

***KRAS* Biomarker Testing & Treatment among Colorectal Cancer Patients**

CDC CER Project

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Outline

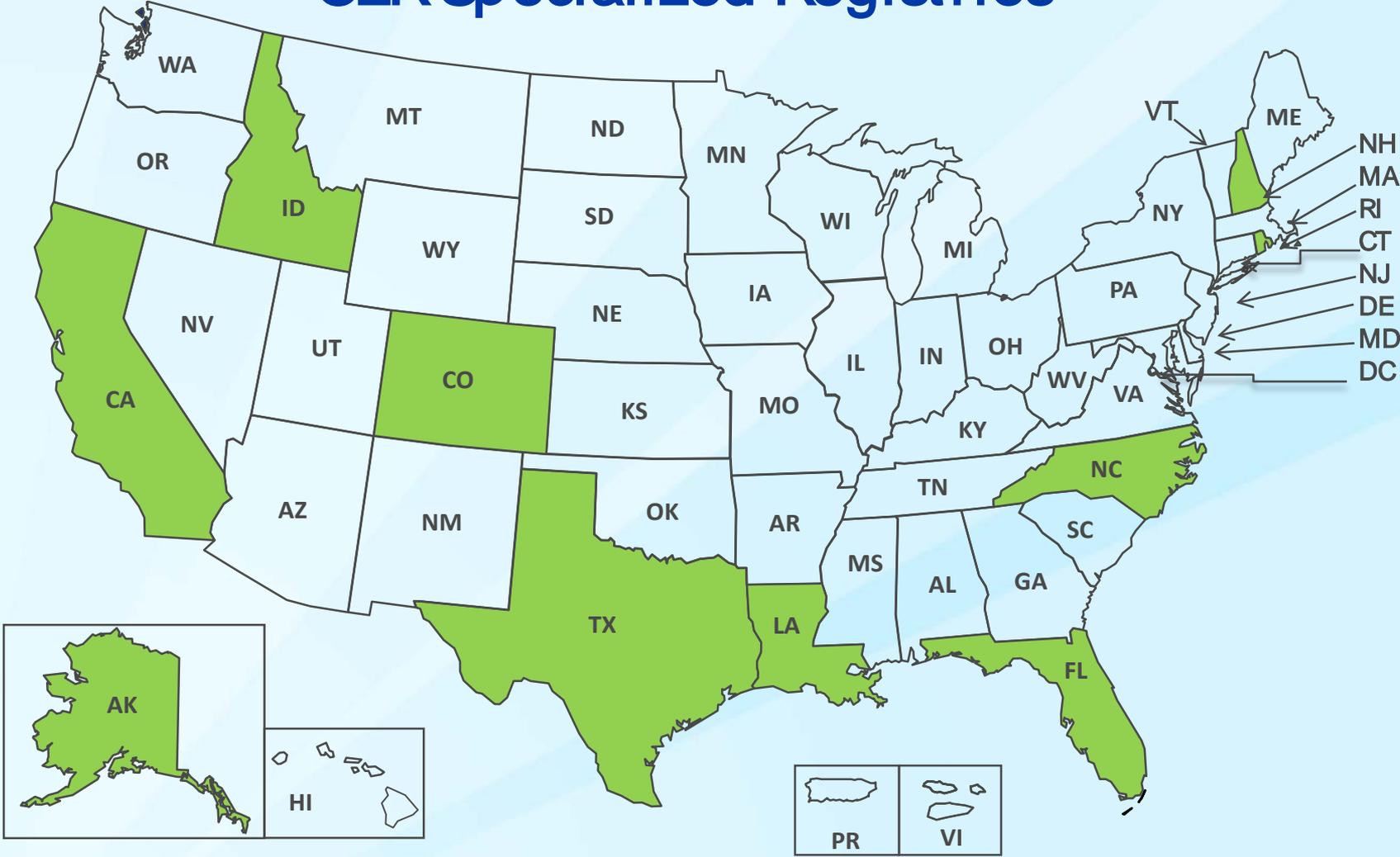
- **Comparative Effectiveness Research (CER)**
- ***KRAS* recommendations/test**
- **CER Question**
- **Part 1: *KRAS* testing results**
- **Part 2: Preliminary treatment results**
- **Summarize findings**
- **Discussion**
- **Questions**

