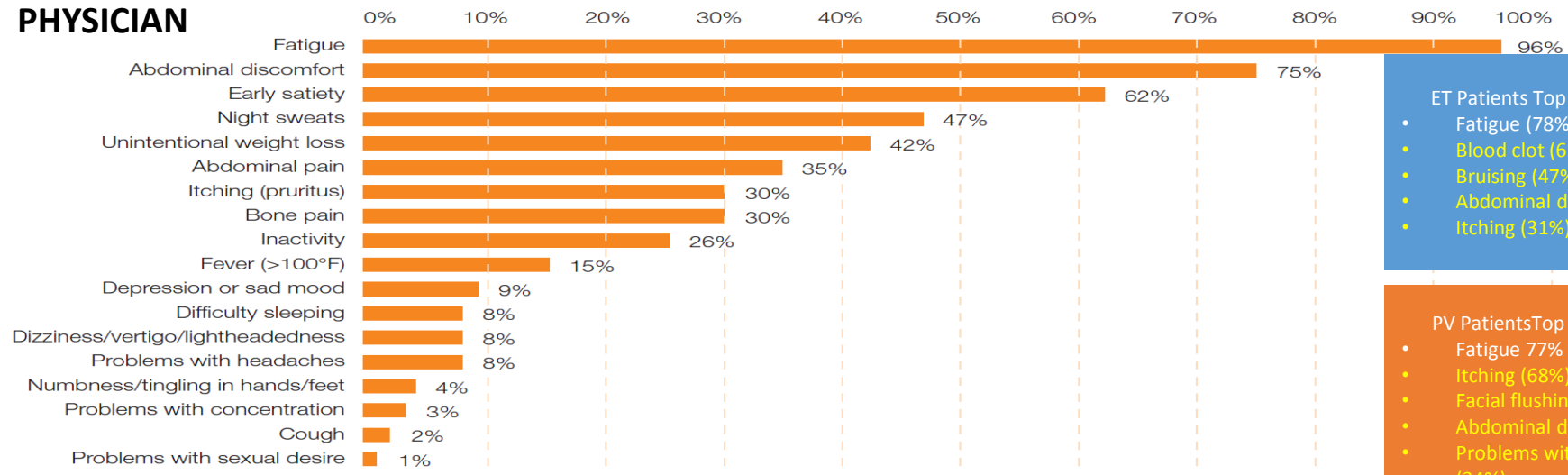
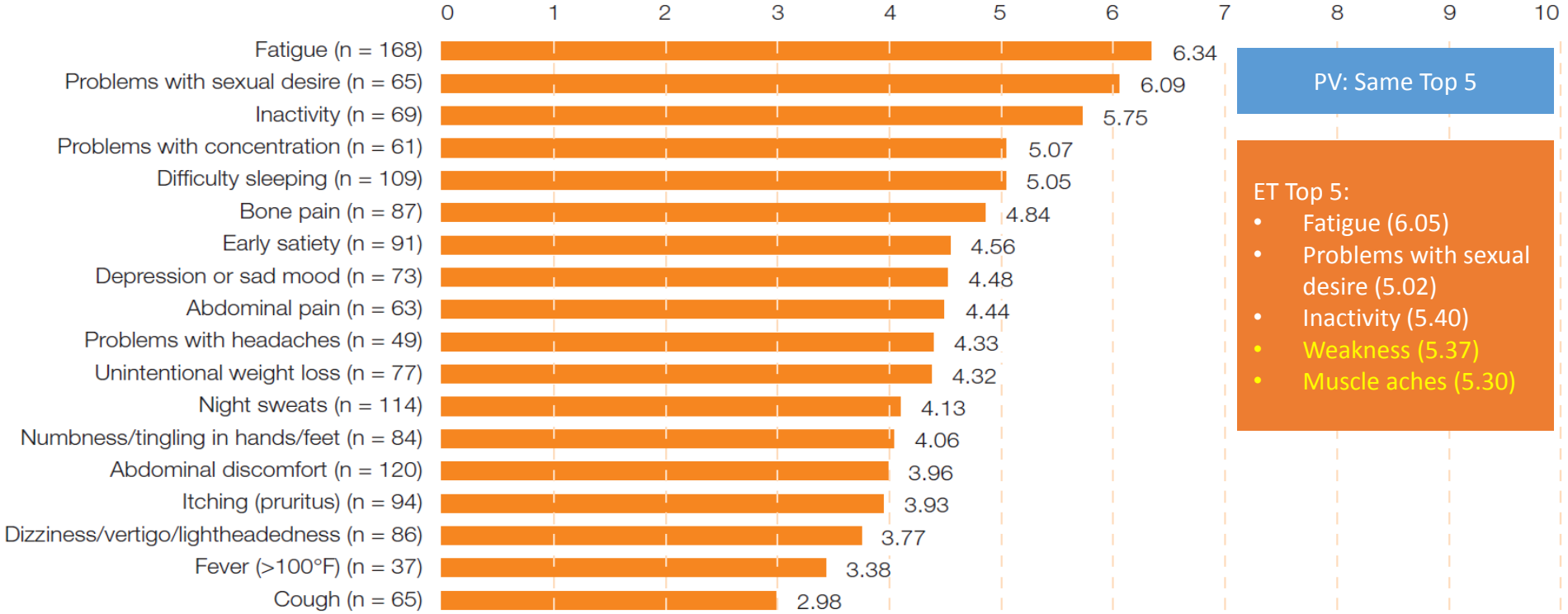



