

# Sat AM Case

Tim Wiegand, MD, FACMT, FAACT, DFASAM

MEDICINE *of* THE HIGHEST ORDER



UNIVERSITY *of*  
**ROCHESTER**  
MEDICAL CENTER

## Case

An 18 year-old M is brought to the Emergency Department (ED) from jail after a, "seizure."

Immediately prior to transport he was found laying on the floor of his cell with his head "jerking up and down against the bars," as he lay on the floor. This lasted for about 15-30 seconds after which he was groaning but unresponsive to stimuli.

His glucose is in the 50's when checked by EMS as they arrived.

The patient is still confused on arrival to the ED but no longer seizing.

ED vitals: HR 50's bpm, SBP 80/40 mmHg, RR 12 breaths/minute.

Exam: Morbidly obese, pupils slightly dilated, skin warm, clammy.

# Case

The patient is started on IVF with dextrose administration.

Atropine followed by norepinephrine and then epinephrine are started for the hypotension. His BP finally improves with the pressors and it maintains with mean of 65-70 mmHg (SBP 110's mmHg) and HR in 60's bpm from shortly after arrival to the ED, on transport to the PICU, and into the evening.

IVF bolus' are also administered.

The patient mental status improves and he is able to interact with medical personnel. He has been incarcerated for 2.5 weeks. 1 week GI illness preceding the seizure.

He doesn't recall anything specifically prior to transport.

Meds while incarcerated: metformin, lisinopril, citalopram, and ondansetron.

## Case

By the following AM the patient is improving and able to come off NE and epinephrine. One further episode of hypoglycemia is reported shortly after arrival but that then stabilizes.

He adamantly denies taking anything.

This has never happened before.

He admits to some previous cannabis use but none while incarcerated.

Toxicology, Neurology and Endocrinology are consulted.

### What happened?

*What tests would you like to order/do?*

# Case

**An expanded drug screen shows:** metformin, lisinopril, ondansetron, **quetiapine**, citalopram and metabolite –but is negative for standard drugs of abuse.

## Add'l Drugs,UR

### TOXICOLOGY, URINE

Drug Remark,UR	<i>see text *</i>
Add'l Drugs,UR	<i>See Text *</i>
Amphetamine,UR	<i>NEG *</i>
Barbiturate,UR	<i>NEG *</i>
Benzodiazepinen,UR	<i>NEG *</i>
THC Metabolite,UR	<i>NEG *</i>
Cocaine/Metab,UR	<i>NEG *</i>
Opiates,UR	<i>NEG *</i>

Collected: 12/23/19 0448

Resulting lab: STRONG MEMORIAL HOSPITAL

Value: See Text

Comment: Metformin present, unconfirmed  
Lisinopril present, unconfirmed  
Ondansetron present, unconfirmed  
Quetiapine present, unconfirmed  
Citalopram and metabolite present, unconfirmed  
For medical purposes only

Methodology: Liquid Chromatography-Tandem Mass Spectrometry  
Test developed and characteristics determined by UR Medicine Labs

[\\*Additional information available - comment](#)

## Case

He had been asked about K2 (synthetic cannabinoids) the morning after he arrived by the Toxicology Consult Service.

He initially denied ever using them but later conceded that he'd tried SCs in the past then admitted he'd smuggled some in to the prison and had been using them intermittently.

On the day of presentation he'd also taken some quetiapine. He was playing cards with someone who had some "cheeked" and he admitted to taking them from his "card buddy" to help 'come down' from the K2.

*Dc'd back to jail after week in hospital of extensive endocrine w/u...*

# Discussion

Abuse of prescription meds during incarceration is common:

Common culprits are?

?????

# Common Rx meds used 'non medically'

Gabapentin

- *Gabbies*

Bupropion (Wellbutrin®)

- *"Poor man's cocaine"*

Quetiapine

- *Suzie Q, Q-ball (with heroin/cocaine), 'baby heroin', quell*

Hydroxyzine or diphenhydramine (antihistamine/anticholinergic)

Clonidine

Other sedating meds...

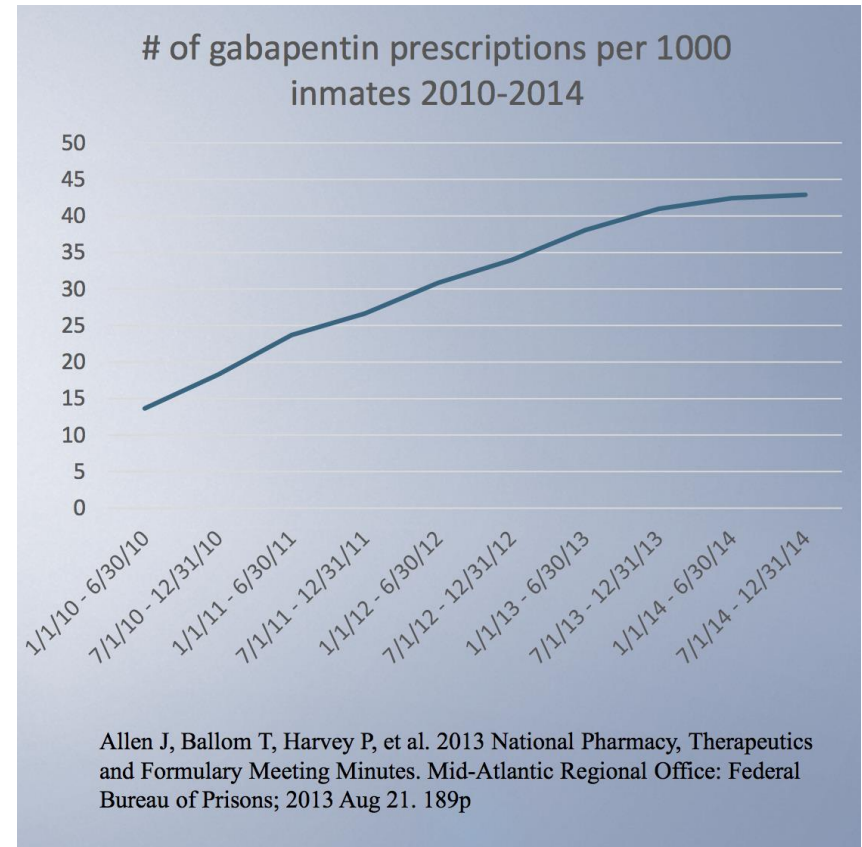
*Most not controlled/scheduled.*



# Gabapentin & Bureau of Prisons (BOP)

## BOP formulary status

- **2002** - Removed
- **2008** – Do not add
- **2009** - Add with restrictions
- **2010** – Reviewed
- **2011** – Retain with restrictions
- **2015** – Delete; add non-formulary use criteria



# Gabapentin

In a retrospective chart review from the New Jersey Department of Corrections found gabapentin as the # 1 most commonly abused medication (2003-2013)

- Gabapentin 14%
  - 2.) Diphenhydramine (8%)
  - 3.) clonidine (6%)
- 
- In Kentucky gabapentin was found in over 1/3 of all overdose deaths in 2017 (*reclassified as controlled substance in KY and many other states*).

# Quetiapine and the BOP

1998 – Added to the BOP National formulary with restrictions

1999-2004 – 10+ BOP institutions reported misuse

2004 – Cases of intranasal abuse in LA County jail reported in Am J Psychiatry

2004 – BOP National Formulary recommends local abuse education

2005 – IV abuse noted in Am J Psychiatry

2005 – Deleted from BOP National Formulary; use criteria created

2008 – Reviewed, but not added to BOP national Formulary

Letter to the Editor

## Intranasal Quetiapine Abuse

JOSEPH M. PIERRE, M.D., IGOR SHNAYDER, M.D., DONNA A. WIRSHING, M.D., and WILLIAM C. WIRSHING, M.D., Los Angeles, Calif.

**Published Online:** 1 Sep 2004 | <https://doi.org/10.1176/appi.ajp.161.9.1718>

To the Editor: We would like to report on the widespread “abuse” of quetiapine among inmates in the Los Angeles County Jail—“the largest mental health institution in the world.” Anecdotal reports from clinicians and staff estimate that as many as 30% of the inmates seen in psychiatric services report malingered psychotic symptoms (typically endorsing “hearing voices” or ill-defined “paranoia”) in order to specifically obtain quetiapine. A history of substance dependence is common among those engaging in this practice. In addition to oral administration, the drug is also taken intranasally by snorting pulverized tablets. Such abusive self-administration seems to be driven by quetiapine’s sedative and anxiolytic effects (to help with sleep or to “calm down”) rather than by its antipsychotic properties. Accordingly, the drug has a “street value” (it is sold to other inmates for money) and is sometimes referred to simply as “quell.”

## Intravenous Quetiapine Abuse

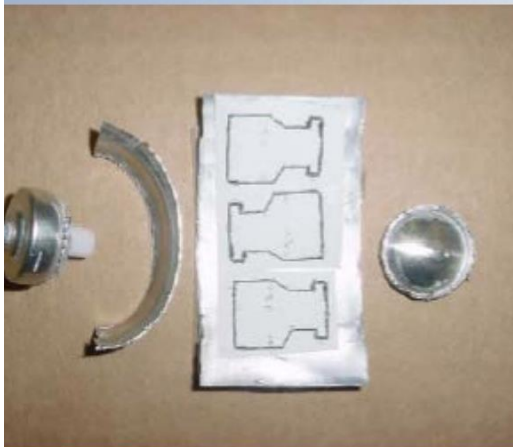
M.Z. HUSSAIN, M.D., Prince Albert, Sask., Canada, WAQAR WAHEED, M.D., and SEEMA HUSSAIN, M.D., Calgary, Alta., Canada

**Published Online:** 1 Sep 2005 | <https://doi.org/10.1176/appi.ajp.162.9.1755-a>

*Ms. A was a 34-year-old woman with a history of polysubstance dependence (alcohol, cannabis, and cocaine), depressive episodes associated with multiple suicide attempts, and borderline personality disorder who was incarcerated after conviction on charges of physical assault and possession of controlled substances. She had a history of incarceration on multiple occasions for similar charges. She complained of difficulty sleeping, poor impulse control, irritability, and depressed mood. For these symptoms, she was given oral quetiapine, 600 mg at bedtime. On one occasion, she took the pills provided to her but did not ingest them. Instead, she crushed the two 300-mg tablets, dissolved them in water, boiled them, drew the solution through a cotton swab, and while lying in bed, covered by blankets, intravenously injected the solution.*