Background

- **CER Funding – American Recovery and Reinvestment Act**
- **Goals:**
 - Address CER questions
 - Enhance cancer registry infrastructure
 - Collect add'l biomarker/treatment data
- **Collected data for 2011 cases**
 - Focus on breast, colon, rectum, and CML
- **CER Project* – May 2010 to September 2013**

* Chen VW, Ehemann CR, Johnson CJ, Hernandez MN, Rousseau D, Styles TS, et al. Enhancing Cancer Registry Data for Comparative Effectiveness Research (CER) Project: Overview and Methodology. *Journal of registry management*. 2014;41:103-12.

CER Specialized Registries



Specialized Registries (AK, CA*, CO, FL*, ID, LA, NC, NH, RI, TX)



CER Question

- **Are colon and rectum (colorectal) cancer patients tested for *KRAS* and are the results used appropriately to determine treatment?**
 - If not tested, what patient characteristics influenced no *KRAS* testing?
 - First time collecting *KRAS* testing info/treatment agent

Recommendation

- **National Comprehensive Cancer Network (NCCN)***
 - 2008 – updated guidelines
 - All stage IV colorectal cancer (CRC) patients should be tested for *KRAS* upon diagnosis and before treatment

* National Comprehensive Cancer Network. NCCN adds survivorship section to colon and rectal cancer guidelines. February 18, 2009 [cited 2015 April 09]; Available from: <http://www.nccn.org/about/news/newsinfo.aspx?NewsID=202>

KRAS Test

- **KRAS test for stage IV colorectal cancer patients***
- **Normal (wild-type) OR Mutated**