Figure 50. Question 15: What are the five symptoms of MF you most often hear about from your patients? (n = 156)

ET Patients Top 5 symptoms:
- Fatigue (78%)
- Blood clot (61%)
- Bruising (47%)
- Abdominal discomfort (31%)
- Itching (31%)

PV PatientsTop 5 symptoms:
- Fatigue 77%
- Itching (68%)
- Facial flushing (44%)
- Abdominal discomfort (36%)
- Problems with headaches (34%)

# MF Patient-reported MPN-SAF mean severity score




PV: Same Top 5

ET Top 5:

- Fatigue (6.05)
- Problems with sexual desire (5.02)
- Inactivity (5.40)
- Weakness (5.37)
- Muscle aches (5.30)

**Figure 2. Question 13a-dd: How severe is [symptom]?**

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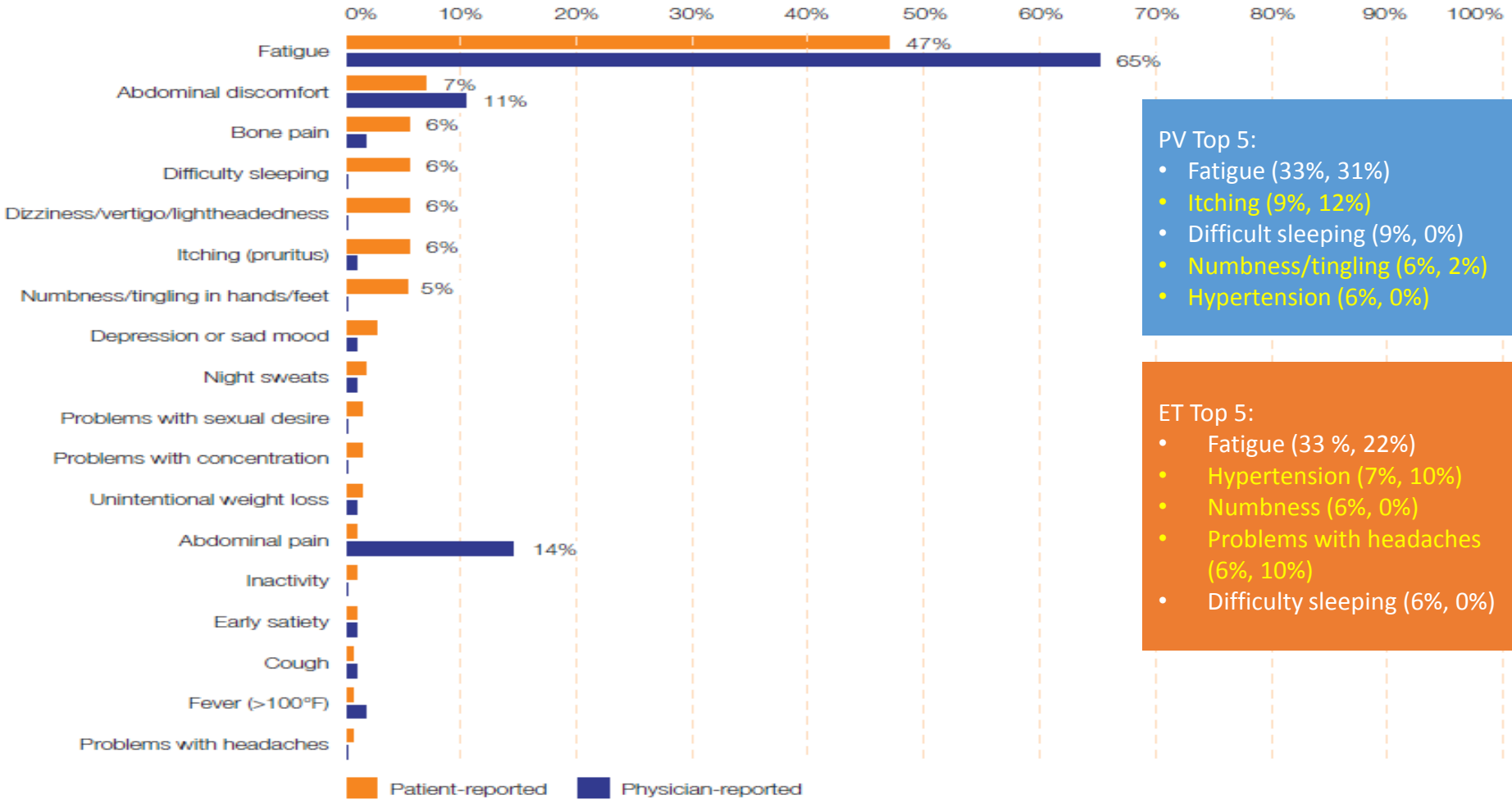
# MF Patient-reported first symptom they would like to resolve vs physician-reported perception