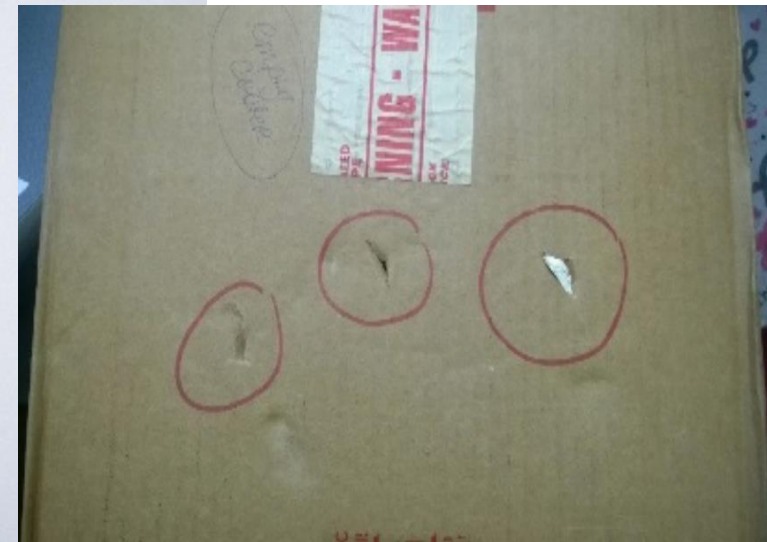
*Twelve hours later, she was awoken by facility guards who found the syringe she used still in place on her arm. She informed the guards that she had intravenously injected herself with quetiapine the previous evening and became rapidly sedated, falling asleep before she could remove the syringe. She additionally admitted to previous intranasal abuse of crushed quetiapine tablets. Apart from “the best sleep I ever had,” she described no dysphoric, euphoric, or other effects.*

# Rx meds have other uses e.g. 'handcuff key'



California Department of Corrections and Rehabilitation. Situational Information Report  
Criminal Tradecraft Alert: Inmate Manufactured Handcuff Key. 2011 Feb 28. Available from  
<http://cryptocomb.org/Handcuff%20Key%20made%20from%20Jail%20Inhaler.pdf>

# And the 'fiber shank'



Left: Correctionsone. Contraband: Fiber Shank. [Internet] . [cited 30 April 2013]. Available from: <https://www.correctionsone.com/contraband/articles/6214404-Contraband-Fiber-shank/>  
Right: Murrer J, Woodward Z. "Fiber Tablet Shank Test."

# Synthetic Cannabinoids (SC) aka 'K2', 'Spike', 'Spice'...

J Emerg Med. 2018 Dec;55(6):788-791. doi: 10.1016/j.jemermed.2018.09.012. Epub 2018 Oct 5.

## Coma, Seizures, Atrioventricular Block, and Hypoglycemia in an ADB-FUBINACA Body-Packer.

Nacca N<sup>1</sup>, Schult R<sup>2</sup>, Loflin R<sup>3</sup>, Weltler A<sup>4</sup>, Gorodetsky R<sup>5</sup>, Kacinko S<sup>6</sup>, Moran J<sup>7</sup>, Krotulski A<sup>8</sup>, Wiegand T<sup>1</sup>.

### ⊕ Author information

#### Abstract

**BACKGROUND:** Synthetic cannabinoid intoxication has become difficult to diagnose and manage in the United States, in part due to varying clinical effects within this heterogeneous group of compounds.





# Symptoms in the patient

**Bradycardia** thought to be related to the synthetic cannabinoid (*initially thought he might have ingested a beta blocker as the triad hypotension, bradycardia, hypoglycemia can occur with beta blocker ingestion (and if propranolol CNS effects could occur).*

**Hypotension** was thought to be due to quetiapine from its alpha-1 antagonism and potentially also later effect of the SC.

**Hypoglycemia** has been reported in certain SC intoxications and it could also occur in patients taking quetiapine that have hyperinsulinemia (usually hyperglycemia occurs due to insulin resistance but if low levels of intake *patient had prodrome of GI illness* with fasting or lack of intake (e.g. illness) the elevated insulin levels cause drops in available glucose).

**Seizure** may have been due to the SC or from the hypoglycemia.

# ***NYSAM Clinical Case Presentations***

***Kelly S. Ramsey, MD, MPH, MA, FACP***

***Medical Director of Substance Use Disorders***

***HRHCare***

***[kramsey@hrhcare.org](mailto:kramsey@hrhcare.org)***

***No Disclosures***

***February 8, 2020***

**MEDICINE *of* THE HIGHEST ORDER**



**UNIVERSITY *of*  
ROCHESTER  
MEDICAL CENTER**

# ***Dutchess County Medical Examiner Clinical Cases***

**Case 1:** 57 yo M: acute dyspnea and witnessed collapse shortly after smoking a substance; had been reported to be smoking the substance daily in recent weeks; autopsy revealed: acute and organizing bronchopneumonia, advanced liver fibrosis, cachexia, COPD, notable CAD; tox @ death: buprenorphine (rx'd), caffeine, nicotine, marijuana, and the smoked substance

**Case 2:** mid-60s yo M: witnessed collapse immediately after smoking a substance; pt w/ reported hx of CHF, DM, and afib; autopsy revealed: cardiac hypertrophy, CAD, PVD, COPD, hepatic steatosis; tox @ death: sertraline/trazodone/mirtazapine/risperidone (all at therapeutic levels) and the smoked substance

# ***Dutchess County Medical Examiner Clinical Cases***

**Case 3:** 51 yo F: was known to have been smoking a substance, unknown if collapse was witnessed, as she was found unconscious; pt w/ reported hx of morbid obesity (BMI 50.5) and HTN; died several days later, never regained consciousness; autopsy revealed: acute cerebellar infarct, no trauma; tox @ death: gabapentin/clonazepam/paroxetine (all at therapeutic levels), very low level of fentanyl, and the smoked substance

**Case 4:** 37 yo F: was known to have been smoking a substance, unknown if collapse was witnessed, found dead at the same scene as Case 3; autopsy revealed: severe 3v-CAD, no trauma; tox @ death: caffeine, nicotine, clonazepam (therapeutic level), low level of fentanyl, and the smoked substance

All four cases had toxicology with the same substance and all 4 deaths are attributed to complications due to acute intoxication of what substance?

# ***History of Synthetic Cannabinoids***

Synthetic cannabinoids were initially developed as pharmacological probes to explore the endogenous cannabinoid system with potential treatment for inflammatory diseases and cancer pain; no therapeutic uses have been identified

First identified as drugs of misuse in 2008 in Japan and Europe

Typically synthesized in clandestine labs in Asia and sold labeled as “not for human consumption”; initially, synthetic cannabinoids were sprayed on dried plant material, but currently, small bottles of solubilized product are shipped to avoid customs detection, and the end user smokes or vapes the product

The UN Office on Drugs and Crime World Report (2015) indicated that synthetic cannabinoids represented 39% of all new psychoactive substances

From 2014-2015, 177 synthetic cannabinoids were reported to the UN Office on Drugs and Crime from 58 countries and territories. An encouraging trend is the recent reduction in the number of synthetic cannabinoids introduced per year.

# ***Reported Effects Associated with Synthetic Cannabinoid Intoxication***

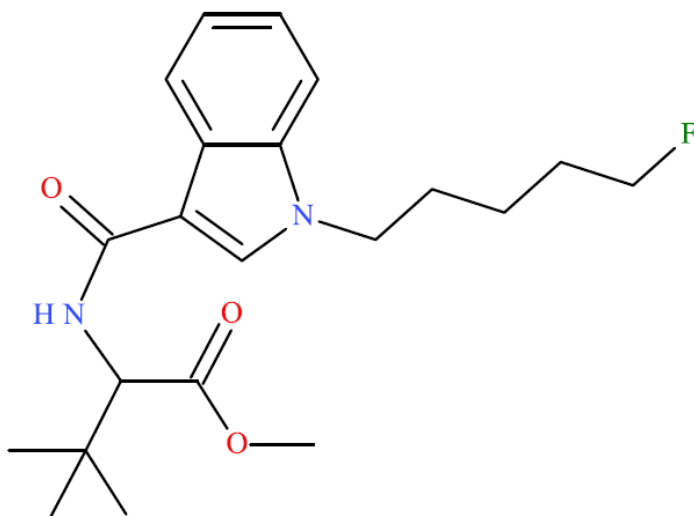
**TABLE 2: Reported effects with synthetic cannabinoid intoxication**

<b><u>System</u></b>	<b><u>Synthetic Cannabinoid Intoxication Effects</u></b>
<b>Cardiac</b>	<b>Tachycardia, supraventricular tachycardia, ventricular fibrillation, myocardial infarction, sudden cardiac death, coronary arterial thrombosis</b>
<b>Hematological</b>	<b>Immune thrombocytopenia, intracranial hemorrhage, coagulopathy</b>
<b>Neurological</b>	<b>Dizziness, tremor, altered mental status, seizure, acute ischemic infarction</b>
<b>Psychiatric</b>	<b>Agitation, anxiety, paranoia, psychosis, suicidal ideation, delirium, dissociation, depersonalization, hallucinations, disorganized behavior</b>
<b>Renal</b>	<b>Acute kidney injury, acute tubular necrosis</b>
<b>Other</b>	<b>Nausea, vomiting, rhabdomyolysis, hyperthermia</b>

# Molecular Structure of Synthetic Cannabinoid 5F-MDMB-PICA



## 5F-MDMB-PICA



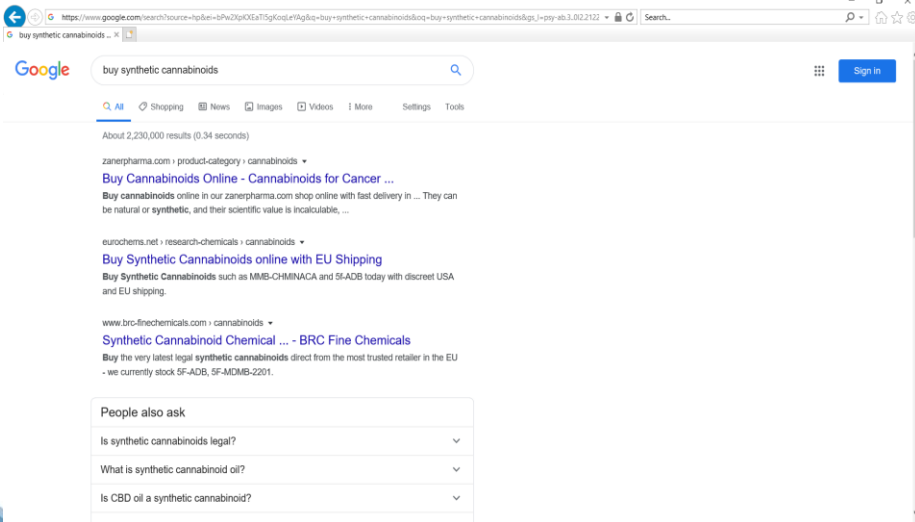
Sample Type: **Seized Material &  
Biological Fluid**

Latest Revision: **July 31, 2018**

Date of Report: **July 31, 2018**

Earliest Identification: **November 2017  
(Seized Material)**

# Branded Products Containing Synthetic Cannabinoids, including 5F-MDMB-PICA



Branded herbal smoking mixtures:

Mind Trip

Devil

Armageddon

Trippy Top

Tropical High

Astro

Red Russian

Supernova

AK-47

Dead Man Walking

Joker

Many others...



