



# Using Standard Cancer Risk Scores in Daily Workflows

**Caroline Peterson, D.O. FACOOG**  
Director, Cancer Screening  
and Prevention for Kettering Health Network

**Tammy Archambault & Deanne Rose**  
Kettering Breast Evaluation Center Supervisors

*Cancer Risk Assessment for  
Personalized Screening and  
Prevention of Cancer*

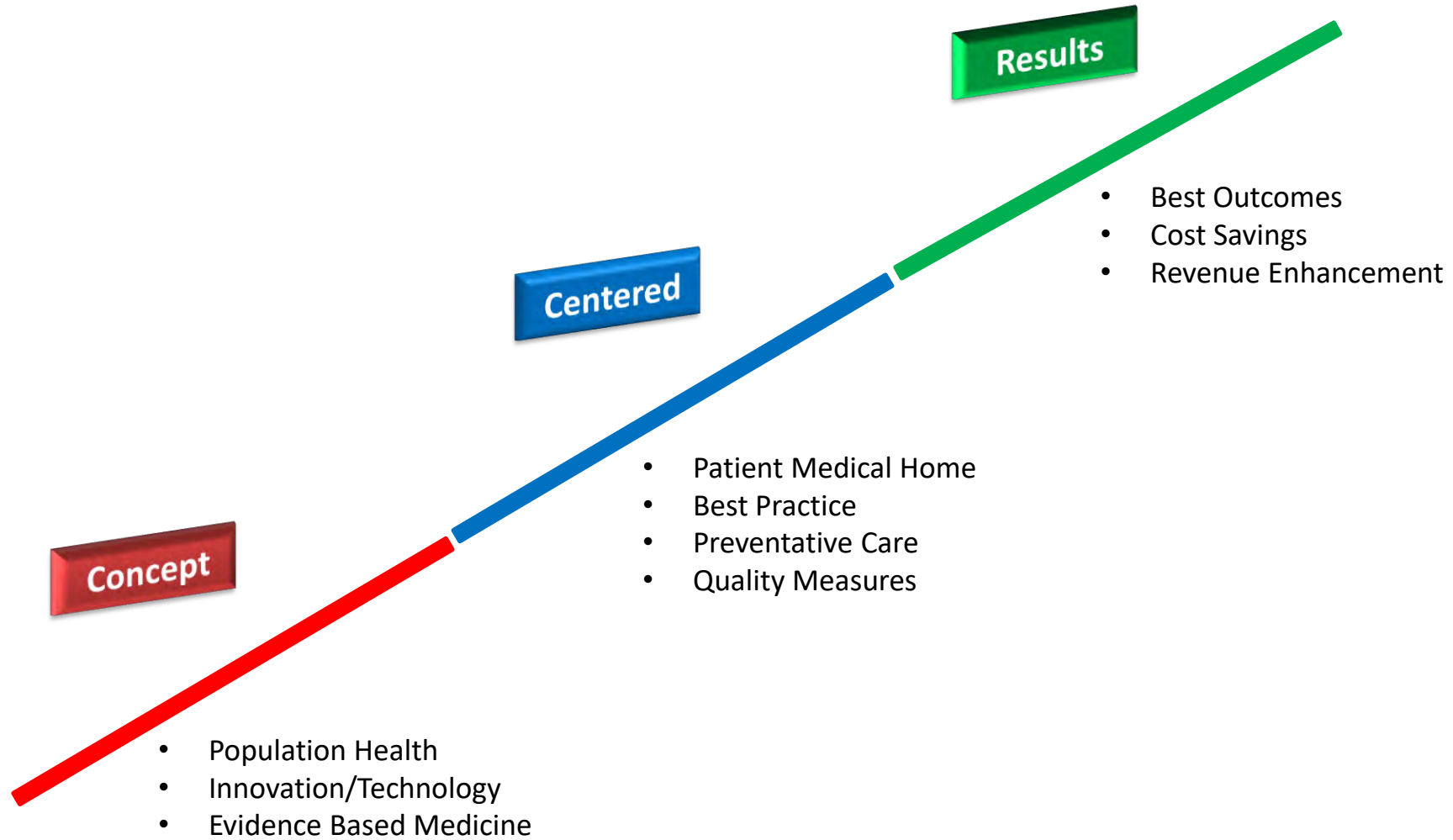


# **Kettering Health Network Cancer Prevention Program**

## **Program Goals (Mission Statement)**

**The Cancer Prevention Program is a population health initiative to determine which Patients and their Family Members, in our Network and in our communities are at risk for Hereditary and Familial Cancers. The program encompasses Risk Assessment, Genetic Counseling and Testing, an Increased Surveillance Program, Prophylactic Surgery, Risk Reducing Medication and Information on Lifestyle Changes.**

# Innovation and Collaboration



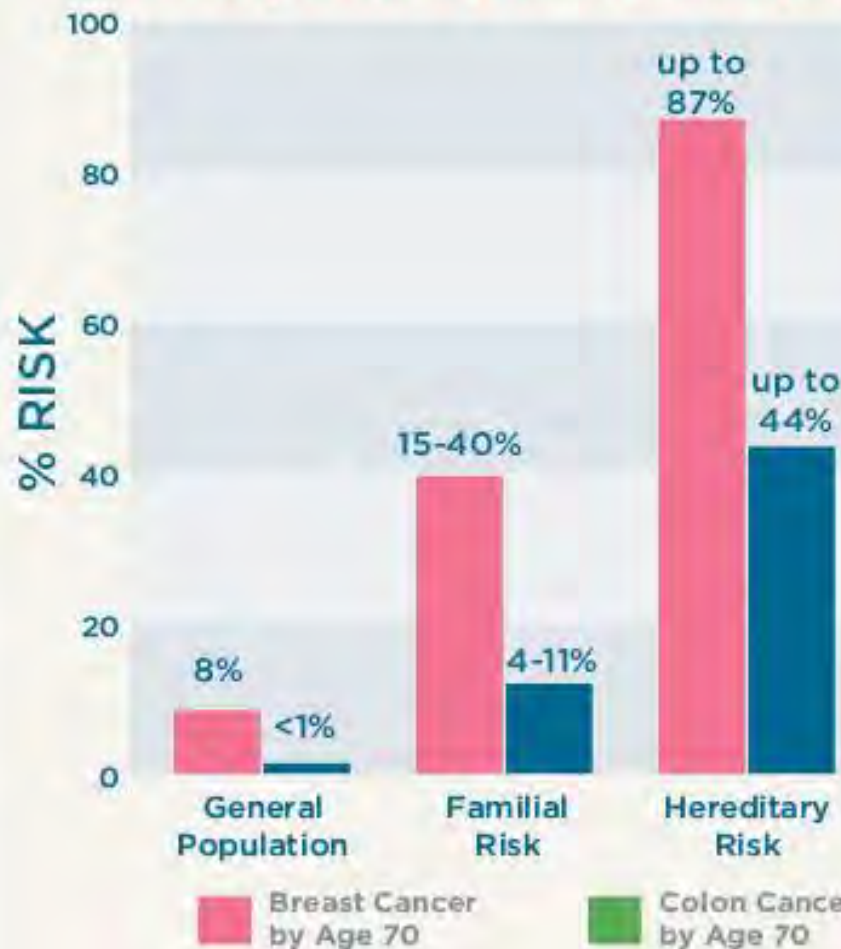


# Incorporating Hereditary Cancer Risk Assessment Into Your Practice



# Hereditary Cancer Syndromes

## Hereditary Breast & Ovarian Cancer (HBOC)



## Lynch Syndrome

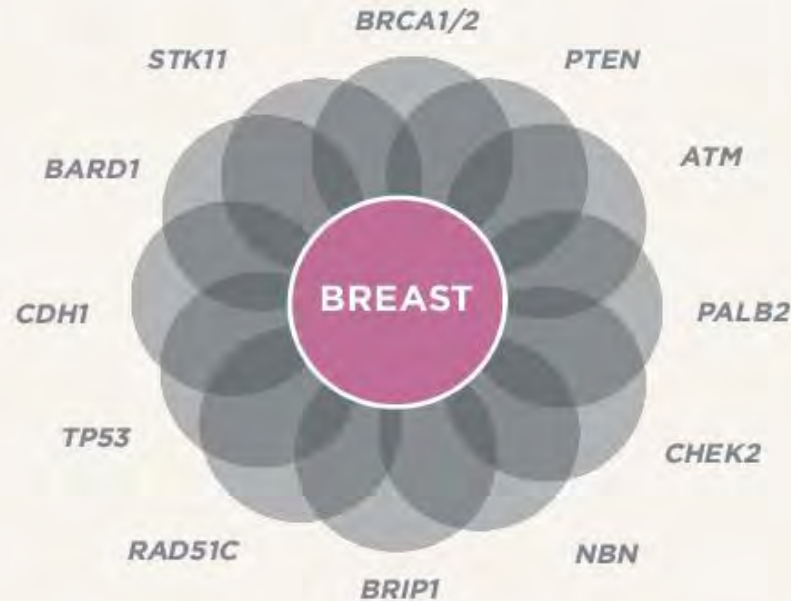


HBOC REFERENCES: 1. Domchek SM, et al. Br J Cancer. 2010;102(1):1409-14. 2. Ford D, et al. Lancet. 1994;343:692-5. 3. Struwing JR, et al. NEJM. 1997;336:1401-8. 4. Antoniou A, et al. AJHG. 2005;72:1117-30. 5. The Breast Cancer Linkage Consortium. JNCI. 1999;91:1370-6. 6. Easton DF, et al. AJHG. 1995;56:265-71. 7. King MC, et al. Science. Oct 24 2003;303:643-6. 8. Narod SA, Offit K. JCO. 2005; Mar 10;23(8):1656-63. 9. DevCan: Probability of Developing or Dying of Cancer Software, Version 6.0. Statistical Research and Applications Branch, National Cancer Institute, 2005. <http://srab.cancer.gov/devcan>. Accessed Jan 2010. 10. Metcalfe KA, et al. Br J Cancer. 2009; Jan 27;100(2):421-5. Epub 2008 Dec 16. 11. Kauf ND, et al. JNCI. 2005;97(18):1382-4. 12. Pharoah Paul PD and Ponder BA. Best Practice & Research Clinical Obstetrics and Gynecology. Vol 16, No.4. 449- 68. 2002. 13. Sutcliffe, et al. Int J Cancer. 2000; Jul 1;(87):1100-7. 14. Whittemore AS, et al. AJHG. 1997;60:495-504. 15. Ford D, et al. AJHG. 1998;62:676-89.

