SUICIDE ATTEMPTS AFTER BARIATRIC SURGERY:

COMPARISON TO A NON-SURGICAL COHORT WITH SEVERE OBESITY

Lisa R. Miller-Matero, PhD, Hsueh-Han Yeh, PhD, Brian K. Ahmedani, PhD, Rebecca C. Rossom, MD, Melissa L. Harry, PhD, Yihe G. Daida, PhD, & Karen J. Coleman, PhD

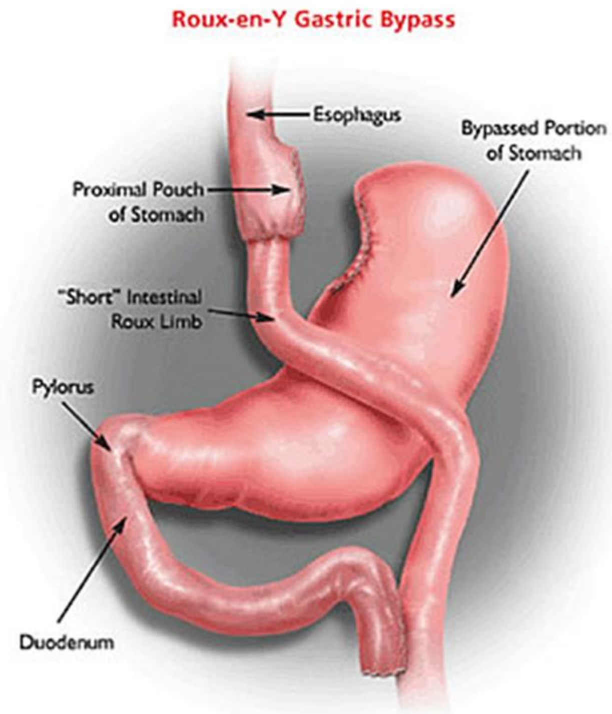
DISCLOSURES

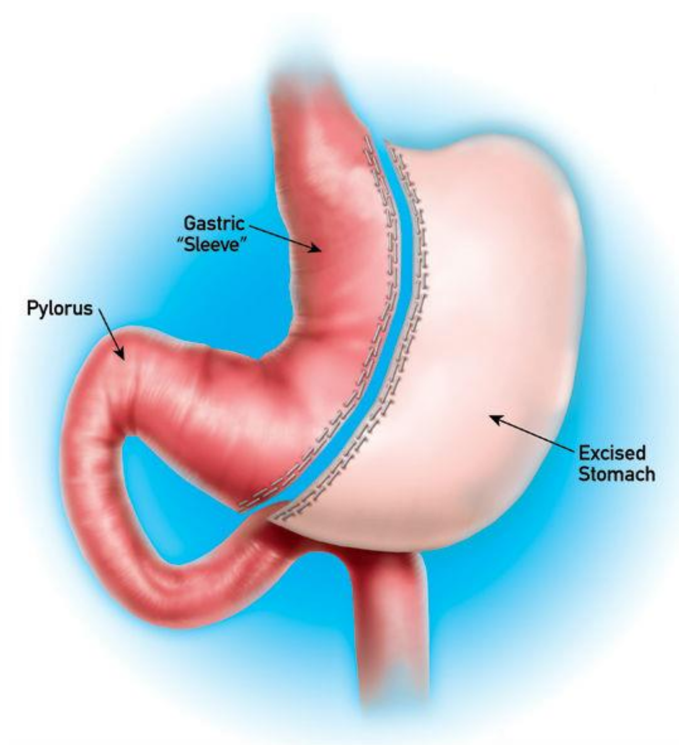
- No conflicts of interest

- National Institute of Mental Health (U19MH121738)

WHAT IS BARIATRIC SURGERY?