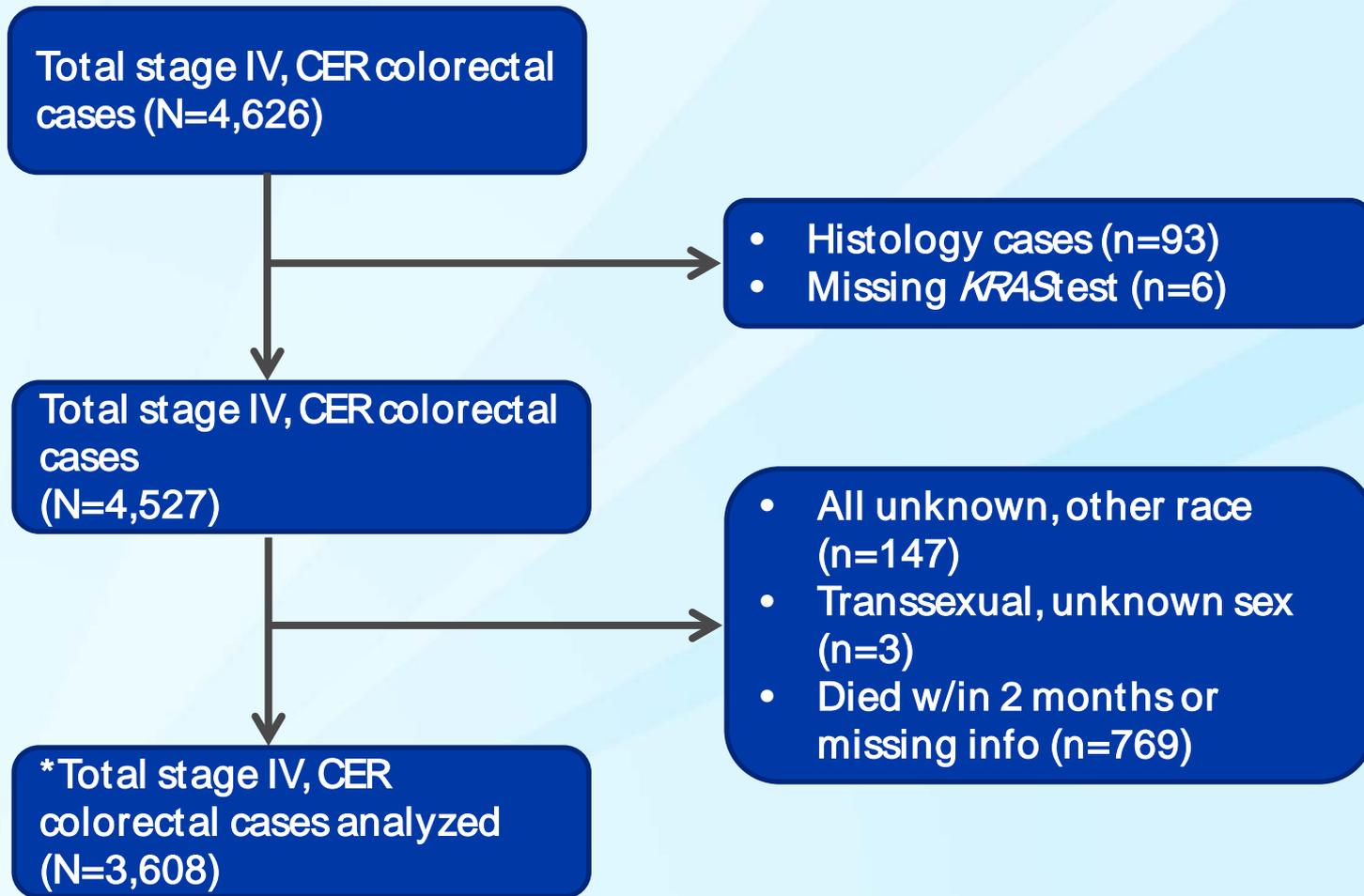


- **KRAS results determine treatment options**
- **anti-Epidermal Growth Factor Receptor (anti-EGFR)**
 - Cetuximab (Erbix – FDA approved 2004*)
 - panitumumab (Vectibix – FDA approved 2006*)

* National Comprehensive Cancer Network. NCCN clinical practice guidelines in oncology for colon cancer- version 3.2011. 2011 February 25.

* http://www.accessdata.fda.gov/scripts/cder/drugsatfda/index.cfm?fuseaction=Search.Search_Drug_Name