# ***Synthetic Cannabinoid 5F-MDMB-PICA Overview***

Brief Description: 5F-MDMB-PICA is classified as a synthetic cannabinoid. Synthetic cannabinoids have been reported to cause psychoactive effects similar to delta-9-THC. Synthetic cannabinoids have caused adverse events, including deaths. Extensive metabolism: difficult to detect; not standard on screening panels

First detection in the US:  
10/2016

Sample history: biological fluid:

5F-MDMB-PICA has been identified in 9 cases since 1/2018

Geographical location: PA (n=4), NY (n=2), LA (n=1), IN (n=1), TX (n=1)

Gender: M (n=5), F (n=1)

Age Range: 17-55 years (n=5)

Biological Sample: Blood (n=7), Femoral Blood (n=2)

Additional Cannabinoids Detected: 5F-ADB (5f-MDMB-PINACA) (n=3), FUB-AMB (MMB-FUBINACA) (n=5), MDMB-FUBINACA (n=1), THC (n=1)

# ***Synthetic Cannabinoid 5F-MDMB-PICA Pharmacology and Use***

Classified as an indole

Data from preclinical studies show that 5F-MDMB-PICA binds to and acts as a potent full agonist at the CB1 and/or CB2 receptor; elicits cannabimimetic effects, similar to THC

There are no published studies on the safety of 5F-MDMB-PICA for human use

There are no commercial or medical uses for 5F-MDMB-PICA. 5F-MDMB-PICA has been encountered in numerous synthetic cannabinoid products that are smoked for their psychoactive effects.

Information on the user population is limited. The Monitoring the Future (MTF) Study, a national cross-sectional survey, queries the use of synthetic cannabinoids among high-school attending adolescents, revealed a decrease in past-year use from 11.86% in 2011 to 4.75% in 2015. Poison control centers continue to report adverse health effects due to the use of synthetic cannabinoids. Serious adverse effects, including death, have been reported following the use of 5F-MDMB-PICA.

5F-MDMB-PICA is classified as a Schedule I controlled substance

# ***Adverse Events Associated with Synthetic Cannabinoids, and, Specifically, 5F-MDMB-PICA***

Potential hazards associated with synthetic cannabinoid use in general: arrhythmias, myocardial infarction, sudden cardiac death, psychosis, suicidal ideation, seizures, ATN, intracranial hemorrhage, and coagulopathies (due to the rodenticide additive brodifacoum); cardiovascular fatalities in the literature: sudden cardiac death in a 22 yo M after smoking SC (MDMB-CHMICA) and fatal coronary artery thrombosis in a 41 yo F after smoking SC (ADB-FUBINACA) (incidentally, originally created by Pfizer in 2009); in Mississippi between 3/2015-5/2015, there were ~1200 ED visits and 17 deaths related to SC use; in Alabama during the same timeframe, there were ~1000 ED visits and 5 deaths related to SC use

“Mass-overdose” cases reported in New Haven, CT in 8/2018, associated with 5F-MDMB-PICA; 52 patients presented over 109 ED visits (range 1-13 visits per patient), 49 visits were within a 10-hr period; clinical features reported included: decreased mental status, agitated delirium, and seizures; 2 patients were intubated

“Mass-overdose” cases reported in Washington DC in 9/2018, 244 cases confirmed the presence of 5F-MDMB-PICA and FUB-AMB

UNDOC Tox Portal: 13 clinical cases and deaths due to 5F-MDMB-PICA; 2 post-mortem cases with only 5F-MDMB-PICA found as exogenous substances; Case 1: 47 yo M w/ SUD and Type 1 DM, autopsy revealed pulmonary edema, fatty liver, and underweight; Case 2: 49 yo M w/ SUD; autopsy nonremarkable; in both cases, ketoacidosis secondary to 5F-MDMB-PICA acute intoxication was considered the cause of death

***Pre-existing conditions (particularly cardiopulmonary disease) may produce greater risk for a fatal case outcome***

# ***Summary for Synthetic Cannabinoids***

No antidote for acute intoxication

Supportive management only dependent on presenting symptoms

Withdrawal syndrome reportedly similar to that for marijuana, except potentially more severe: anxiety, irritability, insomnia, cravings, lethargy, labile mood

Persons with underlying cardiopulmonary and other chronic conditions may be more vulnerable to a fatal outcome using synthetic cannabinoids

NMS and Kia Newman, MD (Dutchess County ME) plan to do additional research and publish the Dutchess County clinical cases

# References

Special thanks to Kia Newman, MD, Dutchess County, NY Medical Examiner.

5F-MDMB-PICA Fact Sheet, NMS Labs.

5F-MDMB-PICA (5F-MDMB-2201) Fact Sheet, DEA, May 2019.

Alipour, Azita, PharmD, et al. *Review of the many faces of synthetic cannabinoid toxicities*, The Mental Health Clinician [internet], 2019, 9(2): pp. 93-99.

Athanasidou, Andriani, et al. *Cannabinoid receptor agonists are mitochondrial inhibitor: A unified hypothesis of how cannabinoids modulate mitochondrial function and induce cell death*, Biochemical and Biophysical Research Communications, Volume 364, Issue 1, 12/7/07, pp. 131-137

Austgulen Westin, Andreas, et al. *Letter to the Editor: Sudden Cardiac Death Following Use of the Synthetic Cannabinoid MDMD-CHMICA*, Journal of Analytical Toxicology, 2016: 40: 86-87.

Cohen, Koby, et al. *Synthetic and Non-synthetic Cannabinoid Drugs and Their Adverse Effects – A Review from Public Health Perspective*, Frontiers in Public Health, Volume 6, Article 162, June 2018, pp. 1-8.

Diao, Xingxing, et al. *New Synthetic Cannabinoids Metabolism and Strategies to Best Identify Optimal Marker Metabolites*, Frontiers in Chemistry, Volume 7, Article 109, March 2019, pp. 1-15.

Labay, Laura M., et al. *Synthetic cannabinoid drug use as a cause or contributory cause of death*, Forensic Science International, Volume 260, March 2016, pp. 31-39.

NIH. *Drug Facts: Synthetic Cannabinoids*, <https://www.drugabuse.gov/publications/drugfacts/synthetic-cannabinoids-k2spice>, revised 2/2018.

Powell, Devin. *The Spice of Death: The Science behind Tainted "Synthetic Marijuana"*, Scientific American, <https://www.scientificamerican.com/article/the-spice-of-death-the-science-behind-tainted-synthetic-marijuana/>, 4/17/18.

Shanks, Kevin D., et al. *Case Report: Death Associated With the Use of the Synthetic Cannabinoid ADB-FUBINACA*, Journal of Analytical Toxicology, 2016, 40: 236-239.

Trecki, Jordan, PhD, et al. *Synthetic Cannabinoid-Related Illness and Deaths*, NEJM, 373;2, 7/9/15, pp. 103-107.

WHO, *Critical Review Report: 5F-MDMB-PICA*, October 2019.

## Case 3: A 64 year-old female

Admitted to rehab for treatment of AUD following a “detox” protocol. MMTP 60mg for many years. No Opioids.

Married: Spouse no SUD:

F: +EtOH 4S: No EtOH 2Children: No EtOH

HS Graduate: Employed in Sales

Social, Occasional EtOH until age 56

? Event → ↑↑ EtOH one year after event → AUD

Labs: Normal CMP, CBC, Lipids

UDT: + Methadone

## 64 yo Female with AUD

Age 56: Bariatric Surgery: 5' 4" 240lbs. BMI=

? Type of Bariatric Surgery?

? RYBS, SG, LAGB

SG

2 liters Vodka day

## 22 yo Male

Admitted to rehab for treatment of AUD, following  
“Detox”

FH: neg for EtOH

Stutter age 8—14: Physical Abuse Stepparent 8—  
15

Associate Degree

Age 16—17: Occasional EtOH

Age 18: ?Event → ↑↑ EtOH 2yrs after event→AUD



## Key Take Home Points

Rates of EtOH related problems ↑ in ~ 10% of WLS Pts.

More likely with RYGB, SG than LAGB.

Some WLS patients ↓ EtOH intake.

EtOH problems increase over time. Usually begins ~2 years after WLS.

Inform and Monitor all WLS patients about the risk of AUD/SUD over time.

# Predictors of AUD

Type of Weight Loss Surgery

Male: Women More WLS

Younger Age, FH

EtOH use Pre-Op

Tobacco

Lower Sense of Belonging, Depression

More Weight Loss → ↑ Socialization → ↑ EtOH

## 22 yo Male with AUD

Age 18: Bariatric Surgery: ?RYGB, SG, LAGB

Age 6: ↑ Weight: Teased

Age 16: 6' 00": 300lbs: BMI=

Age 18: RYGB Mother RYGB 6 mos. Earlier

Age 20: Felt depressed: Drank EtOH : Felt much different than prior to RYGB

One Liter Bourbon daily

Thinks alcohol substituted for food

# ?Addiction Transfer/Substitution

? Why Delayed to ~ 2years

? Why Procedure Dependent

? Occurs In Patients with Gastric CA: nl BMI

Rodent Model: ↑EtOH after RYGB

# ? Pharmacokinetics/Pharmacodynamics

Explains Difference RYGB, SG, LAGB

↓ Gastric ADH

↓ Weight

↑ Absorption, ↑ Cmax, earlier Tmax

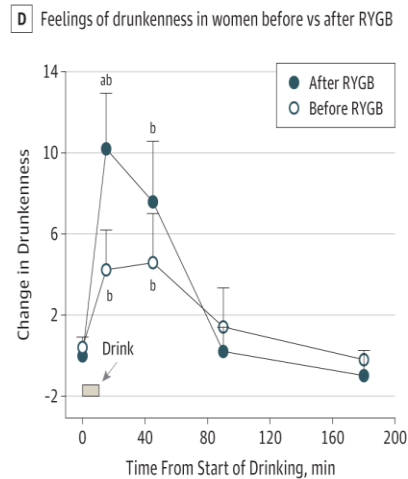
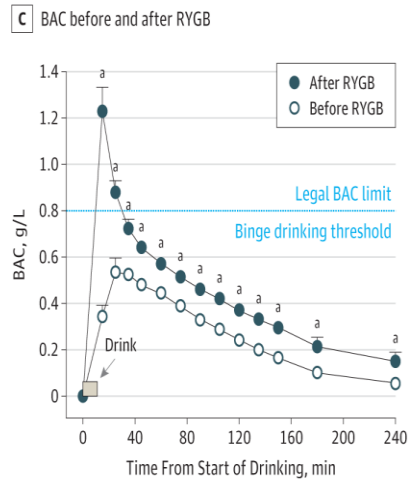
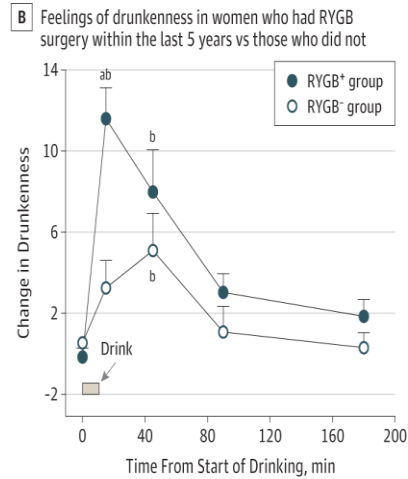
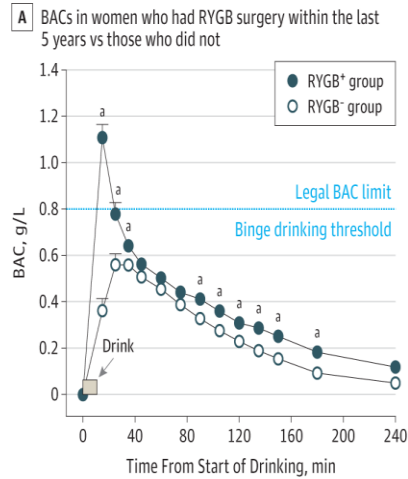
Feeling More Intoxicated