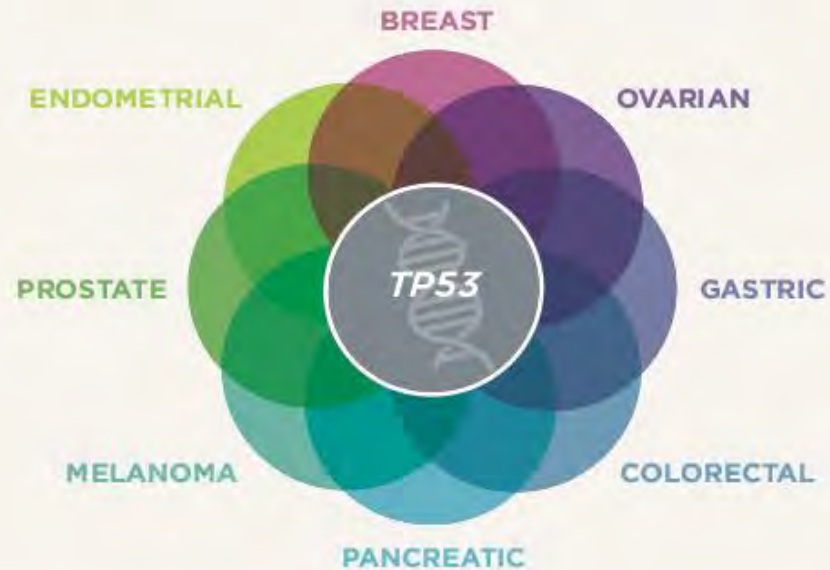
LYNCH REFERENCES: 1. Vasen HFA, et al. Gastroenterology. 1996;110:1020-7. 2. Aarlio M, et al. Int J Cancer. 1999;81:214-8. 3. Vasen HF, et al. J Clin Oncol. 2001; Oct 15;19(20):4074-80. 4. Hampel H, et al. Gastroenterology. 2005; Aug 128(2):415-21. 5. Handley YM, et al. Gastroenterology. 2004;127:17-25. 6. Stoffel S, et al. Gastroenterology. 2009;127(5):1621-7. 7. Surveillance Epidemiology End Results (SEER). National Cancer Institute. 2007. <http://seer.cancer.gov/statstat>. 8. Jaspersen KW, et al. Gastroenterology. 2010;138:2044-58. 9. Taylor DR, et al. Gastroenterology. 2010;138:877-885. 10. Grady WM, et al. Gastroenterology. 2003;124:1574-94. 11. Burt RW. Gastroenterology. 2000; 119:837-853. 12. Butlerworth AS, et al. European Journal of Cancer. 2006;42:216-217. 13. Pharoah Paul PD and Ponder BA. Best Practice & Research Clinical Obstetrics and Gynecology. Vol 16, No.4. 449- 68. 2002.

# Precision Medicine

**Multiple genes** can be associated with increased risk of a single cancer



**Multiple cancer risks** can be associated with a single gene

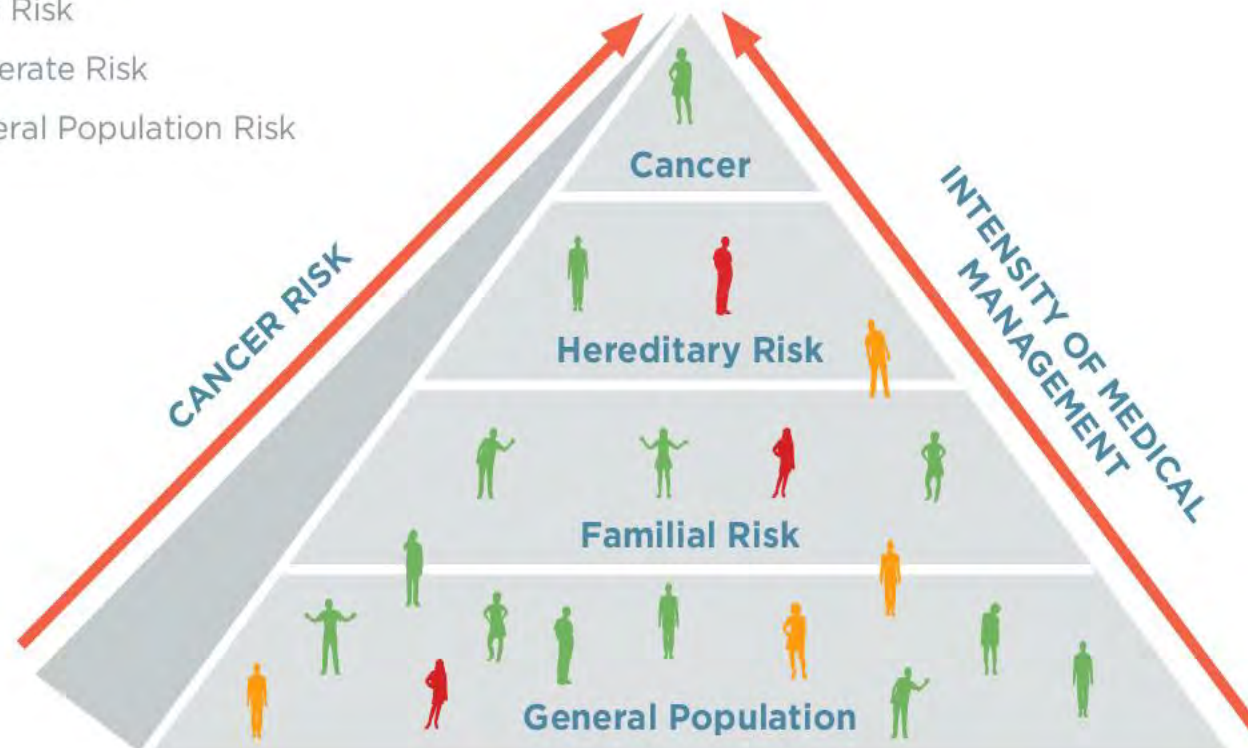


**Assessment that is too narrow can lead to a false sense of security and patient mismanagement**

# Risk Stratification

**Suboptimal risk stratification leads to wasteful spending**

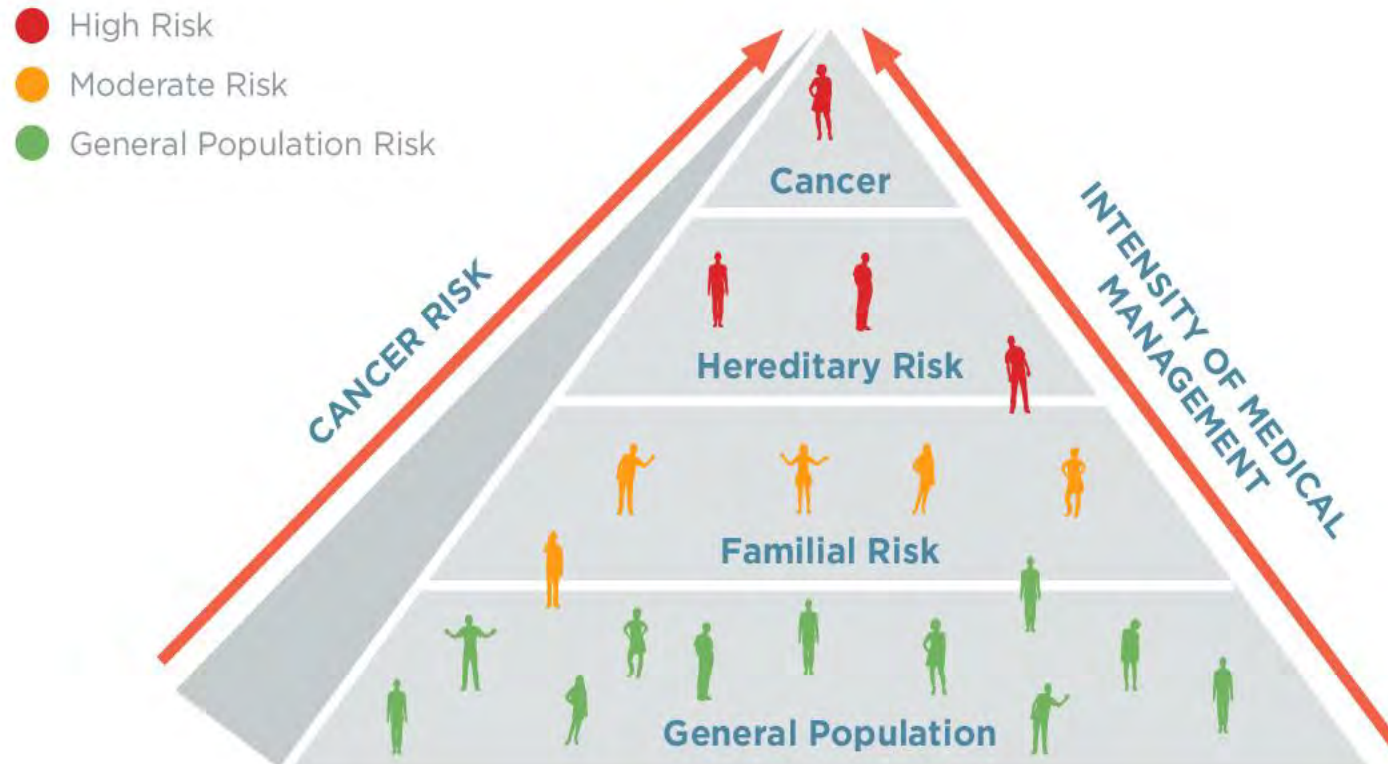
- High Risk
- Moderate Risk
- General Population Risk





# Moving Forward Together

More precise risk stratification yields more value

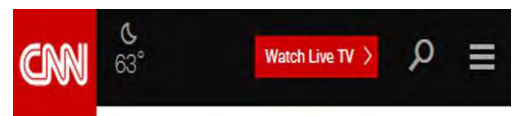


# Information Challenges



April 04, 2018  
New ACR and SBI Breast Cancer Screening Guidelines  
Call for Significant Changes to Screening Process  
[Share](#) [Recommend](#) [Bookmark](#)

**USPSTF 2009 mammo recs led to drop in screening rates**  
By Brian Casey, AuntMinnie.com staff writer



**New breast cancer guidelines:  
screen later, less often**  
By Elizabeth Cohen, Senior Medical Correspondent  
Updated 2:53 PM ET, Wed October 21, 2015