- Variety of procedures
  - Restriction
  - Malabsorption
  - Most common procedures
- Eligibility criteria
  - BMI and/or co-occurring diagnoses
- Most effective, durable treatment





Arterburn et al., 2018
Arterburn et al., 2020
Coleman et al., 2022a
Coleman et al., 2022b
McTigue et al., 2020
Sarma & Palcu, 2022

NUMBER OF SURGERIES

2022	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011
279,967	262,893	198,651	256,000	252,564	228,005	215,666	196,700	193,000	179,000	173,000	158,000

- Continued growth in the number of surgeries performed
  - 77% growth since 2011
- Will this decrease with GLP-1 RAs?
  - GLP-1 increased 2-fold
  - 25% decrease among privately insured

asmbs.org
Lin et al., 2024

PHYSICAL

PSYCHOLOGICAL

COMPLICATIONS

SUICIDE AFTER BARIATRIC SURGERY

-fold increased risk of suicide

-fold increased risk of self-harm/attempt

Castaneda et al., 2019
Peterhansel et al., 2013

GAPS IN AVAILABLE KNOWLEDGE

1. Are patients with obesity inherently at higher risk vs. does bariatric surgery is associated increased risk?

   - Lack of a comparison group

2. Few studies have tracked suicide or suicide attempts as an outcome.
3. Definition of self-harm/suicide attempt varies.

RECENT WORK AMONG VETERANS

- Compared bariatric surgery to nonsurgical cohort
  - Hazard ratio: 1.62 (95% CI: 1.22, 2.15)
- Areas for growth
  - Veterans are higher risk for suicide → general population
  - Sample was mostly male → 80% who undergo surgery are female
  - Next step → civilian population

Hung et al., 2023

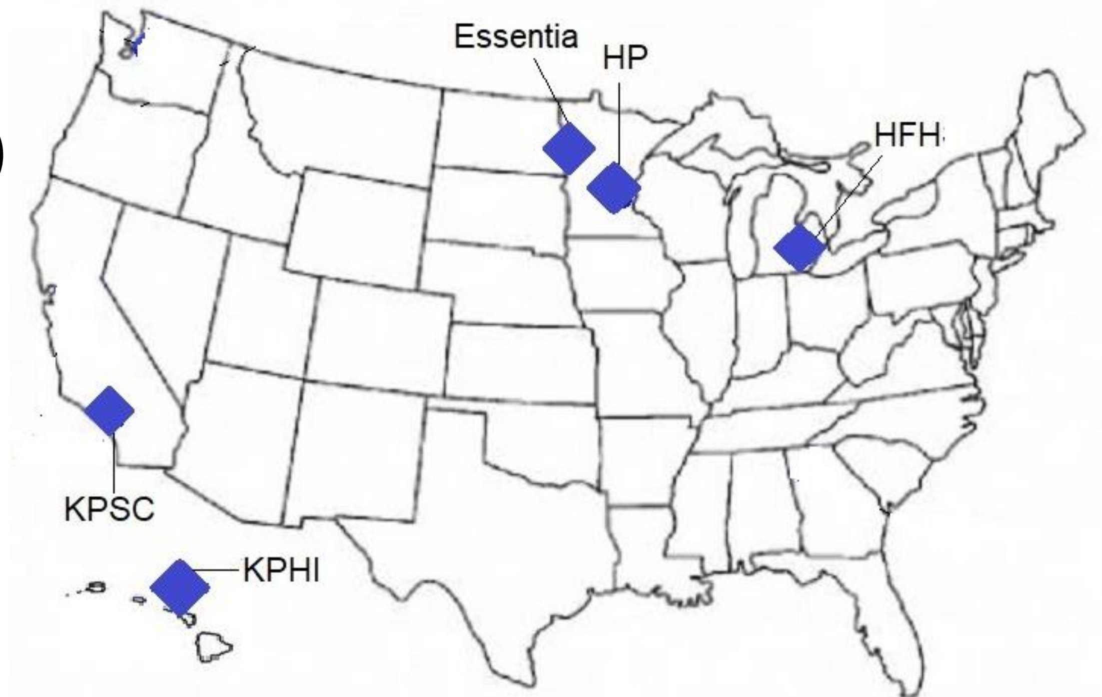
PURPOSE

1. Compare suicide attempts after bariatric surgery to non-surgical cohort with severe obesity.

2. Examine whether pre-operative factors (e.g., sociodemographic variables and prior mental health diagnosis) were associated with having a post-operative suicide attempt among those who underwent bariatric surgery.