AUD >> Other SUDs

Cocaine Analogy: I.N. → Smoked (Crack Cocaine)

# From: Effect of Roux-en-Y Gastric Bypass Surgery: Converting 2 Alcoholic Drinks to 4

JAMA Surg. 2015;150(11):1096-1098, Pepino et al



# Prevalence of Alcohol Use Disorders Before and After Bariatric Surgery

Wendy C. King, PhD

Jia-Yuh Chen, MS

James E. Mitchell, MD

Melissa A. Kalarchian, PhD

Kristine J. Steffen, PharmD, PhD

Scott G. Engel, PhD

Anita P. Courcoulas, MD, MPH

Walter J. Pories, MD

Susan Z. Yanovski, MD

AS THE PREVALENCE OF SEVERE obesity increases in the United States,<sup>1</sup> it is becoming increasingly common for health care providers and their patients to consider bariatric surgery, which is the most effective and durable treatment for severe obesity.<sup>2</sup> Although bariatric surgery may reduce long-term mortality,<sup>3,4</sup> and it carries a low risk of short-term serious adverse outcomes,<sup>5</sup> safety concerns remain. Anecdotal reports suggest that bariatric surgery may increase the risk for alcohol use disorders (AUD; ie, alcohol abuse and dependence).<sup>6</sup> However, only 3 studies have examined AUD before and after bariatric surgery.

Mitchell et al<sup>7</sup> attempted to contact 100 patients who had received the Roux-en-Y gastric bypass (RYGB)

**Context** Anecdotal reports suggest bariatric surgery may increase the risk of alcohol use disorder (AUD), but prospective data are lacking.

**Objective** To determine the prevalence of preoperative and postoperative AUD, and independent predictors of postoperative AUD.

**Design, Setting, and Participants** A prospective cohort study (Longitudinal Assessment of Bariatric Surgery-2) of adults who underwent bariatric surgery at 10 US hospitals. Of 2458 participants, 1945 (78.8% female; 87.0% white; median age, 47 years; median body mass index, 45.8) completed preoperative and postoperative (at 1 year and/or 2 years) assessments between 2006 and 2011.

**Main Outcome Measure** Past year AUD symptoms determined with the Alcohol Use Disorders Identification Test (indication of alcohol-related harm, alcohol dependence symptoms, or score  $\geq 8$ ).

**Results** The prevalence of AUD symptoms did not significantly differ from 1 year before to 1 year after bariatric surgery (7.6% vs 7.3%;  $P = .98$ ), but was significantly higher in the second postoperative year (9.6%;  $P = .01$ ). The following preoperative variables were independently related to an increased odds of AUD after bariatric surgery: male sex (adjusted odds ratio [AOR], 2.14 [95% CI, 1.51-3.01];  $P < .001$ ), younger age (age per 10 years younger with preoperative AUD: AOR, 1.31 [95% CI, 1.03-1.68],  $P = .03$ ; age per 10 years younger without preoperative AUD: AOR, 1.95 [95% CI, 1.65-2.30],  $P < .001$ ), smoking (AOR, 2.58 [95% CI, 1.19-5.58];  $P = .02$ ), regular alcohol consumption ( $\geq 2$  drinks/week: AOR, 6.37 [95% CI, 4.17-9.72];  $P < .001$ ), AUD (eg, at age 45, AOR, 11.14 [95% CI, 7.71-16.10];  $P < .001$ ), recreational drug use (AOR, 2.38 [95% CI, 1.37-4.14];  $P = .01$ ), lower sense of belonging (12-item Interpersonal Support Evaluation List score per 1 point lower: AOR, 1.09 [95% CI, 1.04-1.15];  $P = .01$ ), and undergoing a Roux-en-Y gastric bypass procedure (AOR, 2.07 [95% CI, 1.40-3.08];  $P < .001$ ; reference category: laparoscopic adjustable gastric band procedure).

**Conclusion** In this cohort, the prevalence of AUD was greater in the second postoperative year than the year prior to surgery or in the first postoperative year and was associated with male sex and younger age, numerous preoperative variables (smoking, regular alcohol consumption, AUD, recreational drug use, and lower interpersonal support) and undergoing a Roux-en-Y gastric bypass procedure.

JAMA. 2012;307(23):2516-2525

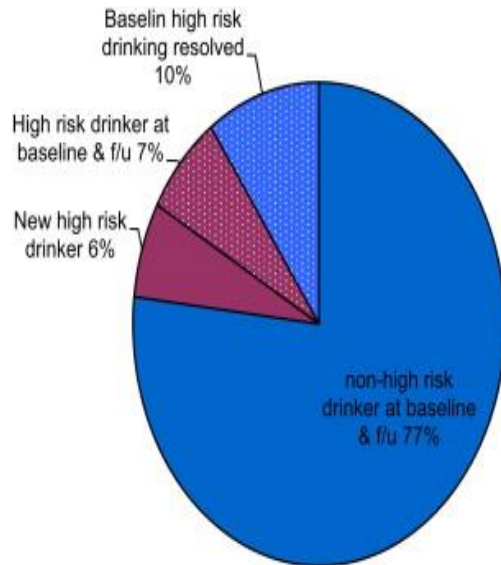
Published online June 18, 2012. doi:10.1001/jama.2012.6147

www.jama.com

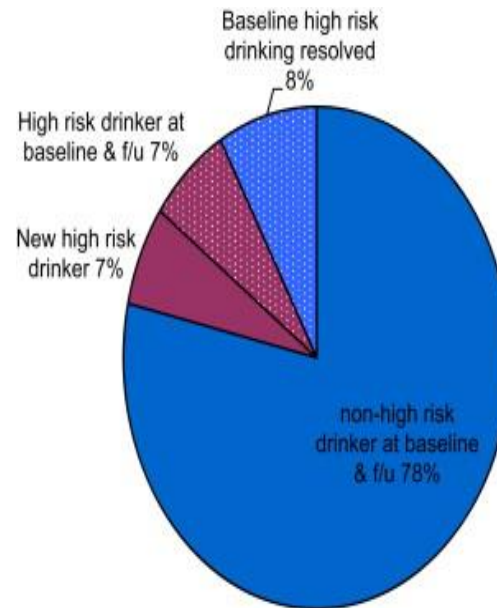
Integrated health article

High-risk alcohol use after weight loss surgery

Christina C. Wee, M.D., M.P.H., F.A.C.P.<sup>a,\*</sup>, Kenneth J. Mukamal, M.D., M.P.H.<sup>a</sup>,  
 Karen W. Huskey, M.P.H.<sup>a</sup>, Roger B. Davis, Sc.D.<sup>a</sup>, Mary Ellen Colten, Ph.D.<sup>b</sup>,  
 Dragana Bolcic-Jankovic, M.A.<sup>b</sup>, Caroline M. Apovian, M.D.<sup>c</sup>,  
 Daniel B. Jones, M.D., F.A.S.P.<sup>d</sup>, George L. Blackburn, M.D., Ph.D.<sup>d,e</sup>



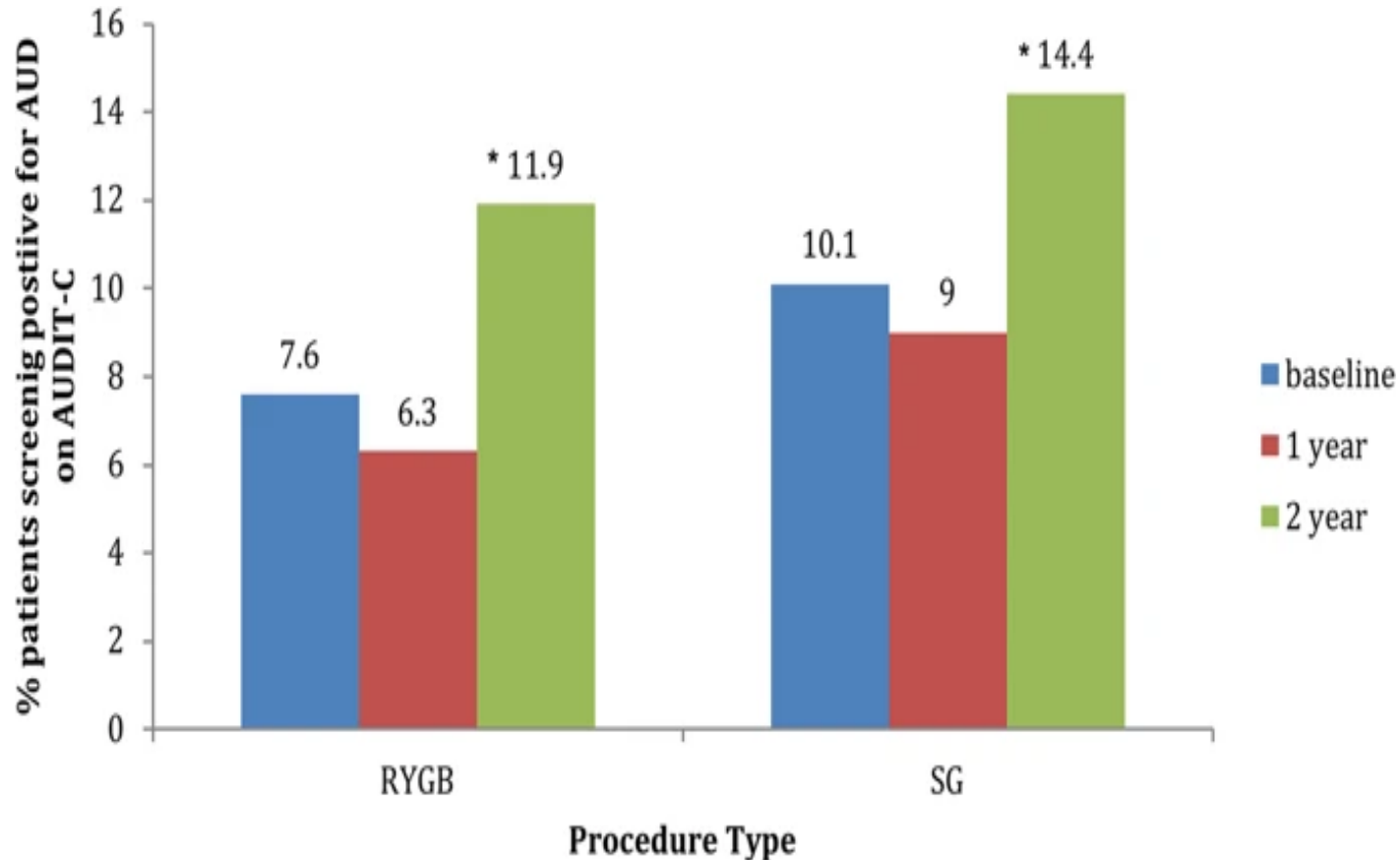
High-risk alcohol use at 1-year follow-up relative to baseline (n = 375).