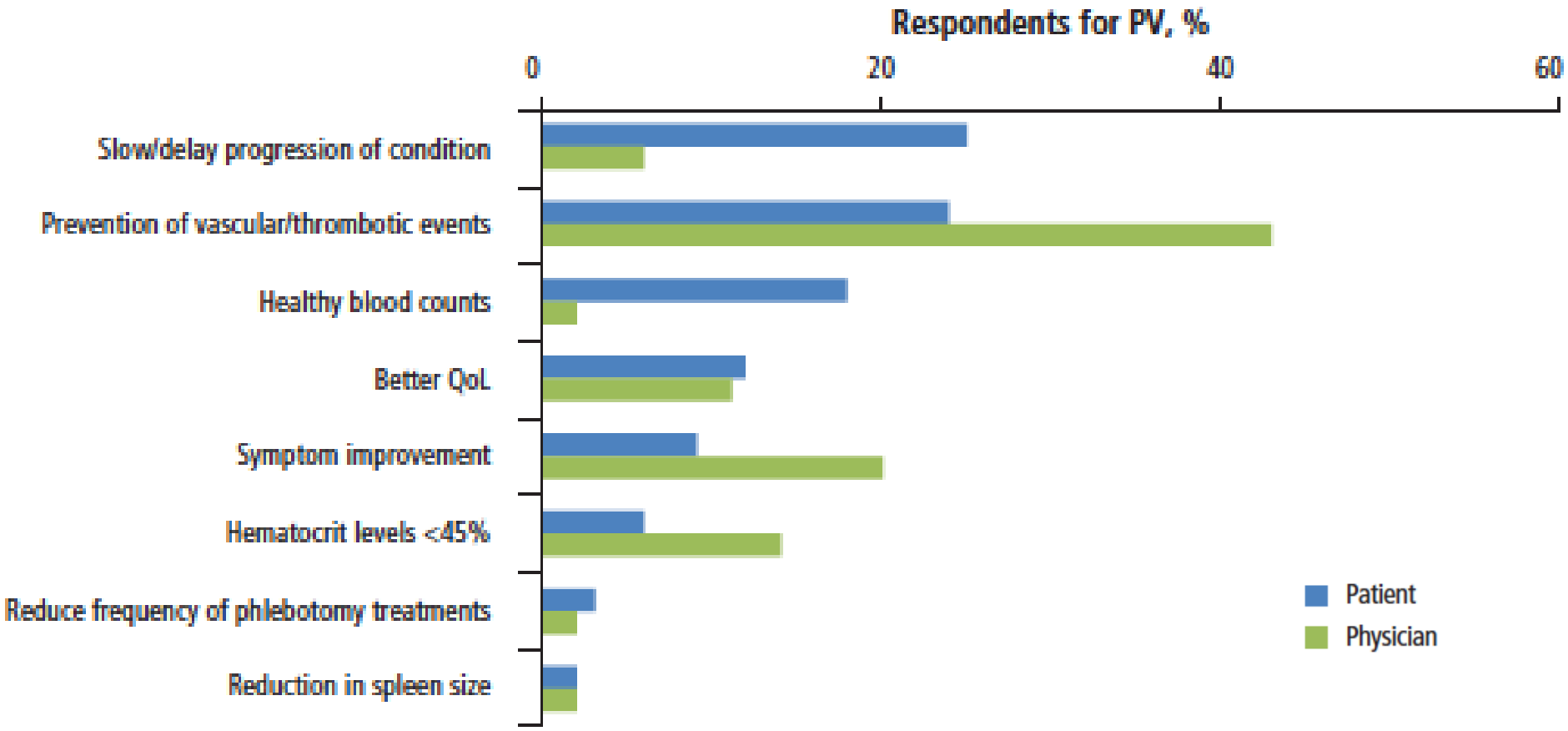



PV Top 5:
- Fatigue (33%, 31%)
- Itching (9%, 12%)
- Difficult sleeping (9%, 0%)
- Numbness/tingling (6%, 2%)
- Hypertension (6%, 0%)