# Case Example #1

## CHEK2 positive result

### Cancer Family History Information

- Patient: breast ca (lobular) @ 50
- Mother: breast ca @ 46
- Maternal Grandmother: breast ca @ 56

### Patient Information

- 57 year old female
- DN, 3/25/1959
- Medicare Replacement
- \$0 out of pocket

CHEK2 gene Cancer Risk Table

■ High Risk ■ Elevated Risk

CANCER	AGE RANGE	CANCER RISK	RISK FOR GENERAL POPULATION <sup>8</sup>
Female Breast	To age 80	23%-48% <sup>1,2,3,4</sup>	10.2%
	Second breast cancer within 25 years of a first breast cancer diagnosis	Up to 25% <sup>4</sup>	6.9%
Colorectal	To age 80	7.2%-9.5% <sup>7</sup>	3.4%
Prostate	To age 80	24%-44% <sup>6</sup>	13.6%
Male Breast	To age 80	0.4%-1% <sup>5</sup>	0.1%

# Case Example #2

## PMS2 positive result

### Cancer Family History Information

- Patient: NO CANCER DIAGNOSIS
- Maternal Aunt: breast ca @ 50
- Maternal Grandmother: breast ca @ 67
- Paternal Uncle: CRC @ 62
- Paternal Cousin: CRC @ 35

### Patient Information

- 31 year old female
- NS, 6/9/1985
- Key Benefit Administrators
- \$0 out of pocket

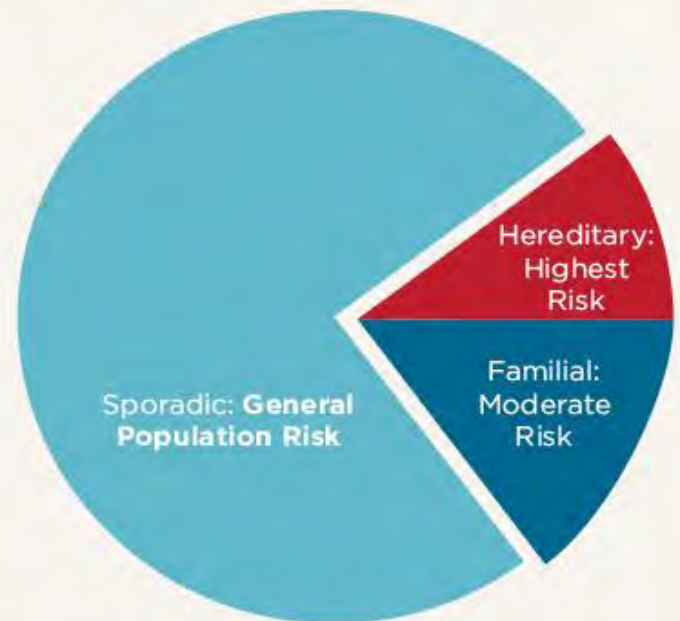
PMS2 Gene Cancer Risk Table

■ High Risk ■ Elevated Risk

CANCER	AGE RANGE	CANCER RISK	RISK FOR GENERAL POPULATION *
Colorectal	To age 70	Up to 20% <sup>1</sup>	1.9%
Endometrial	To age 70	Up to 15% <sup>2</sup>	1.6%
Sebaceous Neoplasms	To age 70	Elevated risk <sup>1,2,3</sup>	<1.0%
Ovarian	To age 70	Elevated risk <sup>1,2,3</sup>	0.7%
Small Bowel	To age 70	Elevated risk <sup>1,2,3</sup>	0.1%
Ureter/Renal Pelvis	To age 70	Elevated risk <sup>1,2,3</sup>	<1.0%
Gastric	To age 70	Elevated risk <sup>1,2,3</sup>	0.3%
Hepatobiliary Tract	To age 70	Elevated risk <sup>1,2,3</sup>	0.4%
Pancreatic	To age 70	Elevated risk <sup>1,2,3,4</sup>	0.5%
Central Nervous System	To age 70	Elevated risk <sup>1,2,3</sup>	0.4%

# Risk Stratification

- **Cancer family history alone can help you optimize management.**
- **If your patient is positive for a syndrome, management will be different. Even a negative result will impact medical management.**



Genetic testing is the only way to stratify risk between these two groups and find those at highest risk for cancer

# Risk Factors



Ovarian Cancer

Breast Cancer

Age < 50

Multiple

Male

Colon Cancer

Young

Multiple

Pancreatic

Metastatic Prostate

Number of biopsies

Atypical hyperplasia

LCIS

Tumor markers

Hereditary

Hormonal

Pathologic

Height

BMI

Parous vs nulliparous

Age first live birth

Age menarche

Age menopause

HRT years used after the  
avg age of menopause

*Modified by age, race, ethnicity, religion*

Risk Breast Ca

**Claus**

- Chemoprevention
- MRI
- Personalized screening

**Gail**

- Chemoprevention
- Personalized screening

Hereditary

Hormonal

Pathologic

Risk Mutation & Risk Breast Ca

**BRCAPRO**

- Genetic Testing
- Chemoprevention
- MRI
- Personalized screening

**Tyrer Cuzick**

- Genetic Testing
- Chemoprevention
- MRI
- Personalized screening

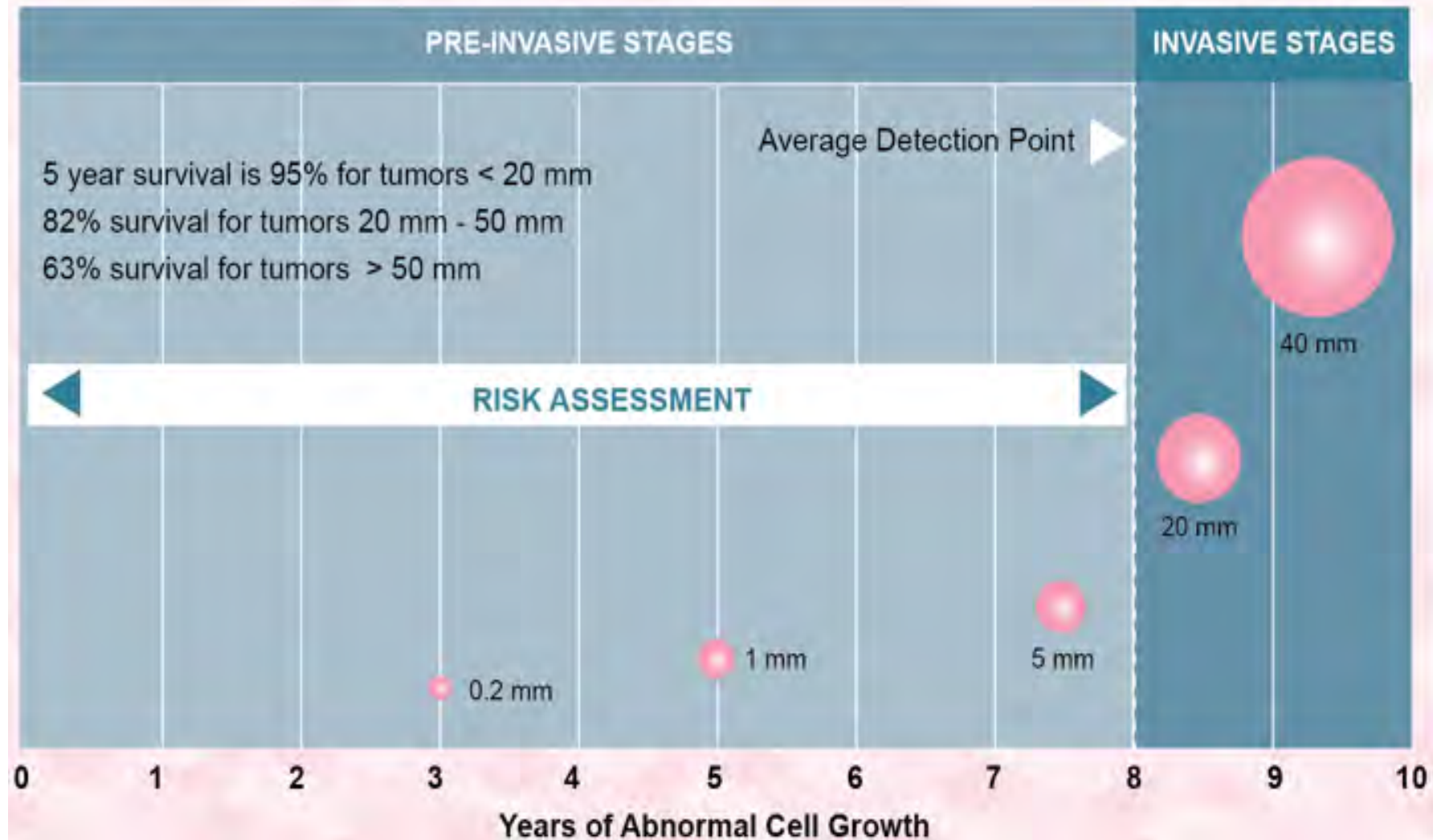
# Workflow-integrated Clinical Decision Support

- Patient-entered family history and risk factors via Tablet or website
- Risk calculations using standard models ⇒ Recommendations  
**>20% risk of breast cancer**  
*(Tyrrer Cuzick, BRCAPRO, Claus)*
- Elevated-Risk Patients Receive appropriate MBI/MRI Screening





# Breast Cancer Develops Before it's Detected



# Chemoprevention

## ❖ Risk Reducing Medications

SERMS : Selective Estrogen Regulating Modulators

- Tamoxifen – Nalvadex, Soltamox
- Raloxifene – Evista
- Ospemifene – Osphena
- Bazedoxifene + Conjugated Estrogen - Duavee



# Why Stratify? .....Abby

- 45 yr old female
- Nulliparous
- Menarche age 11
- No family hx CA
- No personal hx CA
- No prior breast bx
- Annual Mammogram at 50 yr old advised by USPSTF
- Paternal Grandmother – Breast Cancer at Age 69

**Age 48, breast lump found by pt.**

- **Stage 3 Invasive ductal CA, ER+**
- **Mastectomy, ChemoTx, RadTx, Adriamycin**
- **Cardiotoxicity, Congestive heart failure**



## Why Stratify? .....Abby

- 45 yr old female.....Abby
- Nulliparous
- Menarche age 11
- No family hx CA
- No personal hx CA
- No prior breast bx
- Annual mammogram at 50 yr old advised by USPSTF
- Paternal Grandmother – Breast Cancer Age 69

Age 48, breast lump found by pt.