High-risk alcohol use at 2-year follow-up relative to baseline (n = 328)

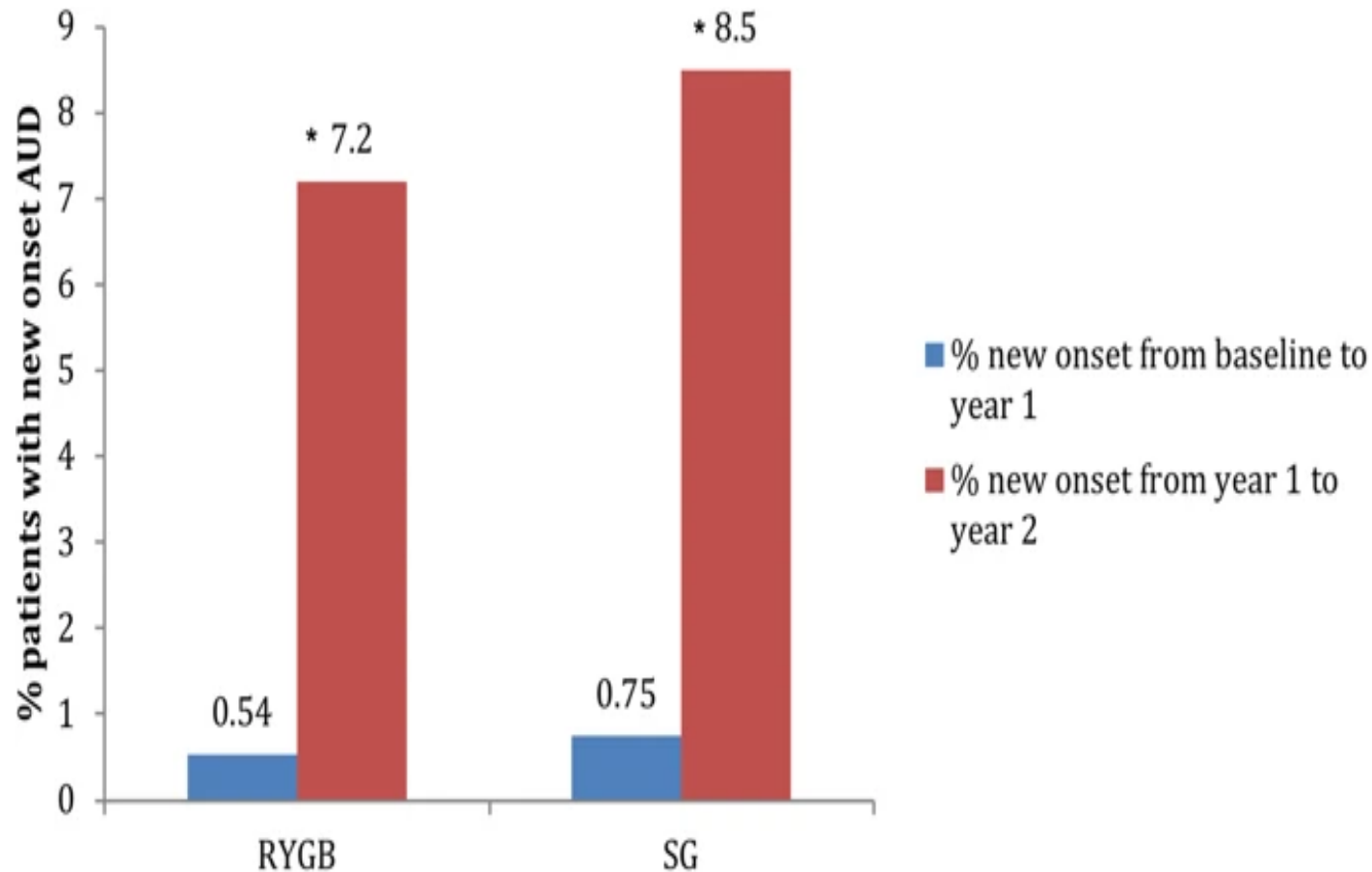


**Comparison of patients screening positive for AUD at baseline, year 1, and year 2. There is a significant increase in AUD positive patients at year 2 compared to baseline for RYGB and SG procedures (\*p < 0.001)**



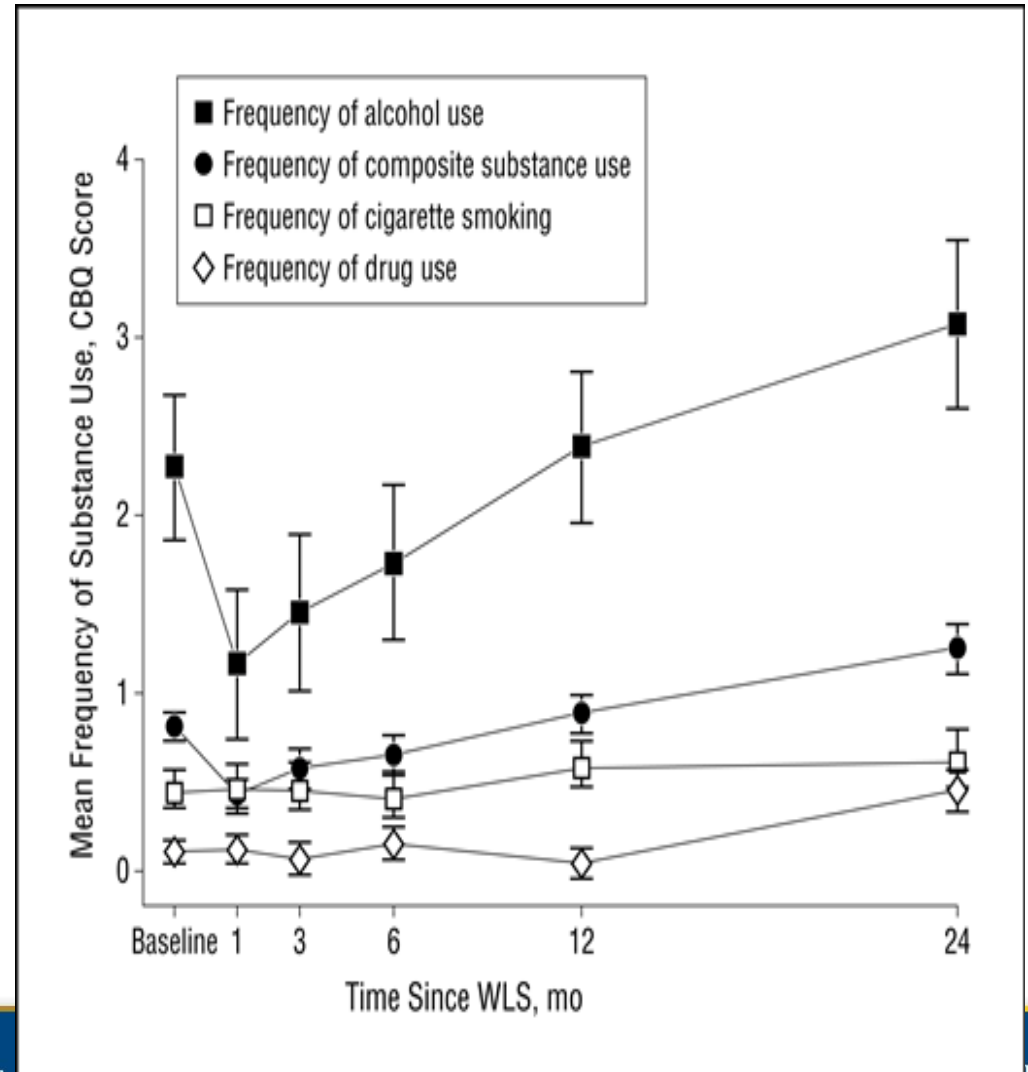
Ibrahim, N., Alameddine, M., Brennan, J. et al. New onset alcohol use disorder following bariatric surgery. Surg Endosc 33, 2521–2530 (2019)

# Comparison of patients screening positive for AUD between baseline and year 1 and year 1 to year 2 following surgery



Ibrahim, N., Alameddine, M., Brennan, J. et al. New onset alcohol use disorder following bariatric surgery. Surg Endosc 33, 2521–2530 (2019)

# Estimated mean frequency of substance use by category for bariatric weight loss surgery (WLS) based on Compulsive Behaviors Questionnaire (CBQ) scores of 155 participants.