ET Top 5:
- Fatigue (33 %, 22%)
- Hypertension (7%, 10%)
- Numbness (6%, 0%)
- Problems with headaches (6%, 10%)
- Difficulty sleeping (6%, 0%)

**Figure 52. Question 14: Of the symptoms that you are currently experiencing, which one would you most like to resolve? (n = 199)**
**Question 17: Out of all the symptoms patients experience, which single symptom do you perceive they would most want to resolve? (n = 156)**
Note: Labels for data under 5% are not displayed.

# LANDMARK Study in PV
# Goals (Patients (N=382) & Physicians)




Mesa et. al.
BMC Cancer
2016;16:167

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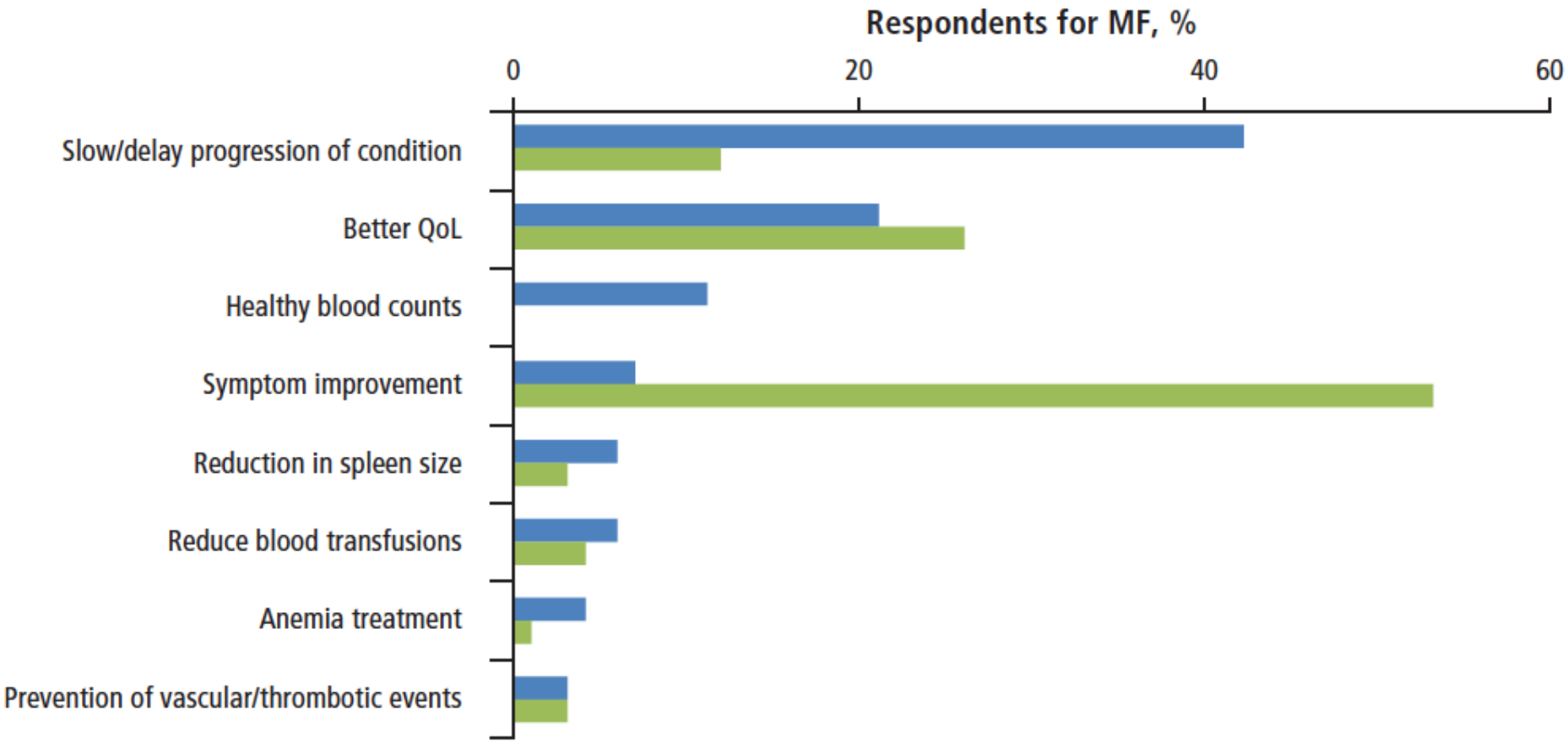
# LANDMARK Study in MF
# Goals (Patients (N=207) & Physicians)