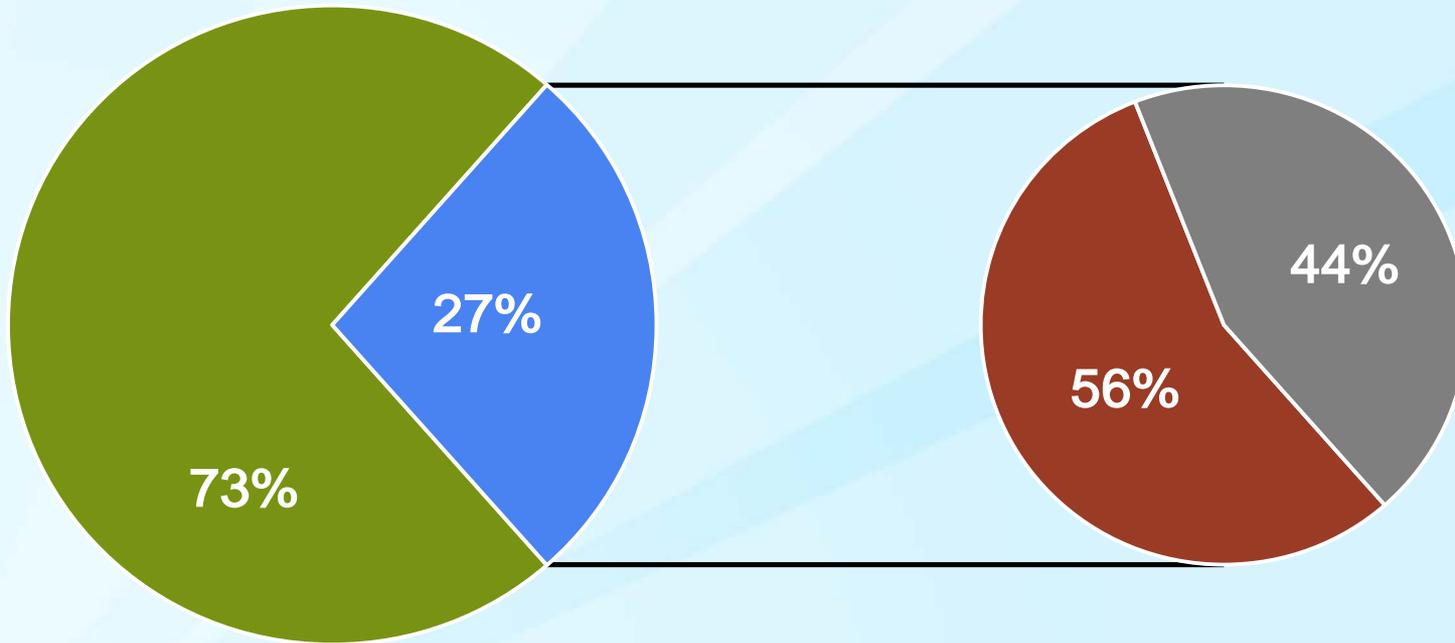
Study Population



Testing Results

- Total 2011 colorectal stage IV cases analyzed (N=3,608)

- Total 2011 tested stage IV cases analyzed (N=992)
- n=36 test ordered, but results not in chart



■ YES (n=992) ■ NO (n=2616) ■ Normal (n=534) ■ Mutated (n=422)

Testing Results

Chi-square tests:

- Age at dx (older age)
- Race/ethnicity (Black non-Hispanics/Hispanics)
- State of dx (CA, LA, TX, and FL)
- Insurance status (public)
- Education by census tract (low)
- **Sex**
- **% of people below poverty level**
- **Rural/urban by census tract**
- **Comorbidities**

} No significant differences

Testing Results

Multivariate logistic regression:

- Age at dx
- Race/ethnicity
- State of dx
- Insurance status
- Education by census tract
- Sex
- % of people below poverty level
- Rural/urban by census tract
- Comorbidities

No significant differences

Table 1. Multivariate logistic regression of demographics to having a *KRAS* test

Characteristic	Value	OR	95% CI	<i>P</i>
Age* (per 5-year increase)				<0.0001
	Below 70	0.92	(0.88, 0.96)	
	Above 70	0.76	(0.69, 0.84)	
Race/Ethnicity	White, Non-Hispanic	1.00		0.0837
	Black, Non-Hispanic	0.77	(0.61, 0.97)	
	Hispanic	0.89	(0.70, 1.12)	
State of Dx	TX	1.00		<0.0001
	AK	1.68	(0.71, 3.96)	
	CA	0.70	(0.47, 1.06)	
	CO	1.98	(1.45, 2.70)	
	FL	1.19	(0.93, 1.52)	
	ID	1.97	(1.31, 2.97)	
	LA	0.93	(0.69, 1.25)	
	NH	2.98	(1.84, 4.81)	
	NC	1.79	(1.42, 2.26)	
	RI	2.72	(1.52, 4.85)	

Treatment Preliminary Results

KRAS Tested (n=992)