PARTICIPATING SITES

- Henry Ford Health (HFH; Michigan)
  - Brian Ahmedani; Hsueh-Han Yeh
- Kaiser Permanente Southern California (KPSC)
  - Karen Coleman
- Kaiser Permanente Hawaii (KPHI)
  - Yihe Daida
- HealthPartners (HP; Minnesota)
  - Rebecca Rossom
- Essentia Health (Minnesota, Wisconsin, North Dakota)
  - Melissa Harry



DATA SOURCE

- Aggregate data from each site (VDW)
- Identified individuals within each health system
- Patients who initiated care between 2009 and 2017
- Continued care through 2021 (4-12 years of follow up data)

IDENTIFICATION OF COHORTS

- Surgical cohort
  - Underwent bariatric surgery (diagnosis and procedure codes)
  - BMI of $\geq$40mg/kg^2
- Non-surgical cohort
  - No bariatric surgery
  - BMI of $\geq$40mg/kg^2
- Exclusion – no GI cancer

OUTCOME –
NON-FATAL SUICIDE ATTEMPT

- From date eligible through 2021
- Used extensively validated codes to identify
  - ICD-9: prior to 10/1/2015
  - ICD-10: on or after 10/1/2015

OTHER VARIABLES

- Demographic variables - age, sex, race and ethnicity, and census-based neighborhood household income and education
- Baseline mental health & substance use disorders
  - ICD-9 and ICD-10
  - Two years prior to index date

Diagnosis Categories	
Depression Disorder	Eating Disorder
Anxiety Disorder	Personality Disorder
Bipolar Disorder	Alcohol Use Disorder
Attention Deficit Hyperactivity Disorder	Cannabis Use Disorder
Autism Spectrum Disorder	Opioid Use Disorder
Schizophrenia Spectrum Disorder	Other Substance Use Disorder

Table 1. Characteristics of the bariatric surgery and non-surgical cohorts.

		Bariatric Surgery Cohort n= 35,522		Non-Surgical Cohort n= 691,752	
Factors	Category	n	%	n	%
Age	10-17	12	<.01	22,674	3.27
	18-39	18,694	52.63	347,098	50.17
	40-64	15,326	43.15	246,823	35.68
	>=65	1,490	4.19	75,157	10.86
Sex	Female	28,370	79.87	433,997	62.73
	Male	7,151	20.13	257,742	37.26
	Other/unknown	1	<.01	8	<.01
Race/Ethnicity	Asian	573	1.61	15,794	2.28
	African American	6,055	17.05	117,289	16.96
	Hawaiian/Pacific Islander	261	.73	5,556	.80
	Hispanic	11,061	31.14	202606	29.29
	Other	1,608	4.53	48560	7.02
	White	15,965	44.94	301,947	43.65
Insurance Type	Commercial	27,762	78.15	426,718	61.69
	Medicaid	3,111	8.76	63,654	9.20
	Medicare	2,266	6.38	78,264	11.31
	Private Payment	576	1.62	14,815	2.14
	Others/Unknown	1,721	4.84	108,105	15.63
Low income	No	31,322	88.18	556,273	80.41
	Yes	3,436	9.67	106,200	15.35
	Not available	764	2.15	29,279	4.23
Low education	No	26,875	75.66	487,818	70.52
	Yes	7,883	22.19	174,672	25.25
	Not available	764	2.15	29,262	4.23
Baseline mental health disorder	No	17,242	48.54	556,689	80.48
	Yes	18,280	51.46	135,063	19.52

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AIM 1

Compare suicide attempts after bariatric surgery to a non-surgical cohort with severe obesity.

RATE OF SUICIDE ATTEMPTS

- Surgical cohort: 771 patients (2.2%)
- Non-surgical cohort: 9,151 (1.3%)
- Relative Risk Ratio = 1.64, (95% CI: 1.53, 1.76)

Table 2. Comparison of risk for suicide attempts among sociodemographic factors between the bariatric surgery and non-surgical cohorts.