Mesa et. al.
BMC Cancer
2016;16:167

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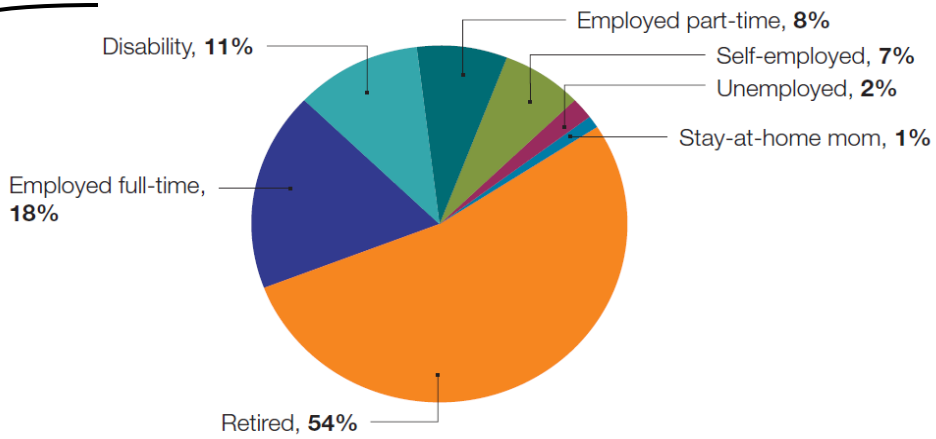
# Employment status and MF's impact

**Respondents employment status**




## Impact on Employment Status as a Result of MF

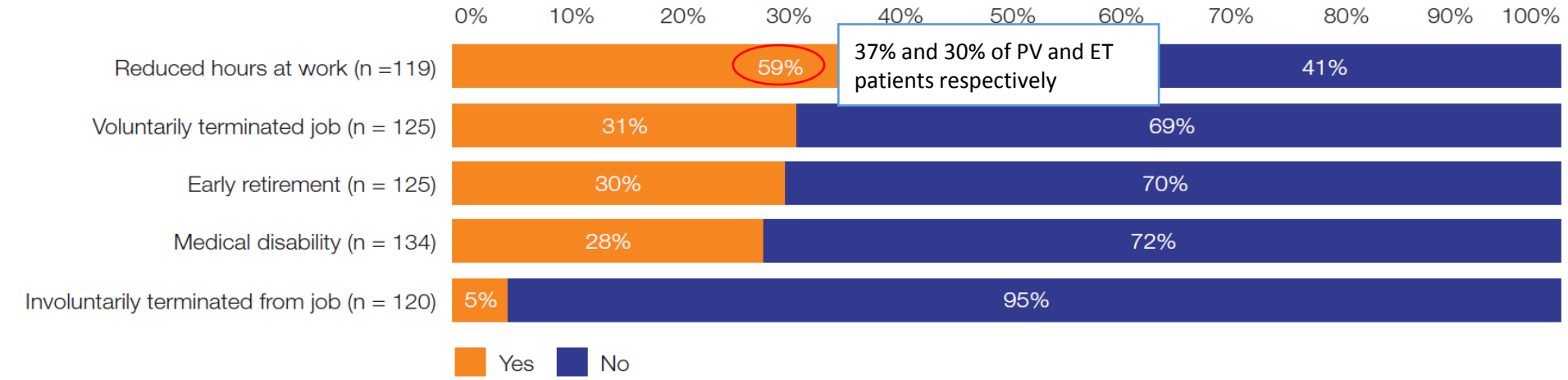



**Figure 10. Q21a-e: As a result of your diagnosis have you ever…?***

*Note: Data excludes "Not applicable" responses. Individual values are rounded and may not total 100%.