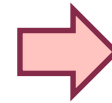
- Stage 3 Invasive ductal CA, ER+
- Mastectomy, ChemoTx, RadTx,
- Adriamycin cardiotoxicity, CHF

Gail Model

1% 5-yr risk

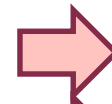
Tyrer-Cuzick

2.0% 5-yr risk



TAMOXIFEN x 5 years

**23% integrated lifetime risk**



ANNUAL MAMMOGRAM

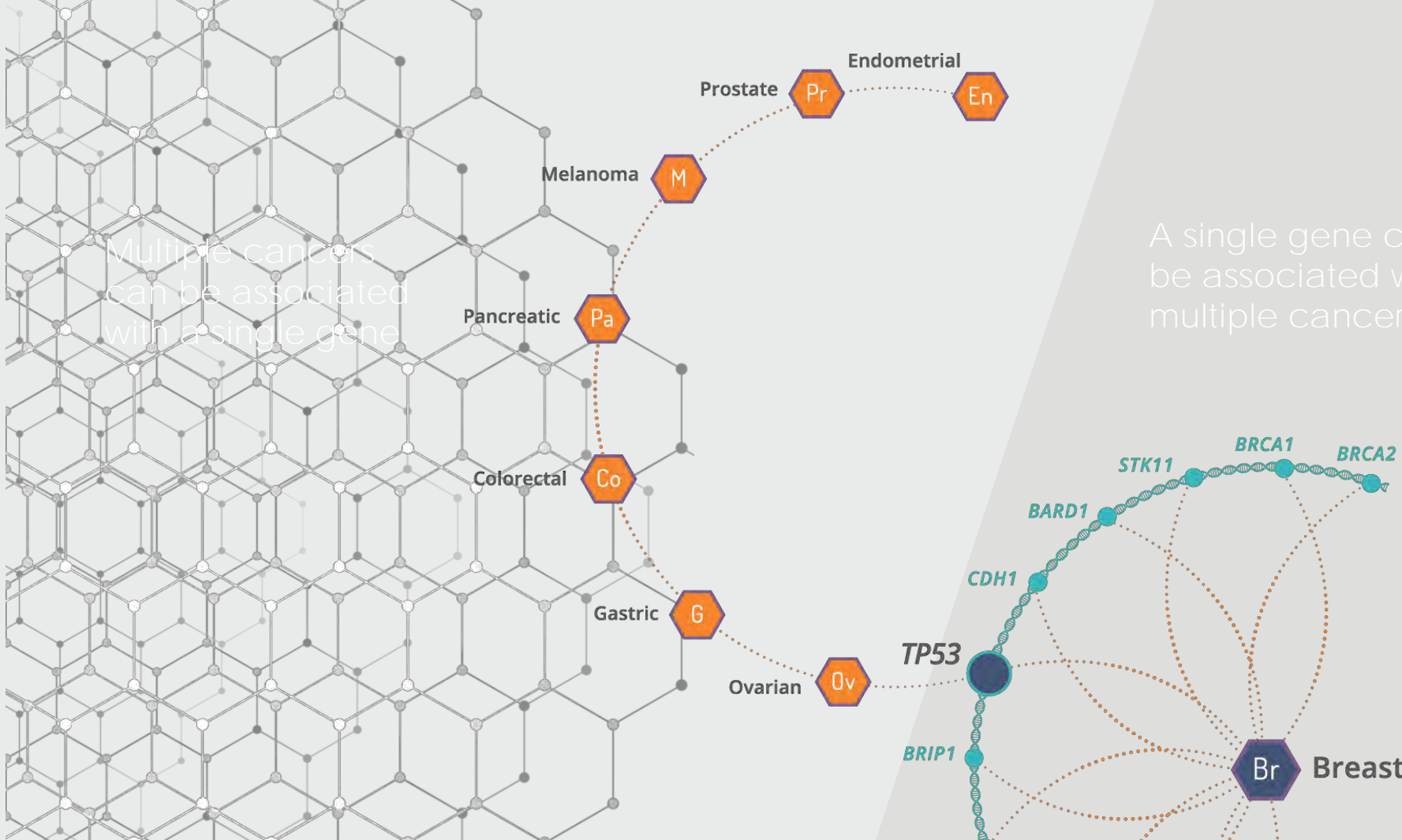


ANNUAL MRI



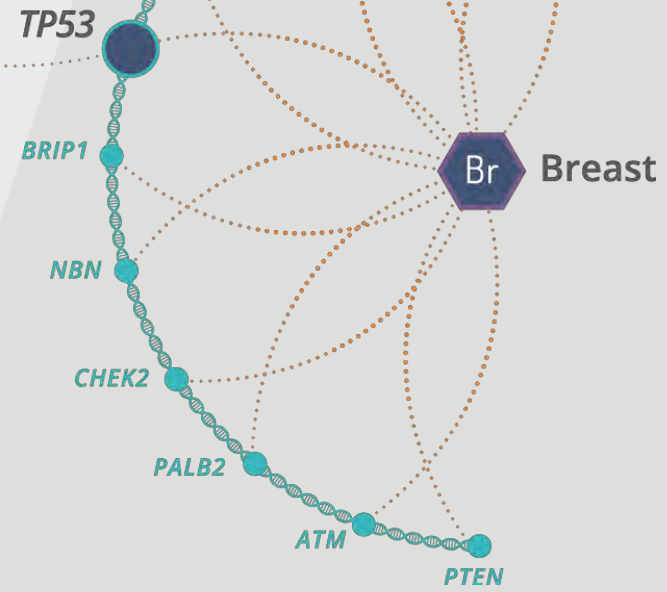
**Cancer Prevented, or  
Diagnosed at Stage I**

Multiple cancers  
can be associated  
with a single gene.

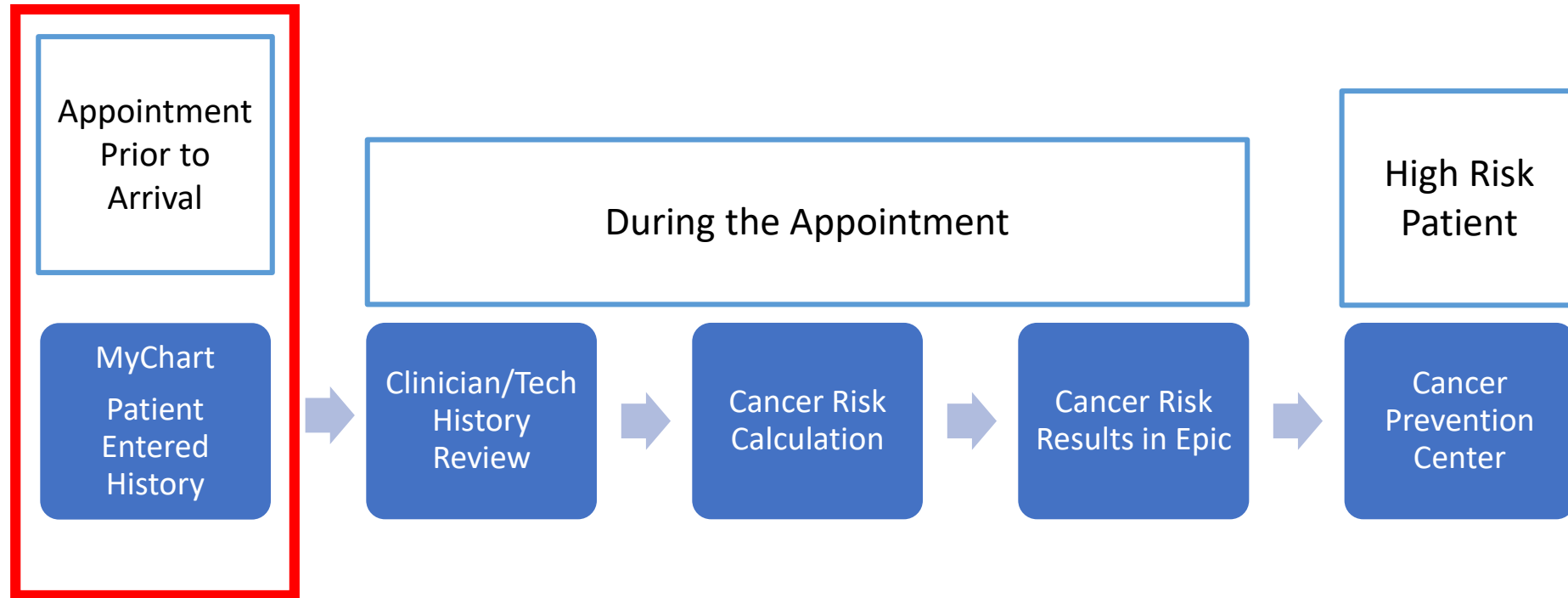


A single gene can  
be associated with  
multiple cancers.

If you are using a narrower testing approach,  
you may miss critical information, which may  
compromise patient outcomes.



# High Level Cancer Risk Screening Process



## Family History

Check the box and add the family member for each diagnosis that applies.

Which, if any of your family members have been diagnosed with the following:

BRCA1 or BRCA2 gene positive

Vickie (Mother) ▼

Name  
Vickie

Comments



Deana (Sister) ▼

Name  
Deana

Comments



Add a new family member ▼

Name

Comments

Breast cancer

Judy (Paternal Aunt) ▼

Name  
Judy

Comments  
age 46



Add a new family member ▼

Name

Comments

An additional onset of breast cancer

Add a new family member ▼

Name

Comments

Colon cancer

Add a new family member ▼

Name

Comments

Endometrial cancer

Add a new family member ▼

Name

Comments

Ovarian cancer

Add a new family member ▼

Name

Comments

Prostate cancer

Add a new family member ▼

Name

Comments

Uterine cancer

Add a new family member ▼

Name

Comments

Cervical cancer

Add a new family member ▼

Name

Comments

Bone cancer

Add a new family member ▼

Name

Comments

Pancreatic cancer

Add a new family member ▼

Name

Comments

BACK

CONTINUE

FINISH LATER

CANCEL

You will have a chance to review your answers before submitting the questionnaire.

Please review your responses. To finish, click **Submit and Continue**. To change any answers, click **Modify**.

### Genetic Testing Results

Did you have a positive BRCA1 gene result?