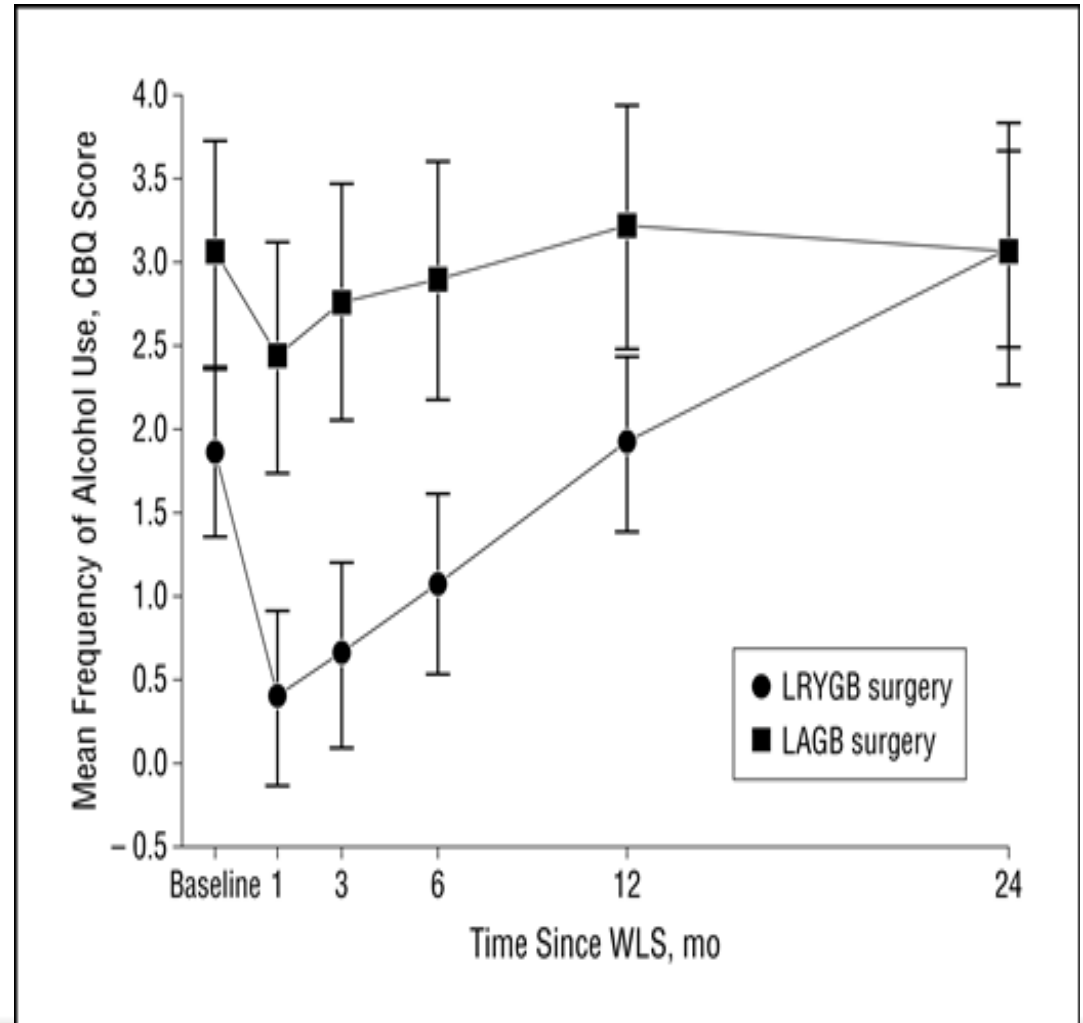
## Substance Use Following Bariatric Weight Loss Surgery

Alexis Conason, PsyD; Julio Teixeira, MD; Chia-Hao Hsu, PhD; Lauren Puma, MS; Danielle Knafo, PhD; Allan Geliebter, PhD

# Estimated mean frequency of alcohol use for laparoscopic Roux-en-Y gastric bypass (LRYGB) surgery and laparoscopic adjustable gastric band (LAGB) surgery

## Substance Use Following Bariatric Weight Loss Surgery

Alexis Conason, PsyD; Julio Teixeira, MD; Chia-Hao Hsu, PhD; Lauren Puma, MS; Danielle Knafo, PhD; Allan Geliebter, PhD



JAMA Surg. 2013;148(2):145-150

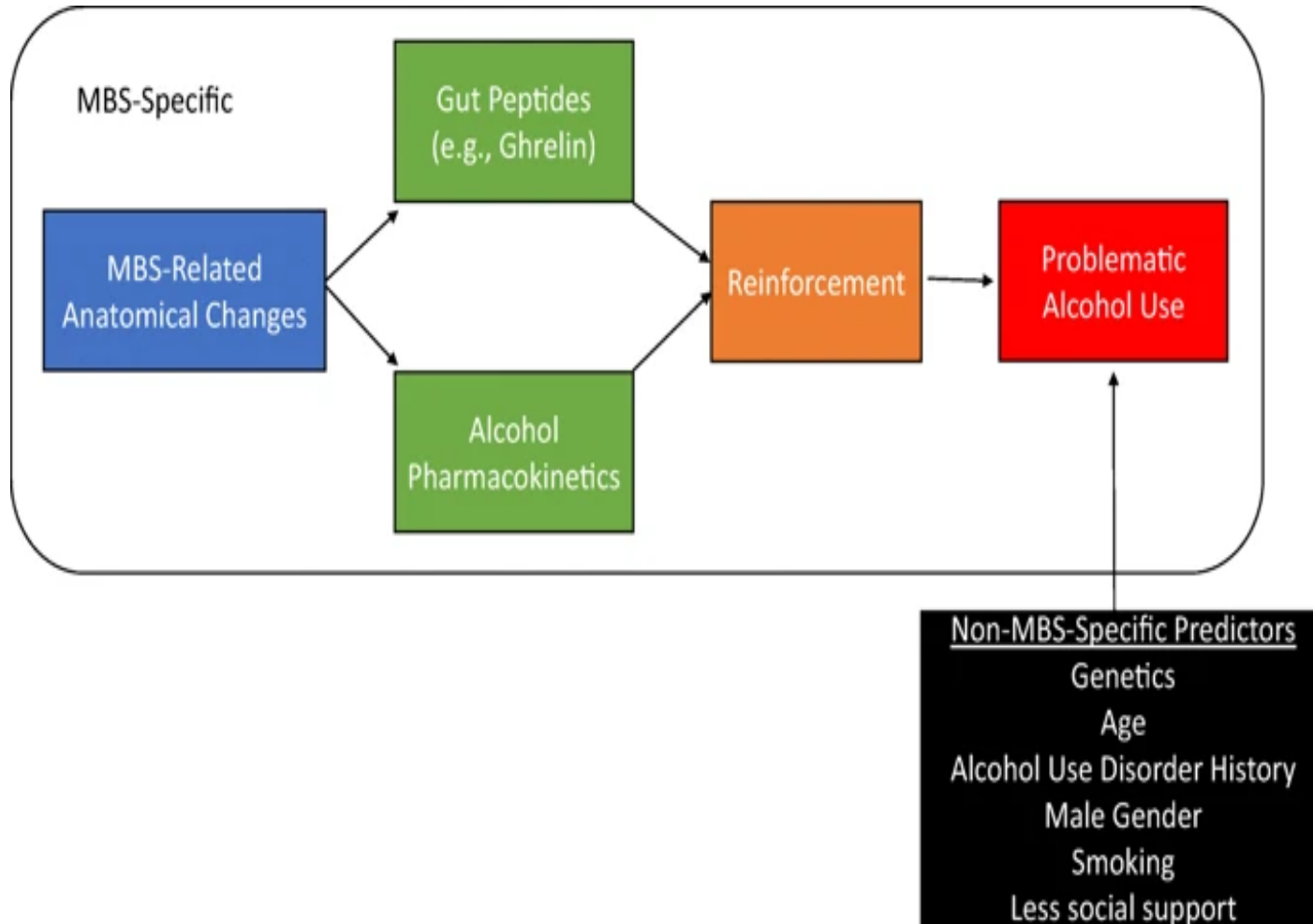


## Changes in Alcohol Use after Metabolic and Bariatric Surgery: Predictors and Mechanisms

Valentina Ivezaj<sup>1</sup> · Stephen C. Benoit<sup>2</sup> · Jon Davis<sup>3</sup> · Scott Engel<sup>4</sup> · Celia Lloret-Linares<sup>5</sup> · James E. Mitchell<sup>6</sup> · M. Yanina Pepino<sup>7</sup> · Ann M. Rogers<sup>8</sup> · Kristine Steffen<sup>4</sup> · Stephanie Sogg<sup>9,10</sup>

Author(s)	N	Surgery	F/U	% ETOH misuse, abuse, or dependence
Mitchell et al. 2001 [10]	78	RYGB	13–15 years	7.8%
Buffington et al. 2007 [75]	318	Variable	Variable	28.4%
Ertelt et al. 2008 [8]	70	RYGB	6–10 years	10.0%
Welch et al. 2011 [76]	75	RYGB	2–3 years	1.3%
Suzuki et al. 2012 [12]	23/28	RYGB/LAGB	31–59 months	21.4%/0.0%
Svensson et al. 2013 [13]	164/135	RYGB/bands	10/15 years	% not indicated
Conason et al. 2013 [77]	100/55	RYGB/bands	24 months	% not indicated
Wee et al. 2014 [14]	328	RYGB/LAGB/SG	2 years	13% combined
Reslan et al. 2014 [78]	141	RYGB	Mean 6.2 years	14%
Alfonsson et al. 2014 [79]	129	RYGB	1 year	2.3%
Ivezaj et al. 2014 [69]	143	RYGB	Mean 2.7 years	19.6%
Burgos et al. 2015 [74]	277	RYGB/LAGB	2 years	9.4% combined
King et al. 2017 [2]	752/250	RYGB/LAGB	7 years	16.4%/----
Spadola et al. 2017 [11]	69	RYGB/LAGB/SG	5–55 months	14.5% combined
Coluzzi et al. 2018 [80]	142	LAGB	1 year	2.1%
Ibrahim et al. 2019 [9]	5724	RYGB/SG	2 years	11.9%/14.4%