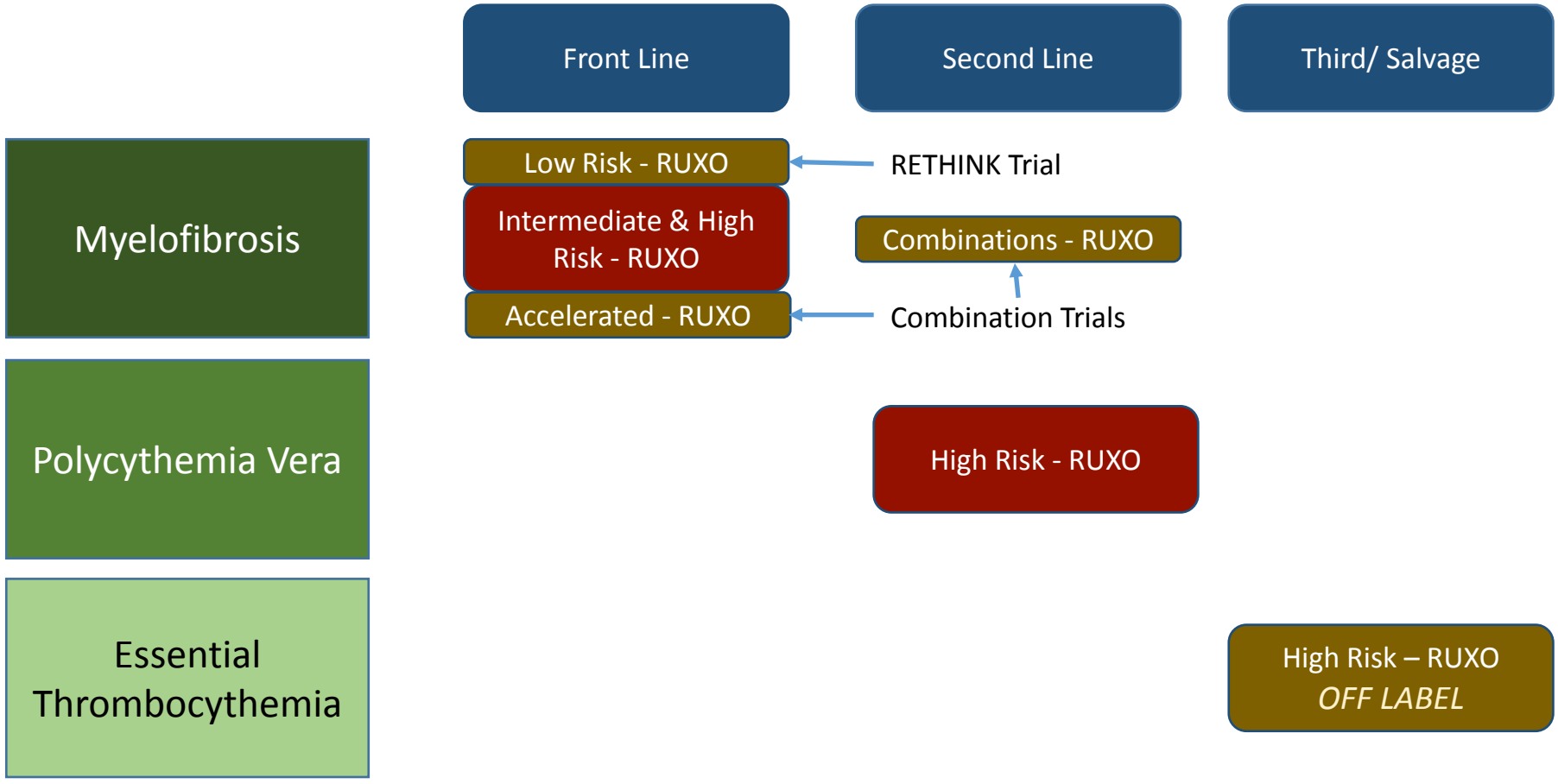
# State of the Art MPNs - Concept 4

1. An accurate and serial assessment of MPN symptom burden is important
2. Risk, of thrombosis and mortality, is assessed by combination of clinical and molecular features (evolving)
3. Stem Cell Transplant (MF), Ruxolitinib (MF/PV), INF (MPN), and Cytoreductives (HU/ANAG) all can be woven together in evolving and individualized care plans
4. Decreasing risk of progression is a major concern of patients, and surrogate markers for risk of progression an unmet scientific need

# "State of the Art" Care of MPN Patients

- What is your patients disease burden?
- What is your patients risk?
- What are your treatment goals?
- What are the unmet needs "new drugs" in hematology need to address?
- Who is a clinical trial patient in MPNs in 2016 vs. standard therapy?
- Future directions