No

Did you have a positive BRCA2 gene result?

Yes

Not sure of the date

### Patient Medical History

Have you ever been diagnosed with breast cancer?

No

Have you ever been diagnosed with ovarian cancer?

No

Have you ever been diagnosed with colon cancer?

No

Have you ever been diagnosed with endometrial cancer?

No

Have you ever been diagnosed with cervical cancer?

No

### Breast Biopsy Diagnosis

Did your biopsy result in Atypical Hyperplasia(Pre Cancer)?

Yes - 4/2016  
comments

Did your biopsy result in Usual Ductal Hyperplasia?

No

Did your biopsy result in Lobular Carcinoma In Situ(Pre Cancer)?

No

Did your biopsy result in Ductal Carcinoma In Situ(Pre Cancer)?

No

### Surgical History

Have you ever had a breast needle biopsy?

Yes - 4/2016  
2 biopsies

Have you ever had a breast excisional biopsy?

No

Have you ever had a breast cyst aspiration?

No

Have you ever had a breast lumpectomy?

No

Have you ever had a mastectomy?

No

Have you ever had a breast enhancement?

No

Have you ever had a breast reduction?

No

Have you ever had a Oophorectomy (both ovaries removed)?

Yes - 12/15/2017

### Family History

BRCA1 or BRCA2 gene positive

Vickie (Mother)  
Deana (Sister)

Breast cancer

Judy (Paternal Aunt)  
age 46

MODIFY

SUBMIT AND CONTINUE

FINISH LATER

CANCEL





# Cancer Risk Assessment Calculation

**Cancer Risk Assessment**

Review Risk Factors

[View All Risk Factors](#)

- ✓ **History** Last Reviewed by Christopher J Yuppa on 1/2/2019 at 5:42 PM
- ✓ **OBI/Gyn Status** Last Reviewed by Christopher J Yuppa on 1/2/2019 at 5:41 PM
- ✓ **Hormone History** Last Reviewed by Christopher J Yuppa on 1/2/2019 at 5:41 PM
- ✓ **Demographics** Race: White or Caucasian  
Ethnic Group: Non-Hispanic  
Ethnic Background: Prefer Not To Answer
- ✓ **Vitals** Height recorded: 5' 3" (1.6 m)  
Weight recorded: 125 lb (56.7 kg)

Risk Models

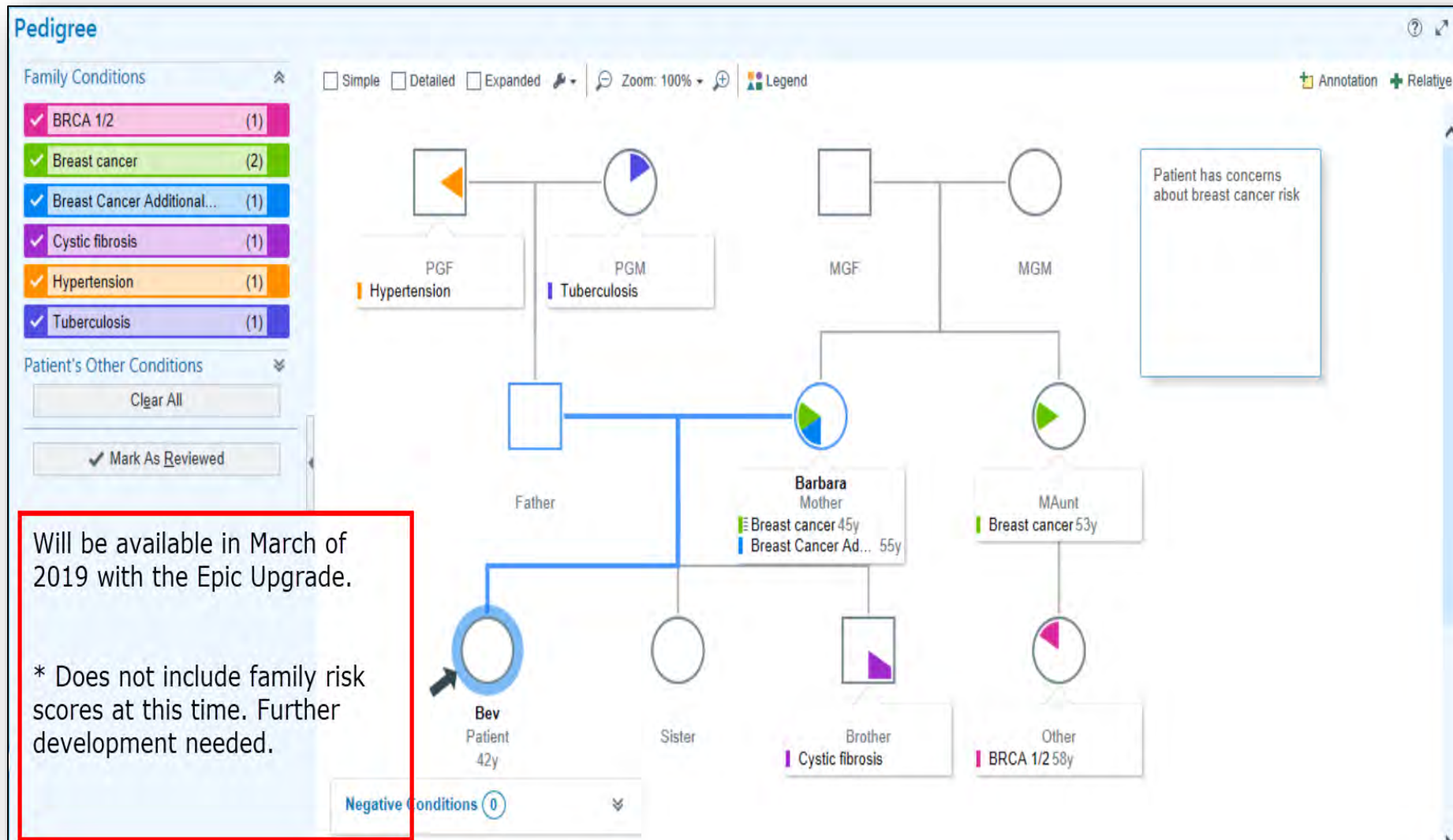
	Last calculated by
✓ Tyrer-Cuzick	Never
✓ BRCAPRO	Never
✓ Claus	Never
✓ Myriad	Never
✓ MMRPRO	Never
✓ PREMM	Never
✓ CCRAT	Never
✓ NCCN for HBOC Testing	Never
✓ Gail	Never
✓ Recommendations	Never
✓ Risk Explanation Tyrer-Cuzi...	Never

The clinician will click the “Calculate” button and all risk factors are sent to the CRA Health cancer risk calculator.

Within 15 seconds, all CRA Health risk models send the cancer risk scores back to the patients Epic medical record discretely.

Results will be available in the risk screening navigator and in the patients chart.

# Pedigree



# Cancer Risk Assessments in Epic

! Patient is at an elevated risk of a hereditary or familial cancer.

## Cancer Risk Recommendations as of 6/20/2019

### Recommendations

Point score 1

#### Cancer Risk Assessment:

This Risk Assessment is based on patient provided information collected in a risk survey taken at the time of this examination.

- Lifetime breast cancer risk: Tyrer-Cuzick v7 = 52.7%
  - If greater than or equal to 20%, then recommend genetic counseling and testing as well as annual breast MRI.
- Risk based on criteria for HBOC (Hereditary Breast and Ovarian Cancer): Elevated
  - if elevated, consider genetic counseling and testing.
- HNPCC (Lynch Syndrome) mutation risk: PREMM = 1.0%
  - if greater than or equal to 2.5%, consider genetic counseling, testing, and screening colonoscopy.
- 5 year breast cancer risk by the Gail model: 0.98%
  - If greater than or equal to 1.7%, the USPSTF recommends that clinicians engage in shared informed decision making for women who are at increased risk for breast cancer about medications to reduce their risk.

If the patient has met any of the above guidelines please consider a referral to the KHN Cancer Prevention Center

## Breast/Ovarian Cancer Risk Scores as of 6/20/2019

	Patient	Population
<b>Tyrer-Cuzick 8</b>		
Breast cancer (HCC) 5-year	9.32 %	1.28 %
Breast cancer (HCC) lifetime	30.41 %	9.45 %
BRCA1 positive	100 %	
BRCA2 positive	0 %	
BRCA gene positive	100 %	
<b>Tyrer-Cuzick 7</b>		
Breast cancer (HCC) 5-year	18.41 %	1.28 %
Breast cancer (HCC) lifetime	52.67 %	9.55 %
BRCA1 positive	100 %	
BRCA2 positive	0 %	
BRCA gene positive	100 %	
<b>BRCAPRO</b>		
Ovarian cancer (HCC) 5-year	7.02 %	
Ovarian cancer (HCC) lifetime	54.75 %	

## NCCN Cancer Risk Statement as of 6/20/2019

### NCCN for HBOC Testing

Point score 1

Individual from a family with a known deleterious BRCA 1/2 pathogenic variant, including such variants found on research testing

## Risk Explanation as of 6/20/2019

### Risk Explanation Tyrer-Cuzick 8

Breast cancer (HCC) 30.41 %

For people with patient's age and gender: 9.95 %  
 Including above and patient's race and ethnicity: 9.95 %  
 Including above and patient's hormonal and reproductive risk factors: 9.77 %  
 Including above and patient's medical history: 9.77 %  
 Including above and patient's family history: 19.64 %  
 Including above and patient's personal family genetic testing: 51.59 %  
 Including above and patient's breast density: 30.41 %  
 Final score: 30.41 %

Breast cancer (HCC) 5-year	11.89 %	
Breast cancer (HCC) lifetime	47.86 %	
Genetic susceptibility to breast cancer	0.81 %	
BRCA1 positive	99.19 %	
BRCA2 positive	0 %	
BRCA gene positive	100 %	
<b>Myriad</b>		
BRCA gene positive	1.5 %	
<b>Gail 4</b>		
Breast cancer (HCC) 5-year	0.98 %	1.29 %
Breast cancer (HCC) lifetime	9.06 %	11.18 %