# Preliminary model of potential mechanisms underlying AUD risk after MBS

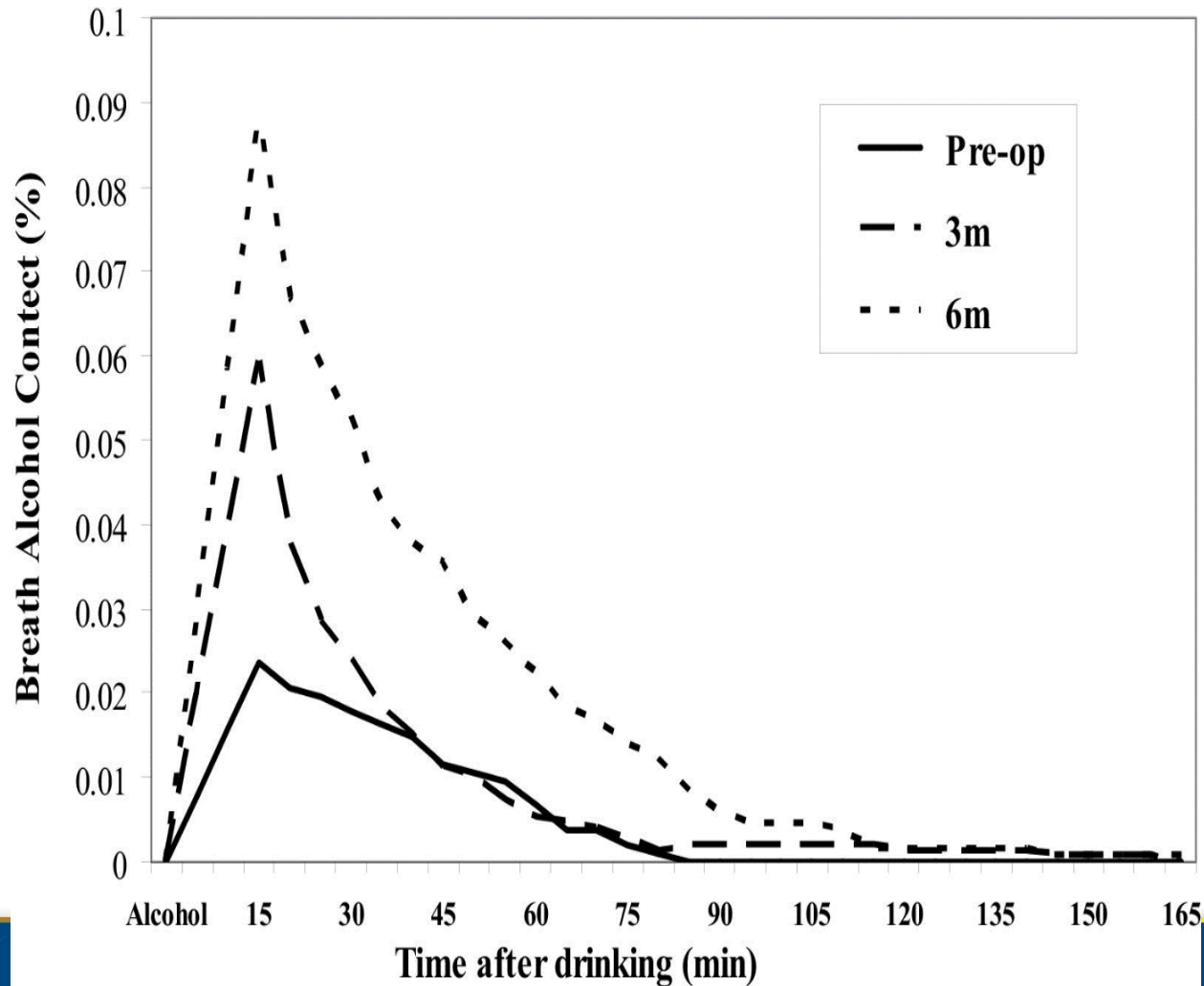


# Impaired Alcohol Metabolism after Gastric Bypass Surgery: A Case-Crossover Trial

Gavitt A Woodard, BS, John Downey, MD, Tina Hernandez-Boussard, PhD, MPH,  
John M Morton, MD, MPH, FACS

J Am Coll Surg

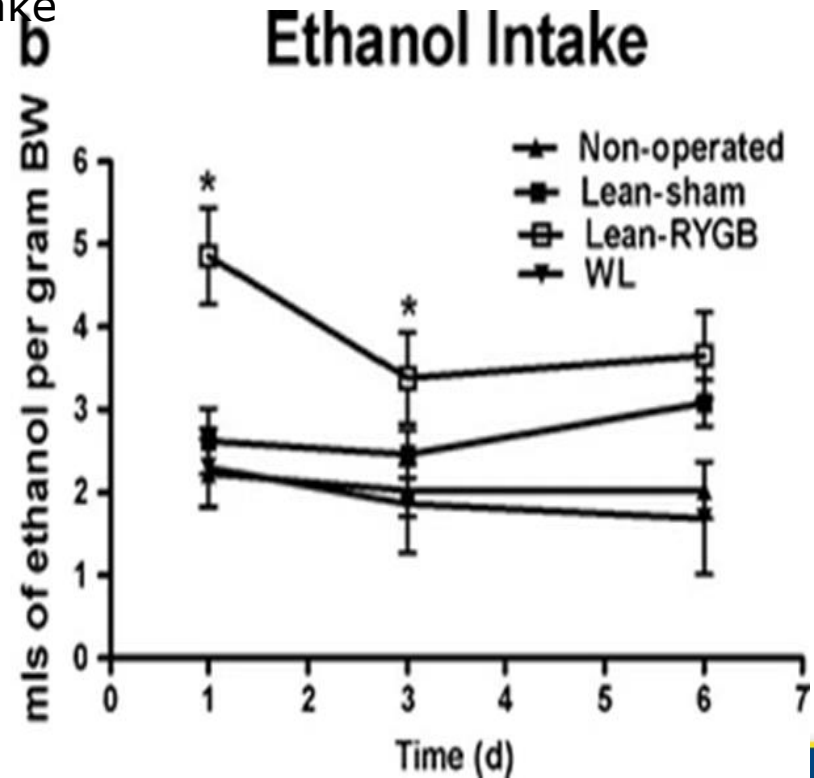
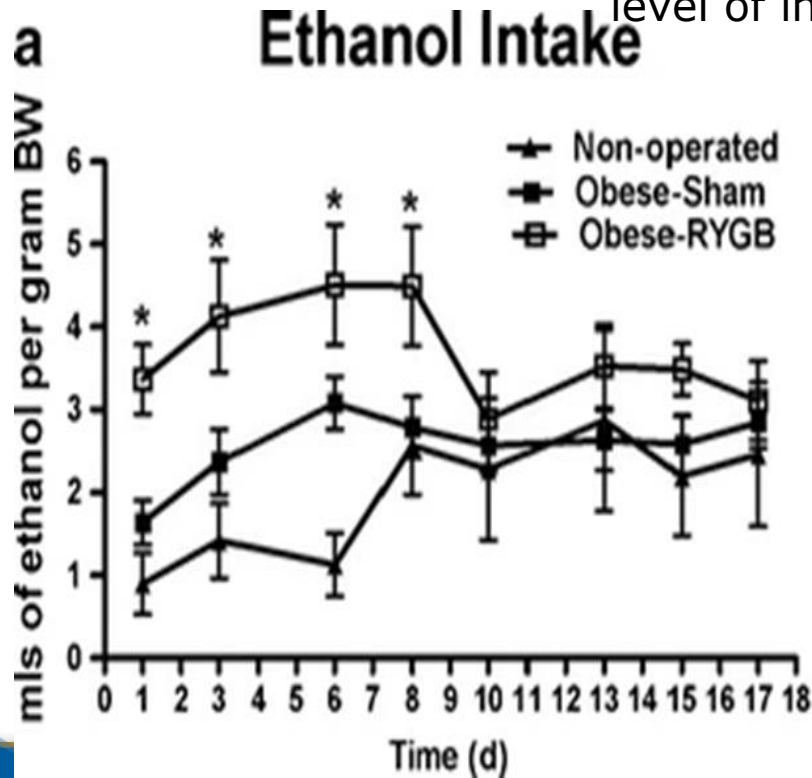
2011;212;209-214



## Roux en Y Gastric Bypass Increases Ethanol Intake in the Rat

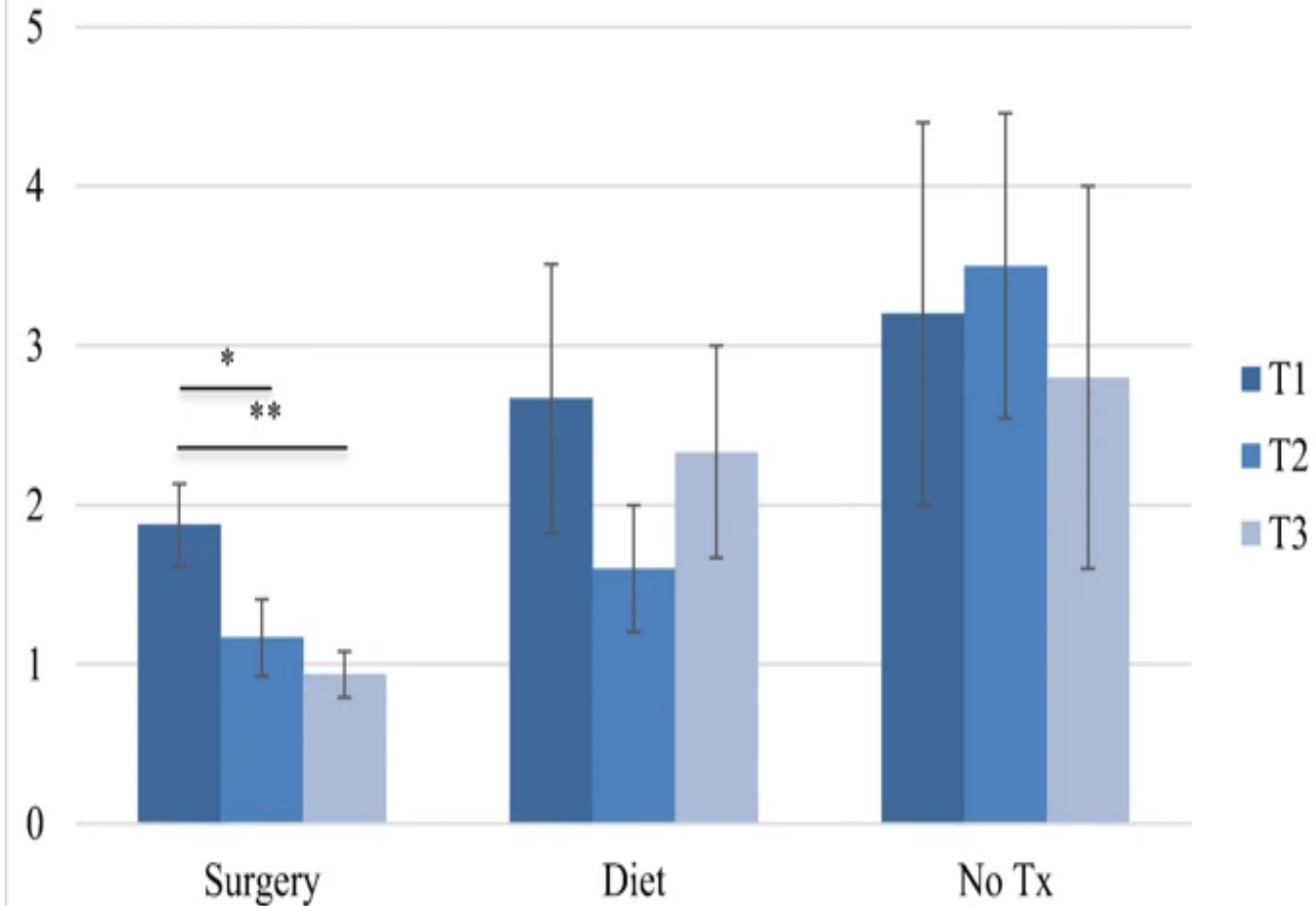
Jon F. Davis · Andrea L. Tracy · Jennifer D. Schurdak ·  
Irwin J. Magrisso · Bernadette E. Grayson ·  
Randy J. Seeley · Stephen C. Benoit

a High fat diet-induced obese rats that received RYGB surgery (obese RYGB) displayed augmented intake of a 10 % ethanol solution compared to obese sham or unoperated controls. b This effect was also apparent in rats that were lean and maintained on a low-fat diet prior to RYGB surgery (lean RYGB) who also consumed significantly more ethanol than sham or unoperated controls. WL rats that lost weight due to food restriction drank significantly less ethanol than lean RYGB rats but did not differ from controls in their level of intake