# Footprint of Ruxolitinib in MPNs – Q2 2016

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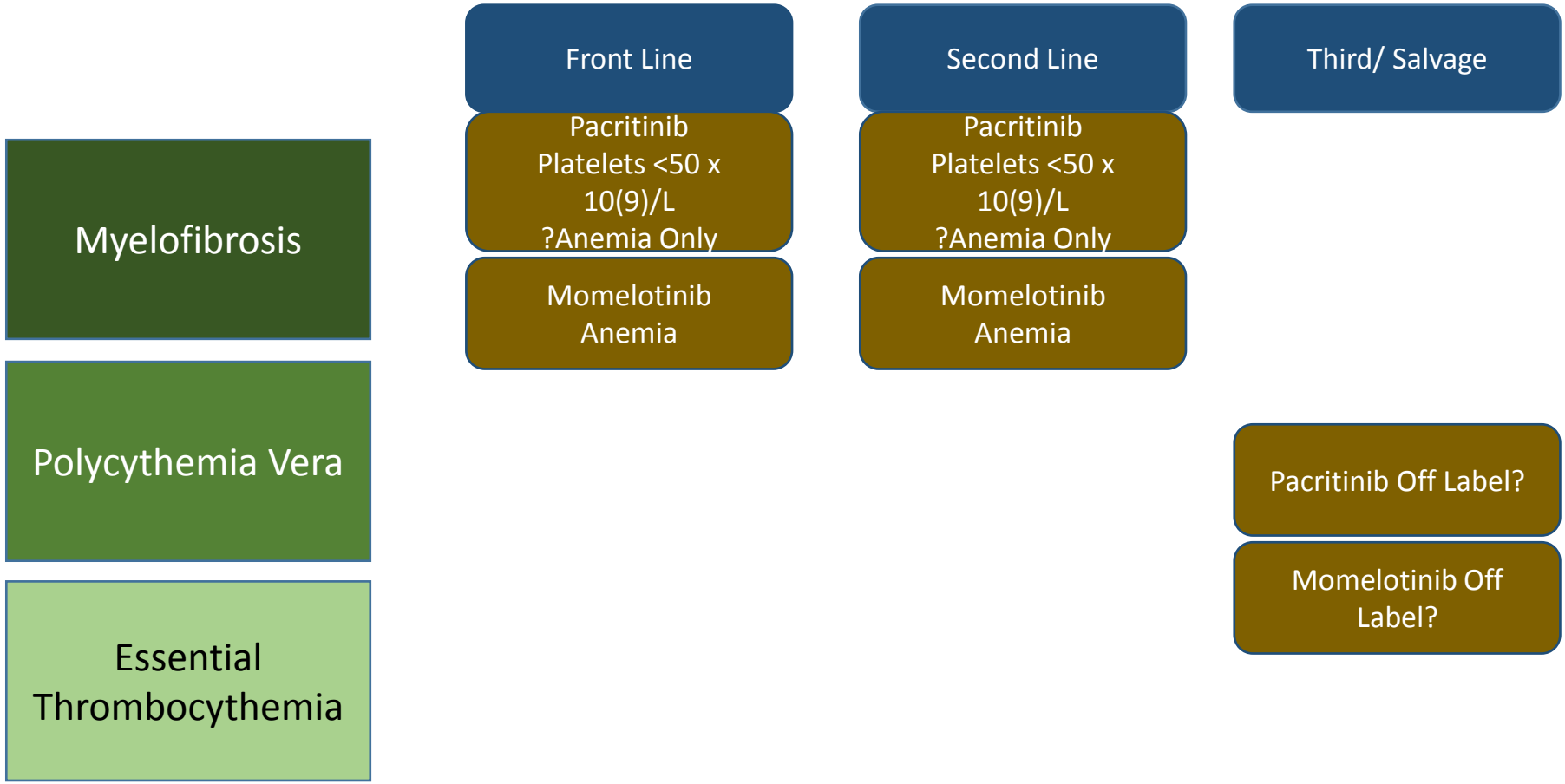
# New JAK Inhibitors – Possible Positioning

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# Who is a clinical trial patient for ET?

## What do we do well in ET?

- Prevention of vascular events
- Front line with HU
- Second line with ANAG, perhaps INF?