**Colon/Endometrial Cancer Risk Scores as of 6/20/2019**

	Patient	Population
<b>MMRPRO</b>		
Uterine cancer (HCC) 5-year	0.18 %	
Uterine cancer (HCC) lifetime	1.89 %	
Colon cancer (HCC) 5-year	0.17 %	
Colon cancer (HCC) lifetime	3.29 %	
Lynch syndrome	0.16 %	
MLH1 gene mutation	0.06 %	
MSH2 gene mutation	0.07 %	
MSH6-related Lynch syndrome (HNPCC5)	0.03 %	
<b>PREMM</b>		
Lynch syndrome	0.96 %	
MLH1 gene mutation	0.3 %	
MSH2 gene mutation	0.33 %	
MSH6-related Lynch syndrome (HNPCC5)	0.33 %	

**Family History**

Problem	Relation	Age of Onset	Comments
Breast cancer	Father		

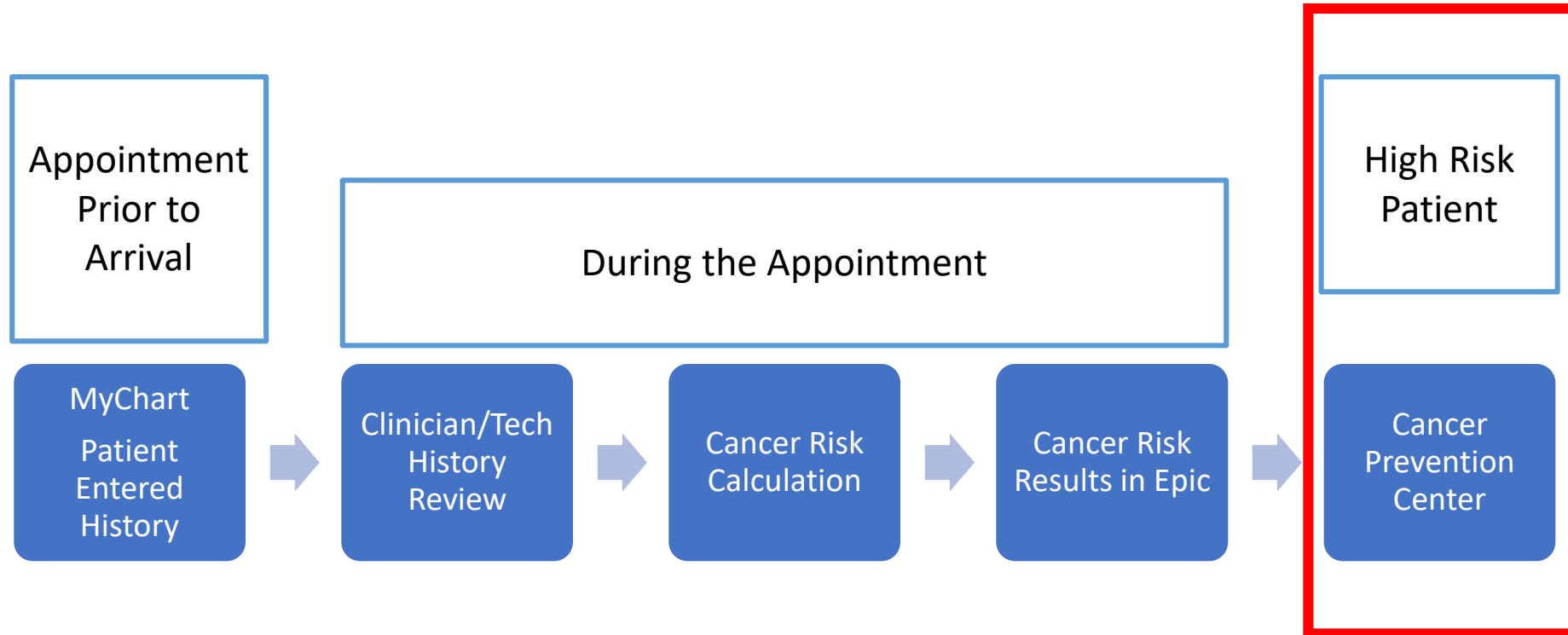
**Medical History**

Diagnosis	Date	Comment	Source Provider
BRCA1 positive			

**Surgical History**

No past surgical history on file.