Factors	Category	Cohort	n	Suicide Attempt	% with Suicide Attempt	Risk Ratio (95% CI)
Age	10-17	Bariatric Cohort	12	0	0.00	--
		Non-surgical Cohort	22,674	816	3.60	
	18-39	Bariatric Cohort	18,694	501	2.68	1.91 (1.74, 2.09)*
		Non-surgical Cohort	347,098	4,873	1.40	
	40-64	Bariatric Cohort	15,326	259	1.69	1.58 (1.39, 1.80)*
		Non-surgical Cohort	246,823	2,635	1.07	
	>=65	Bariatric Cohort	1,490	11	0.74	0.67 (0.37, 1.21)
		Non-surgical Cohort	75,157	827	1.10	
Sex	Female	Bariatric Cohort	28,370	652	2.30	1.63 (1.51, 1.77)*
		Non-surgical Cohort	433,997	6,107	1.41	
	Male	Bariatric Cohort	7,151	119	1.66	1.41 (1.18, 1.69)*
		Non-surgical Cohort	257,742	3,044	1.18	
	Other/unknown	Bariatric Cohort	1	0	0.00	--
		Non-surgical Cohort	13	0	0.00	
Race/ Ethnicity	Asian	Bariatric Cohort	573	10	1.75	1.69 (0.90, 3.18)
		Non-surgical Cohort	15,794	163	1.03	
	African American	Bariatric Cohort	6,055	114	1.88	1.42 (1.18, 1.72)*
		Non-surgical Cohort	117,289	1,554	1.32	
	Hawaiian/Pacific Islander	Bariatric Cohort	261	14	5.36	1.35 (0.80, 2.28)
		Non-surgical Cohort	5,556	221	3.98	
	Hispanic	Bariatric Cohort	11,061	243	2.20	1.99 (1.75, 2.27)*
		Non-surgical Cohort	202,606	2,235	1.10	
	Other	Bariatric Cohort	1,608	20	1.24	2.08 (1.32, 3.26)*
		Non-surgical Cohort	48,560	291	0.60	
	White	Bariatric Cohort	15,965	370	2.32	1.49 (1.34, 1.66)*
		Non-surgical Cohort	301,947	4,687	1.55	

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Table 2. Comparison of risk for suicide attempts among sociodemographic factors between the bariatric surgery and non-surgical cohorts.

Factors	Category	Cohort	n	Suicide Attempt	% with Suicide Attempt	Risk Ratio (95% CI)
Insurance Type	Commercial	Bariatric Cohort	27,762	511	1.84	1.84 (1.68, 2.02)*
		Non-surgical Cohort	426,718	4,259	1.00	
	Medicaid	Bariatric Cohort	3,111	165	5.30	1.64 (1.40, 1.91)*
		Non-surgical Cohort	63,654	2,064	3.24	
	Medicare	Bariatric Cohort	2,266	61	2.69	1.51 (1.18, 1.95)*
		Non-surgical Cohort	78,264	1,392	1.78	
	Private Payment	Bariatric Cohort	576	13	2.26	2.63 (1.50, 4.63)*
		Non-surgical Cohort	14,815	127	0.86	
	Others/Unknown	Bariatric Cohort	1,721	25	1.45	1.04 (0.71, 1.55)
		Non-surgical Cohort	108,261	1,505	1.39	
Low income	No	Bariatric Cohort	31,322	700	2.23	1.64 (1.52, 1.77)*
		Non-surgical Cohort	556,273	7,586	1.36	
	Yes	Bariatric Cohort	3,436	66	1.92	1.60 (1.25, 2.04)*
		Non-surgical Cohort	106,200	1,276	1.20	
	Not available	Bariatric Cohort	764	5	0.65	0.66 (0.27, 1.60)
		Non-surgical Cohort	29,279	289	0.99	
Low education	No	Bariatric Cohort	26,875	608	2.26	1.60 (1.47, 1.73)*
		Non-surgical Cohort	487,818	6,919	1.42	
	Yes	Bariatric Cohort	7,883	158	2.00	1.80 (1.53, 2.12)*
		Non-surgical Cohort	174,672	1,943	1.11	
	Not available	Bariatric Cohort	764	5	0.65	0.66 (0.27, 1.60)
		Non-surgical Cohort	29,262	289	0.99	
Baseline mental health disorder	No	Bariatric Cohort	17,242	173	1.00	1.30 (1.12, 1.52)*
		Non-surgical Cohort	556,689	4,288	0.77	
	Yes	Bariatric Cohort	18,280	598	3.27	0.91 (0.84, 0.99)*
		Non-surgical Cohort	135,063	4,863	3.60	--

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AIM 2

Examine whether pre-operative factors were associated with having a post-operative suicide attempt among those who underwent bariatric surgery.

Table 3. Comparison of sociodemographic factors of those with and without a suicide attempt after undergoing bariatric surgery.
.