## What is the unmet need in ET?

- Better symptom control in symptomatic patients
- Third line therapy
- Clear prevention of progression to MF or AML

# Who is a clinical trial patient for PV?

## What do we do well in PV?

- Prevention of vascular events
- Front line with HU, perhaps INF
- Second line with Ruxolitinib

## What is the unmet need in PV?

- Better symptom control in non JAKi patients
- Optimal management in SVT
- Third line therapy
- Clear prevention of progression to MF or AML

# Who is a clinical trial patient for MF?

## What do we do well in MF?

- Reduction of splenomegaly and symptoms with JAKi
- Some impact on survival
- Allo Transplant in good risk candidates

## What is the unmet need in MF?

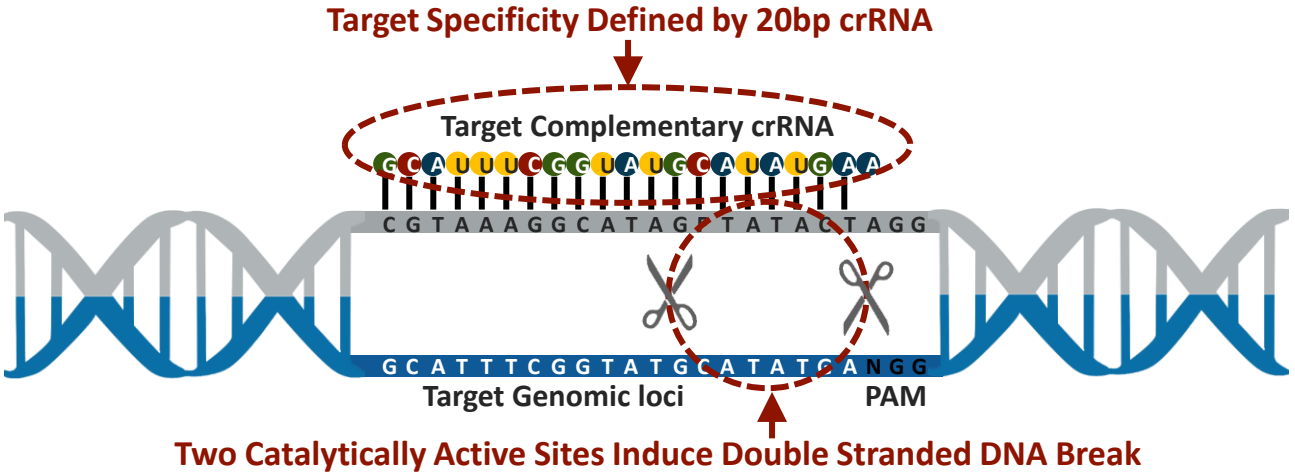
- Prevention of progression in lower risk patients
- Therapy for significant cytopenias
- Post ruxolitinib options
- Allo transplant in higher risk candidates
- Any MF patient with accelerated or blast phase disease

# "State of the Art" Care of MPN Patients

- What is your patients disease burden?
- What is your patients risk?
- What are your treatment goals?
- What are the unmet needs "new drugs" in hematology need to address?
- Who is a clinical trial patient in MPNs in 2016 vs. standard therapy?
- Future directions

# CRISPR: Gene Therapy Finally Coming to MPNs?

- Clustered Regularly Interspaced Short Palindromic Repeat
  - Bacterial immune response system leveraged for genome editing
  - Cas9 DNA nuclease
  - GuideRNA = CrisprRNA (crRNA) + tracrRNA




MPN forum Magazine. CRISPR/Cas9: Gene Editing with Precision. www.mpnforum.com/cascade

# M3 Trial: Myeloproliferative Neoplasm Meditative Movement Trial

## Background:

- Fatigue is major unmet need in MPNs, reduced by JAK inhibition but rarely eradicated
- Meditative movement (including yoga) well known to aid fatigue in chronic diseases

## Trial:

- Feasibility trial of an MPN specific, gentle, Yoga program (in collaboration Udaya yoga) over 12-week period done at home with computer modules
- 50 MPN patients (online screening and consent)
- Serial assessments of MPN symptoms and QoL
- Activity assessment by activity tracker (FitBit) – provided

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**M3 Team: Mayo Clinic: R. Mesa and K. Gowin**
**Arizona State University: Jennifer Huberty PhD**

ASU ARIZONA STATE UNIVERSITY

# State of the Art MPNs - Concept 5

1. An accurate and serial assessment of MPN symptom burden is important
2. Risk, of thrombosis and mortality, is assessed by combination of clinical and molecular features (evolving)
3. Stem Cell Transplant (MF), Ruxolitinib (MF/PV), INF (MPN), and Cytoreductives (HU/ANAG) all can be woven together in evolving and individualized care plans
4. Decreasing risk of progression is a major concern of patients, and surrogate markers for risk of progression an unmet scientific need
5. MPN therapy pipeline robust with key unmet needs avoiding progressive disease, improving cytopenias, deeper and more durable responses







# Myeloproliferative Neoplasms

## Multi-Disciplinary Team
## Mayo Clinic, Arizona, USA

- MPN Burden/ Symptom/QOL Assessment
- Improving Transplant Outcomes
- New MPN Drug/ Genetic Therapies
- Physical Activity/ Behavioral Therapies