# High Level Cancer Risk Screening Process



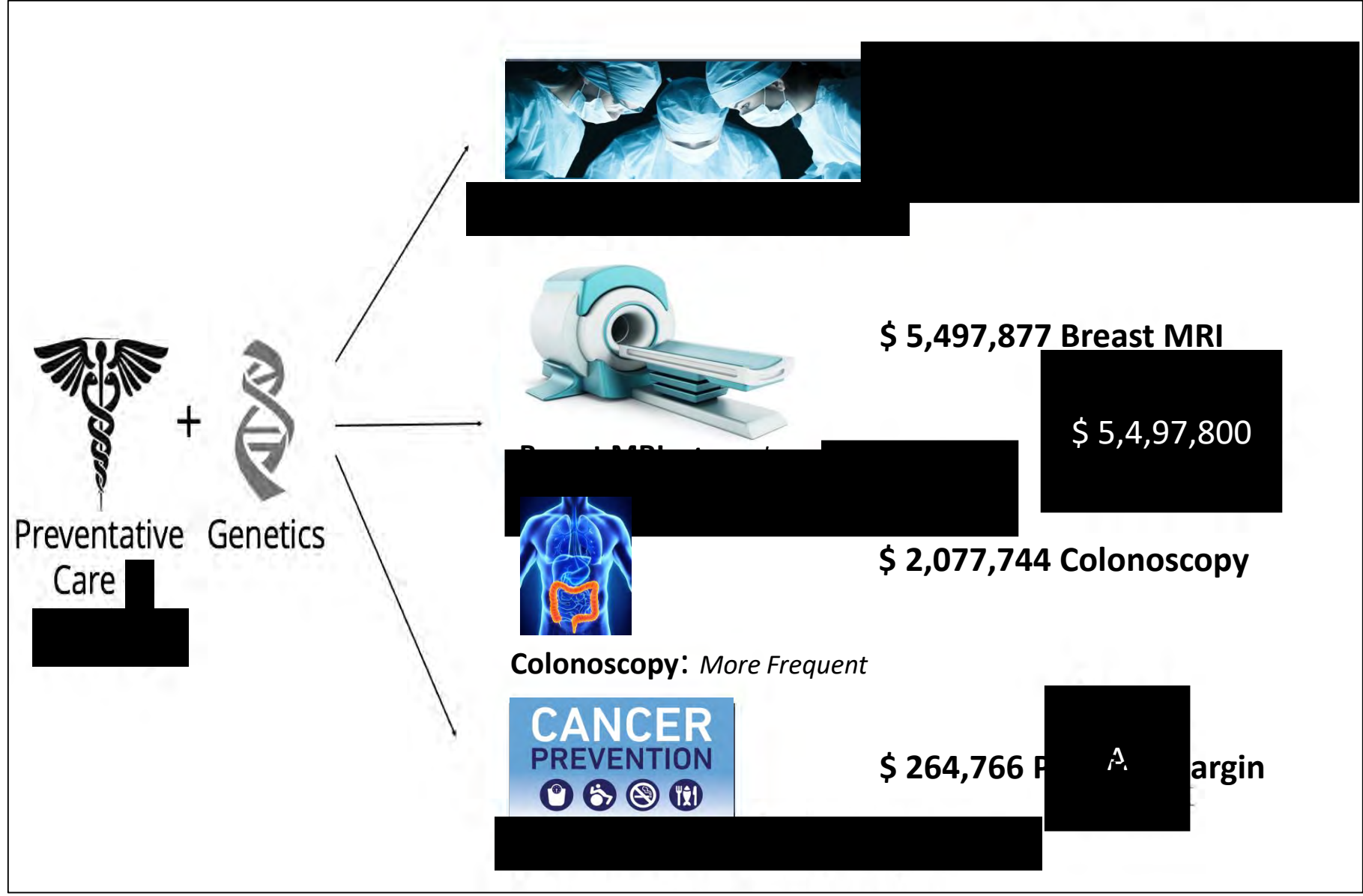
# Overall Objective



Point A: Screening Sites  
Imaging, OB, GI, PCP



Point B: Cancer Prevention Center

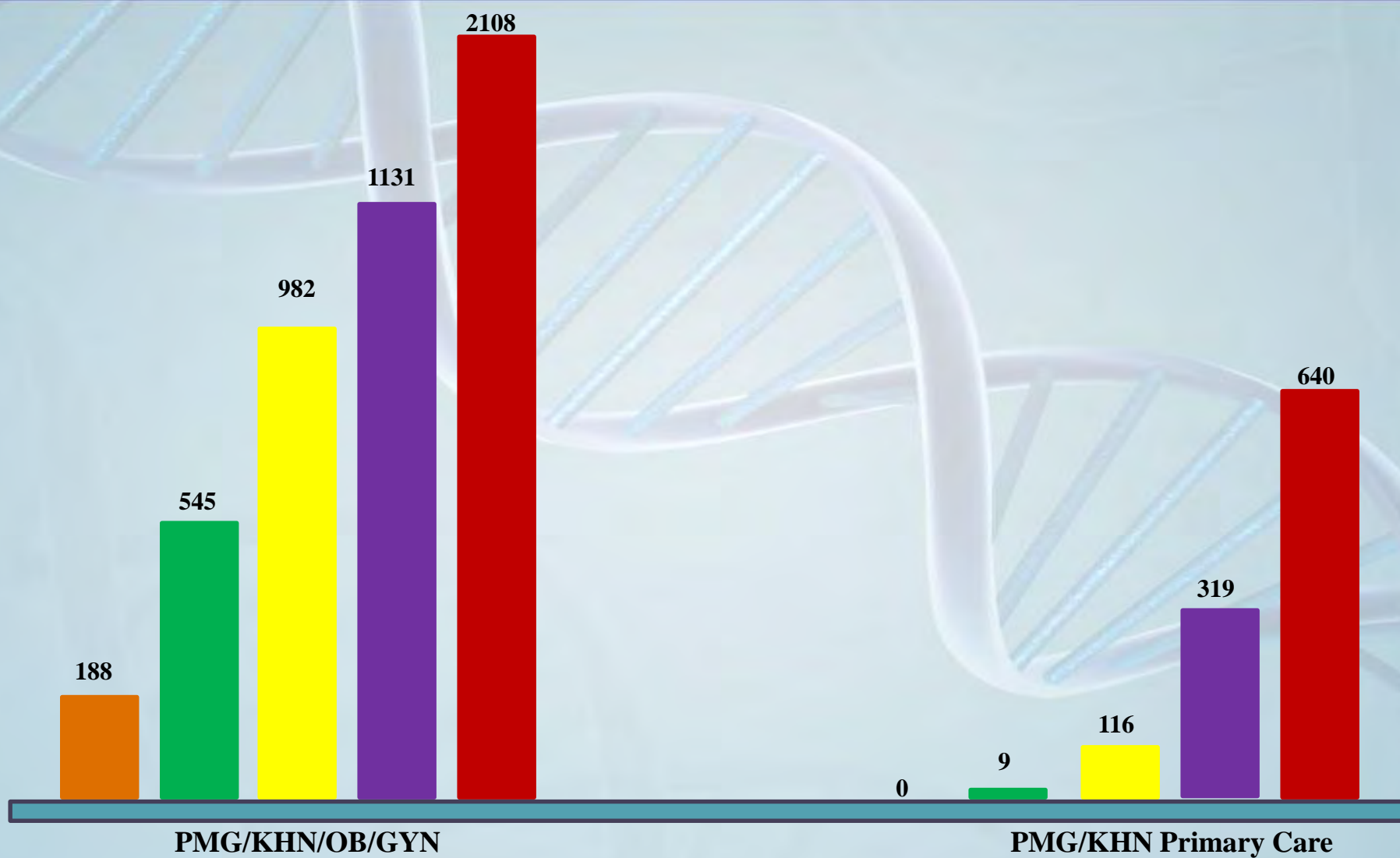




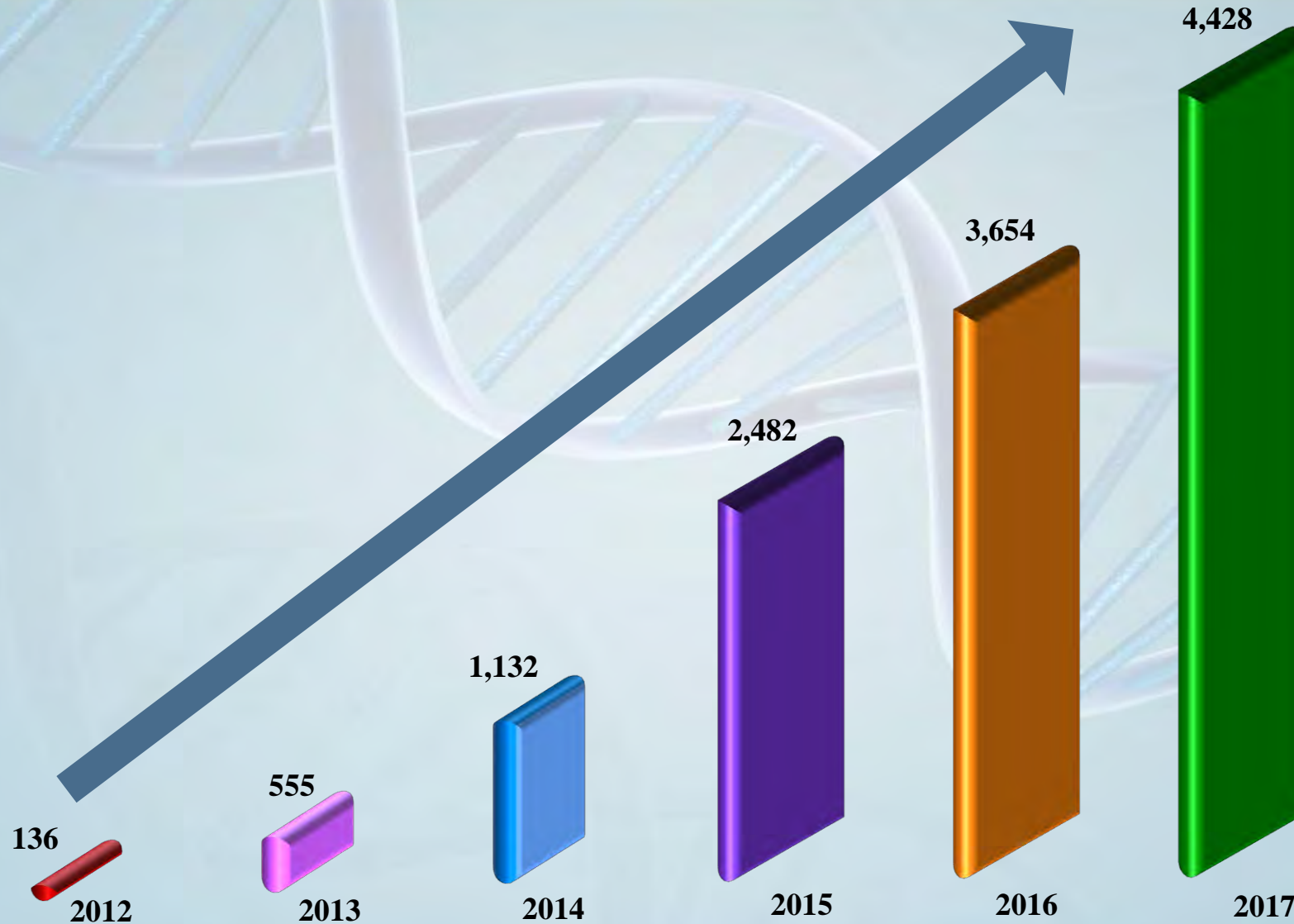
# KHN OBGYN & PRIMARY CARE/FAMILY PRACTICE

## # of Patients Tested by Provider by Year

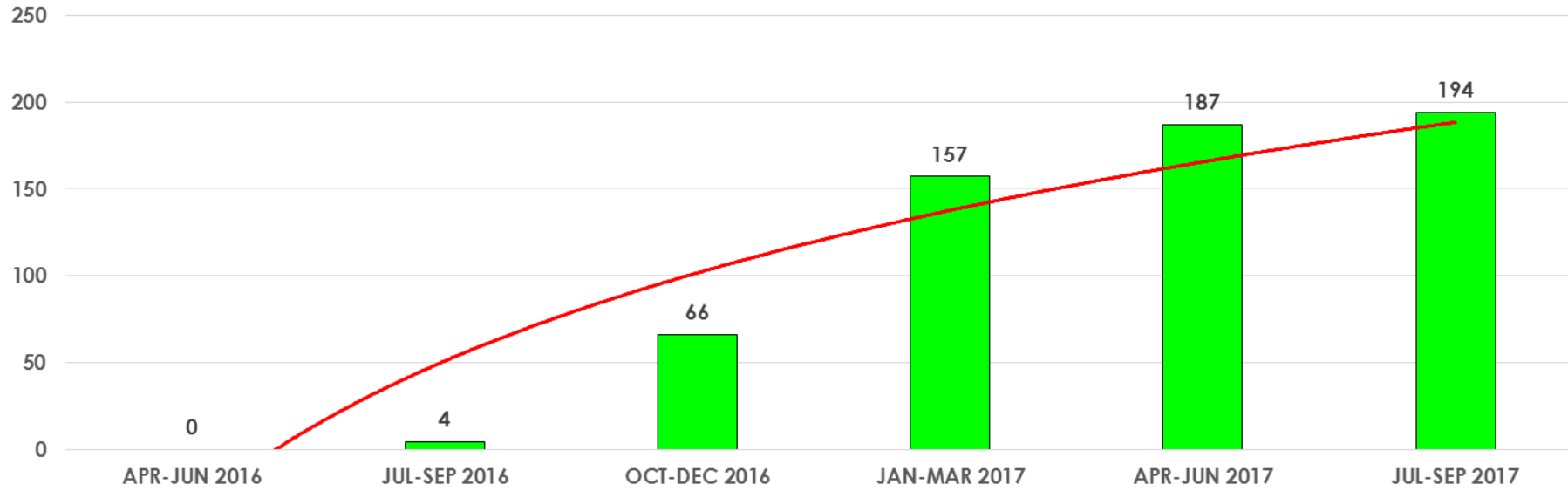
2012 2013 2014 2015 2016



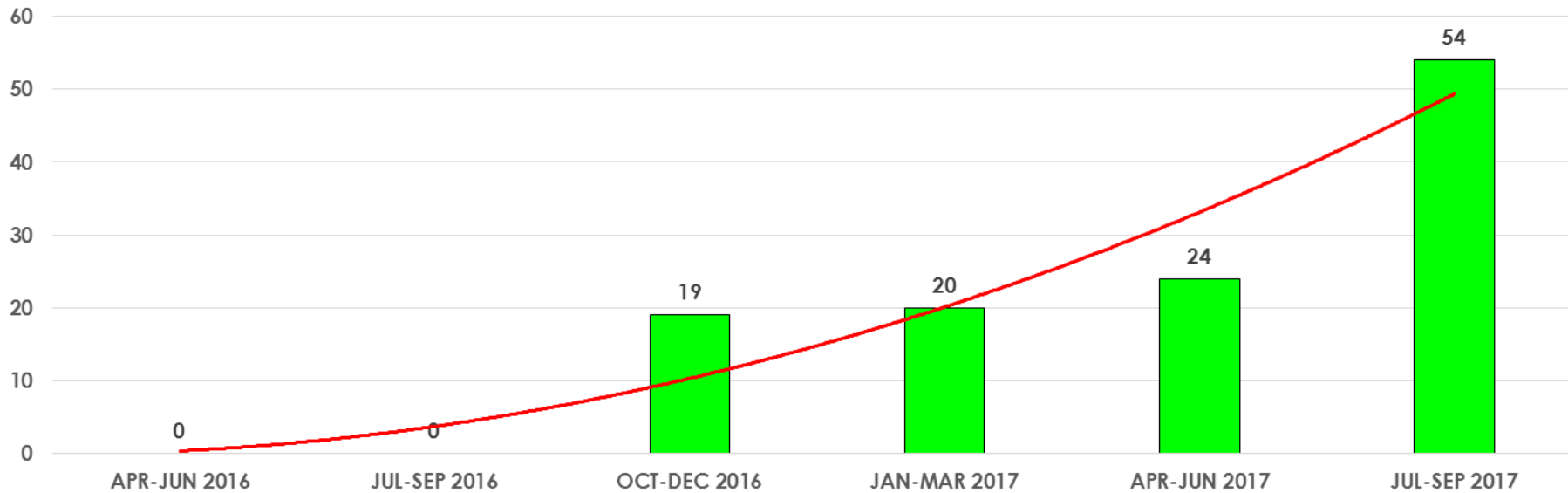
# *Kettering Health Network Breast MRI Volumes*