Treatment	Frequency (No.)	Percent (%)
FOLFOX alone	112	13.27
FOLFIRI alone	13	1.54
CapeOx alone	22	2.61
FOLFOXIRI alone	7	0.83
Fluorouacil alone	32	3.79
Capecitabine alone	47	5.57
Oxaliplatin alone	42	4.98
Irinotecan alone	1	0.12
FOLFOX + bevacizumab	201	23.82
FOLFIRI + bevacizumab	30	3.55
CapeOx + bevacizumab	24	2.84
FOLFOXIRI + bevacizumab	18	2.13
Fluorouacil + bevacizumab	4	0.47
Capecitabine + bevacizumab	8	0.95
FOLFOX + cetuximab	13	1.54
FOLFIRI + cetuximab	3	0.36
FOLFOX + panitumumab	4	0.47
Cetuximab alone	3	0.36
Panitumumab alone	1	0.12
Other single agent	9	1.07
Any other multiple agents	84	9.95
Unknown chemo agent	166	19.67
Total	844	

} 24 cases received anti-EGFR

Treatment Preliminary Results

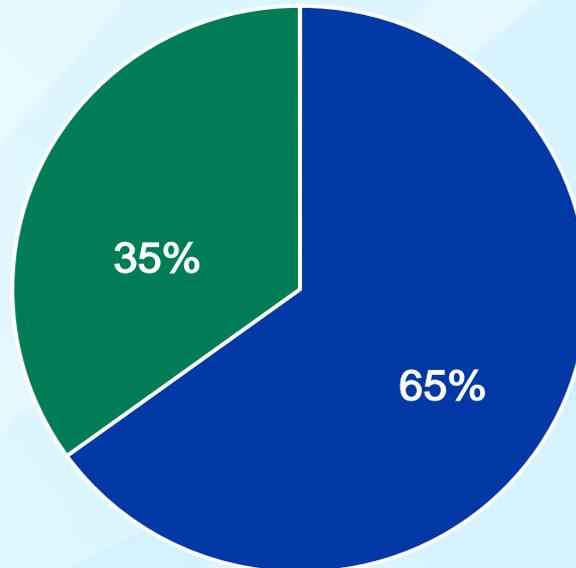
KRAS Not Tested (n=2,616)

Treatment	Frequency (No.)	Percent (%)
FOLFOX alone	191	11.62
FOLFIRI alone	17	1.03
CapeOx alone	45	2.74
FOLFOXIRI alone	5	0.3
Oxaliplatin + Irinotecan	1	0.06
Fluorouacil alone	74	4.5
Capecitabine alone	99	6.02
Oxaliplatin alone	81	4.93
Irinotecan alone	1	0.06
FOLFOX + bevacizumab	325	19.77
FOLFIRI + bevacizumab	41	2.49
CapeOx + bevacizumab	50	3.04
FOLFOXIRI + bevacizumab	14	0.85
Fluorouacil + bevacizumab	27	1.64
Capecitabine + bevacizumab	12	0.73
FOLFOX + cetuximab	7	0.43
FOLFIRI + cetuximab	3	0.18
FOLFOX + panitumumab	1	0.06
Cetuximab alone	2	0.12
Other single agent	34	2.07
Any other multiple agents	126	7.66
Unknown chemo agent	488	29.68
Total	1644	

} 13 cases received anti-EGFR

Treatment Preliminary Results

Received anti-EGFR



■ Tested (n=24) ■ Not Tested (n=13)

Summarize Findings

- **27% received a documented *KRAS* test**
- **73% did not receive a *KRAS* test**
 - Older age was associated with less testing
 - Black, non-Hispanics received less testing than Whites
 - Geographic differences in testing
- **37 cases received anti-EGFR**
 - 35% of cases received anti-EGFR but no *KRAS* test
- **Most cases received FOLFOX + bevacizumab as first-line treatment**

Discussion

- **Did we capture all *KRAS* testing?**
 - If not in medical cart, did not get captured
 - Resource intensive
- **Is there a lag time from guidelines to practice?**
- **Is anti-EGFR better treatment?**
- **If not, then are other first-line treatments better?**
- **More evaluation is needed**

KRASGroup

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Questions?

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