	Bariatric Cohort N= 35,522				
	Suicide attempt (n= 771)		No suicide attempt (n= 34,751)		
Factors	**n**	**%**	**n**	**%**	**p**
Age					
10-17	0	0.0	12	.03	<.001
18-39	501	65.0	18193	52.4	
40-64	259	33.6	15067	43.4	
>=65	11	1.4	1479	4.3	
Sex					.002
Female	652	84.6	27718	79.8	
Male	119	15.4	7032	20.2	
Other/unknown	0	.0	1	<.01	
Race/Ethnicity					
Asian	10	1.3	563	1.6	<.001
African American	114	14.8	5941	17.1	
Hawaiian/Pacific Islander	14	1.8	247	.7	
Hispanic	243	31.5	10818	31.1	
Other	20	2.6	1588	4.6	
White	370	48.0	15595	44.9	

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Private Payment	13	1.7	563	1.6	
Others/Unknown	25	3.2	1696	4.9	
Low income					.01
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Yes	66	8.6	3370	9.7	
Not available	5	0.6	759	2.2	
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SUICIDE ATTEMPT RATE

- 1.64 times higher after bariatric surgery
- Significantly higher than general population (0.3%)
  - Bariatric: 2.2%
  - Non-surgical: 1.3%
- Higher than previous meta-analysis (1.7%)
  - Intentional focus
  - Consistent definition

WHY IS RISK HIGHER?

1) Higher risk among those who undergo surgery

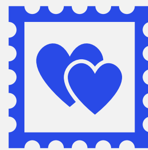
2) Pathway after bariatric surgery that increases risk

HYPOTHESIZED MECHANISMS

Return of psychiatric symptoms

Pharmacokinetic changes of antidepressants

New onset substance use and misuse


Relationship instability

Lack of coping strategies

RETURN OF PSYCHIATRIC SYMPTOMS

Pre-surgical mental health

- Higher rates of mental health disorders

Post-surgical mental health

- Initial improvements in symptoms
- Return of symptoms

Mitchell et al., 2013
Mitchell et al., 2014
Martens et al., 2021

PHARMACOKINETIC CHANGES

No extended release

- 15% remain on XR

Azran et al., 2016
Seaman et al., 2005
Malone et al., 2003

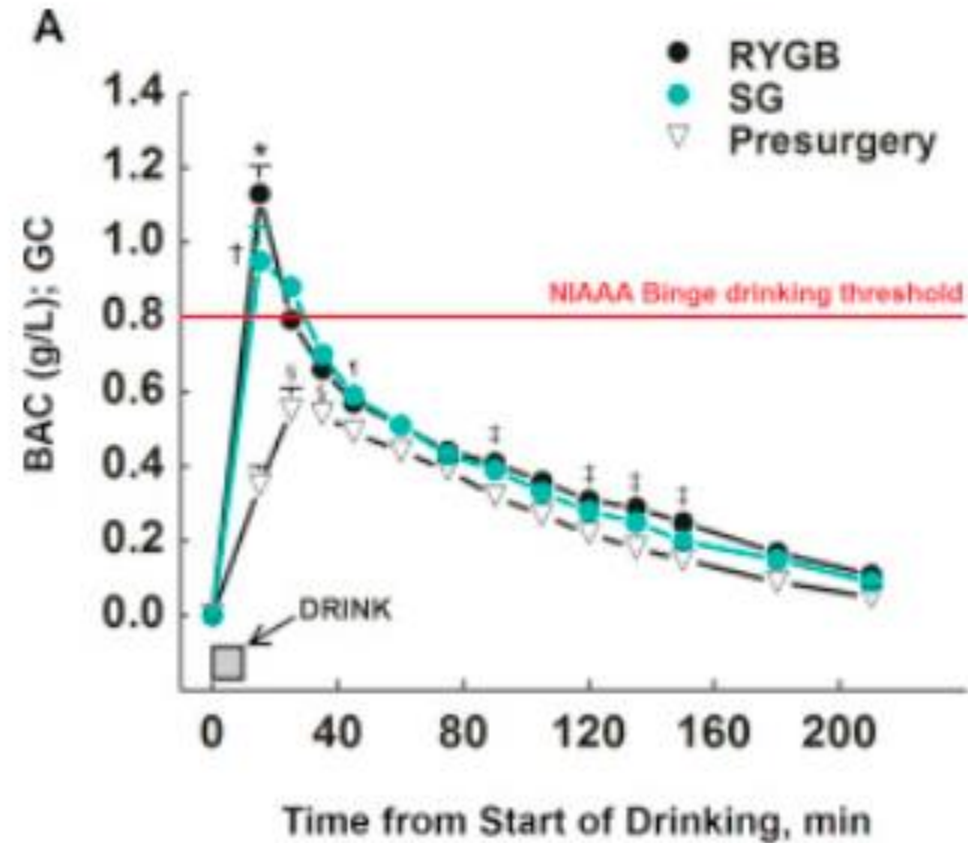
ALCOHOL USE DISORDERS AFTER BARIATRIC SURGERY

- Pre-surgery: 8%
- Post-surgery
  - 2 years: 10-12%
  - 3 years: 18%
  - 5 years: 20%