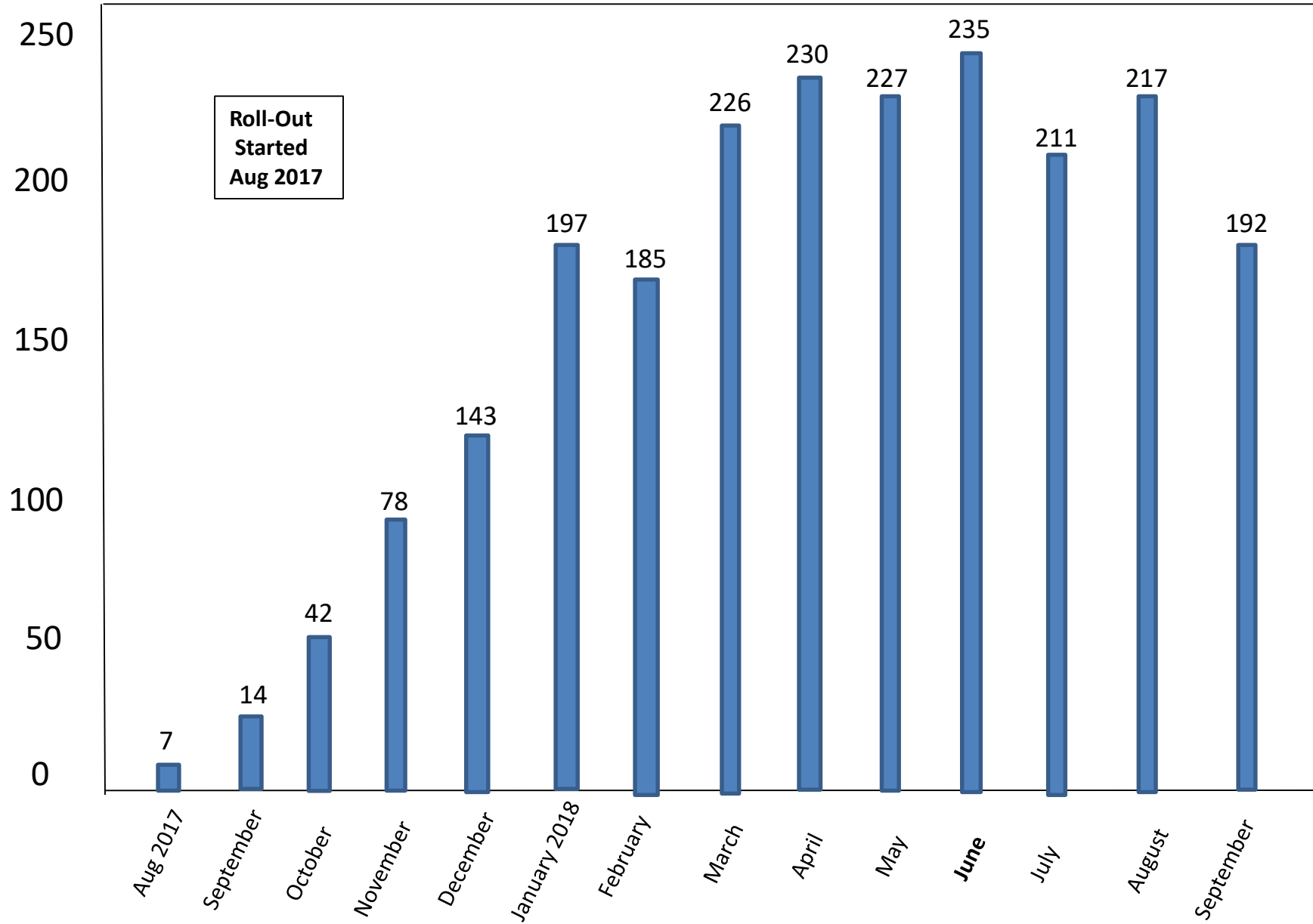
### Summa Ob/Gyn Providers



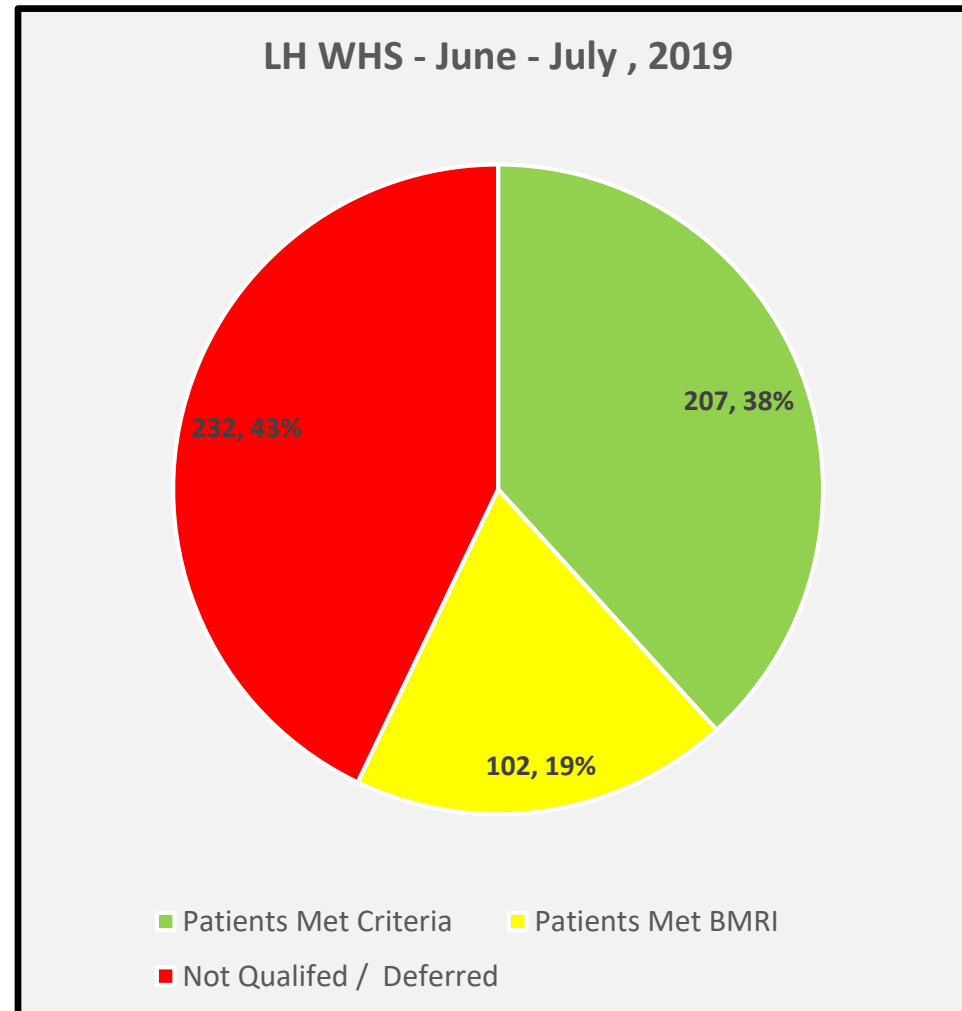
### Summa Primary Care Providers



**By Month - # Patients Completing the CRA with a  
Lifetime Breast Cancer Risk Score >20  
(# High Risk Patients = 2,204)**



- **Total Patients Screened: 541**
- **Meet GT Criteria: 207**
- **Patients Tested for GT: 154**
  - 22 Test on Hold due to Med Mutual
- **Patients Met Breast MRI:  
102**
- **Patients Did Not Meet  
Criteria 232**



# Kettering Health Network Cancer Prevention Program

## Current State

- A. We have developed the first EMR integration in the country- with EPIC, utilizing the Cancer Risk Assessment Software Tool.
- B. Risk Assessment offered to all KBEC **Screening** Mammography patients on June 3, 2019
- C. Kettering Cancer Prevention Center - Opened July 1, 2019
- D. Patient Registry Established-Research/Quality Metrics
- E. Risk Assessment Results from June 1st through August 15th, 2019
  - 3,209 patients have an elevated risk
  - 981 patients selected to be called by the CPC (30%)
  - 342 patients scheduled (10%)
  - 100% of patients seen, that qualified for Genetic testing opted for testing
  - 100% that needed a follow up appointment, scheduled an appointment

# Kettering Health Network Cancer Prevention Program

## Current State

- A. We have developed the first EMR integration in the country- with EPIC, utilizing the Cancer Risk Assessment Software Tool.
- B. Risk Assessment offered to all KBEC **Screening** Mammography patients on June 3, 2019
- C. Kettering Cancer Prevention Center - Opened July 1, 2019
- D. Patient Registry Established-Research/Quality Metrics
- E. Risk Assessment Results from June 1st through August 15th, 2019

- 3,209 patients have an elevated risk
- 981 patients selected to be called by the CPC (30%)
- 342 patients scheduled (10%)
- 100% of patients seen, that qualified for Genetic testing opted for testing
- 100% that needed a follow up appointment, scheduled an appointment

# Keys to Operational Success

- **Timely Communication**
  - Start talking to your referring physician base at least 3 months ahead of the launch of the program to ensure they understand the intent & how their patients will be handled.
- Consider a multi-disciplinary steering committee as you start your journey. Include senior leadership, physicians & all stake holders.
- Consider piloting at one location prior to network launch.
- Consider a Help Line for physicians to use for questions following go-live.



# Keys to Operational Success

- **Results Delivery**
  - How will your referring physicians get results?  
(Employed & Non-employed)
  - Current process: 4 summary statements in the radiology report.
  - Future desired process: Results not tied to radiology report & delivered separately.
  - Will you give your patients their risk results immediately following their mammogram?
    - Current process: Patient is given a tri-fold brochure by the technologist and told if they are Average risk or Higher than Average risk.

# Keys to Operational Success



- **Marketing**

- Materials for patients & physicians about your program
- Community

- **Education**

- For senior leadership & stake holders
- For breast center staff
- For referring physicians & specialty groups
- Patient education materials

# Kettering Health Network Cancer Prevention Program

## Future State

A. Program accessible to: Oncology Service Line  
Women's Service Line

} Completed July 2019

B. Primary Care: Educational Update  
Program launch in Epic

C. Risk Assessment made available to all registered patients in the  
Kettering Health Network

D. National Center of Excellence in Cancer Prevention



Caroline Peterson, D.O.  
[cepeterson@woh.rr.com](mailto:cepeterson@woh.rr.com)  
(937) 271-7251