King et al., 2012
King et al., 2017
Mitchell et al., 2015
Svensson et al., 2013

REASONS FOR AN AUD

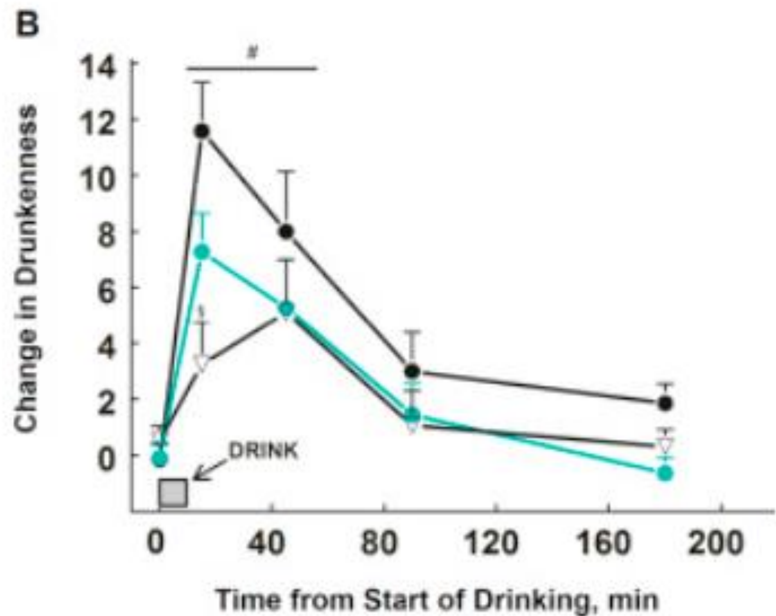
- Pharmacokinetics
  - BAC levels
  - RYGB and SG



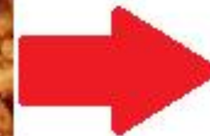
Acevedo et al., 2018
Hagedorn et al., 2007
Pepino et al., 2015
Steffen et al., 2013

REASONS FOR AN AUD

Increased sensitivity



"Addiction transfer"



Acevedo et al., 2018
Ivezaj et al., 2019
Miller-Matero et al., 2023
Smith et al., 2017
Steffen et al., 2015

RELATIONSHIP INSTABILITY

Changes after bariatric surgery impact interpersonal relationships

Increased odds of separation and divorce

Bramming et al., 2021
Bruze et al., 2018

LACK OF COPING STRATEGIES

Pre-surgery → Food

Post-surgery → ?

Miller-Matero et al., 2014
Miller-Matero et al., 2018
Mitchell et al., 2013

HYPOTHESIZED MECHANISMS

Return of medical comorbidities

Sense of failure

Mitchell et al., 2013

FACTORS ASSOCIATED WITH RISK

Several sociodemographic factors associated with increased risk

- Similar to the general population

Baseline mental health diagnosis

- Those with a dx had lower risk of suicide attempt
  - Identified and referred/treated prior to surgery
  - Symptoms improve initially after surgery

LIMITATIONS

Aggregate count data

- Unable to examine risk at individual level
- Timing of risk unknown

Potential for missed suicide attempts

- Undocumented attempts
- Lost to follow up if unenrolled

CLINICAL IMPLICATIONS

Absolute risk is low

Should not deter from surgery

Pre- and post-surgical monitoring

No current guidelines

FUTURE WORK

Rigorously matched cohorts

Determine time(s) when risk is higher

Identify factors associated with increased risk

ACKNOWLEDGEMENTS

- Henry Ford Health
  - Brian Ahmedani, PhD
  - Hsueh-Han Yeh, PhD
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- Kaiser Permanente Hawaii
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- HealthPartners
  - Rebecca Rossom, MD
- Essentia Health
  - Melissa Harry, PhD
- Kaiser Permanente Northern California
  - Esti Iturralde, PhD