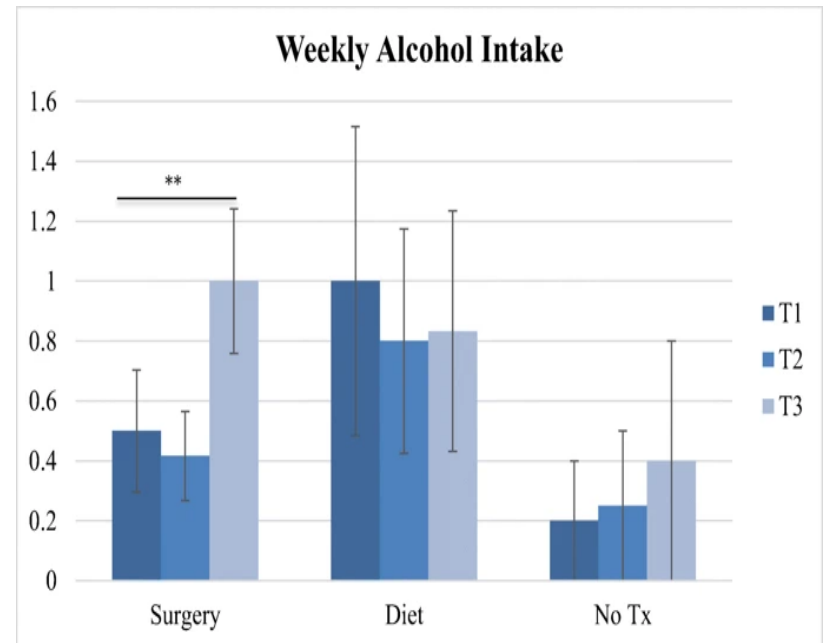
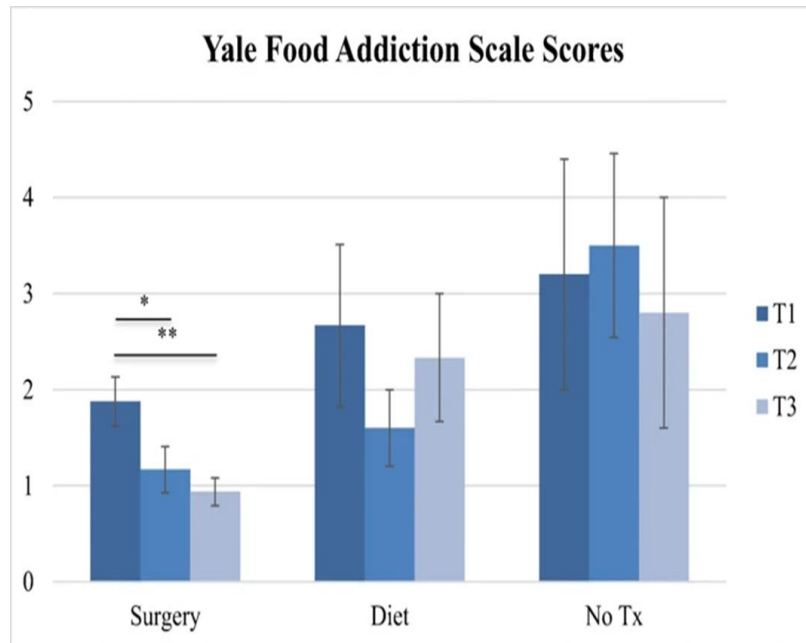


## Yale Food Addiction Scale Scores



## A Longitudinal Preliminary Study of Addiction-Like Responses to Food and Alcohol Consumption Among Individuals Undergoing Weight Loss Surgery

Susan M. Murray<sup>1</sup>  · S. Tweardy<sup>2</sup> · Allan Geliebter<sup>2</sup> · Nicole M. Avena<sup>3</sup>

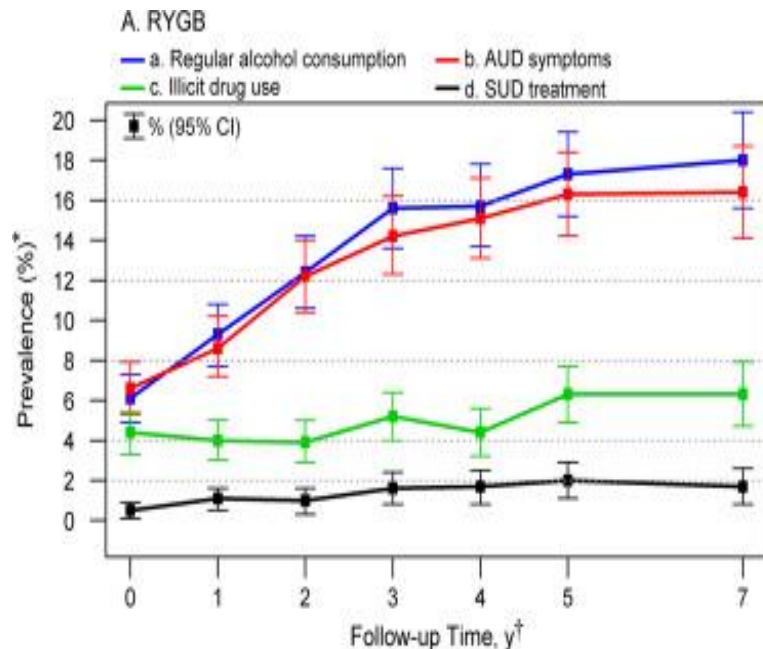


T1= baseline    T2= 4months    T3= 24 months

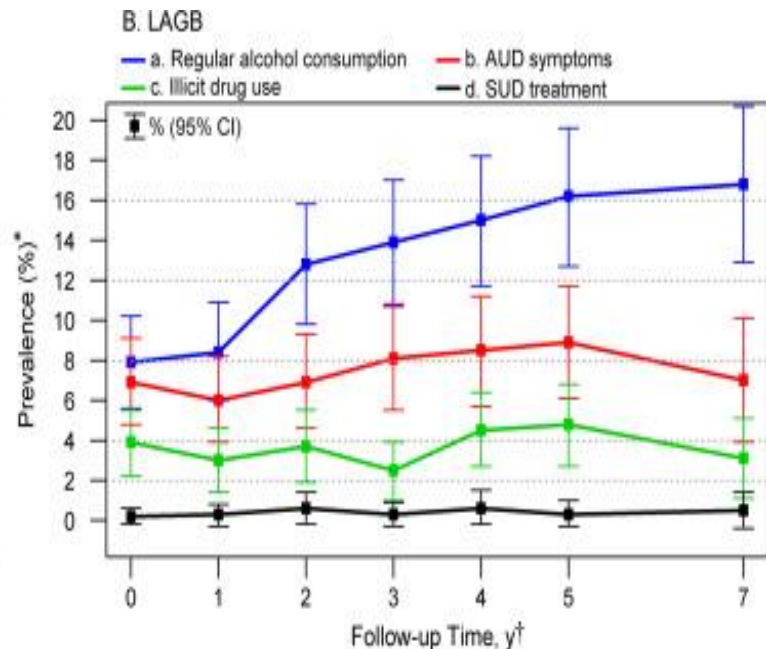
Original article

## Alcohol and other substance use after bariatric surgery: prospective evidence from a U.S. multicenter cohort study

Wendy C. King, Ph.D.<sup>a,\*</sup>, Jia-Yuh Chen, Ph.D.<sup>b</sup>, Anita P. Courcoulas, M.D., M.P.H.<sup>c</sup>,  
 Gregory F. Dakin, M.D.<sup>d</sup>, Scott G. Engel, Ph.D.<sup>c</sup>, David R. Flum, M.D., M.P.H.<sup>f</sup>,  
 Marcelo W. Hinojosa, M.D.<sup>f</sup>, Melissa A. Kalarchian, Ph.D.<sup>g</sup>, Samer G. Mattar, M.D.<sup>h</sup>,  
 James E. Mitchell, M.D.<sup>e</sup>, Alfons Pomp, M.D.<sup>d</sup>, Walter J. Pories, M.D.<sup>i</sup>,  
 Kristine J. Steffen, Pharm.D., Ph.D.<sup>c,j</sup>, Gretchen E. White, M.P.H.<sup>a</sup>, Bruce M. Wolfe, M.D.<sup>i</sup>,  
 Susan Z. Yanovski, M.D.<sup>k</sup>



	0	1	2	3	4	5	7
<b>Number of Patients</b>							
a.	1472	1230	1088	1045	1030	1042	757
b.	1466	1223	1084	1039	1026	1038	752
c.	1465	1221	1074	1039	1021	1036	755
d.	1422	1177	1018	978	965	977	703

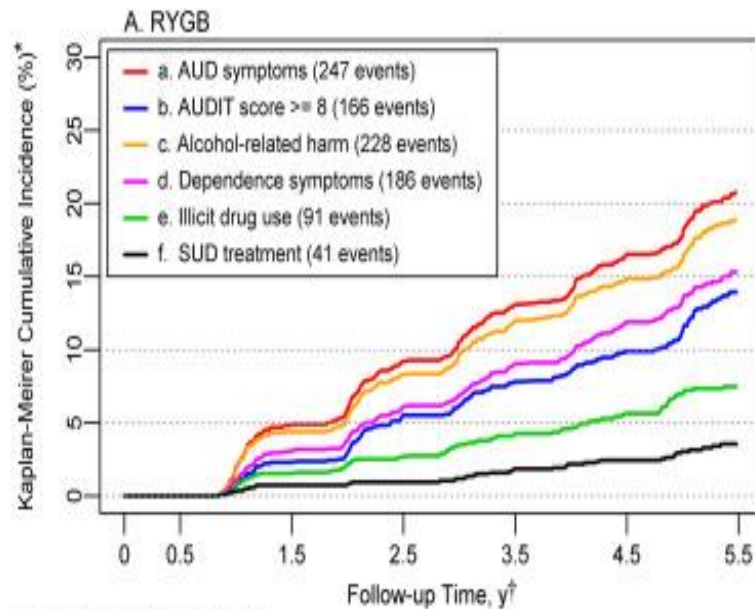


	0	1	2	3	4	5	7
<b>Number of Patients</b>							
a.	520	442	405	377	362	362	251
b.	519	441	401	375	361	361	250
c.	517	437	399	374	362	361	249
d.	501	418	379	354	342	342	235

Original article

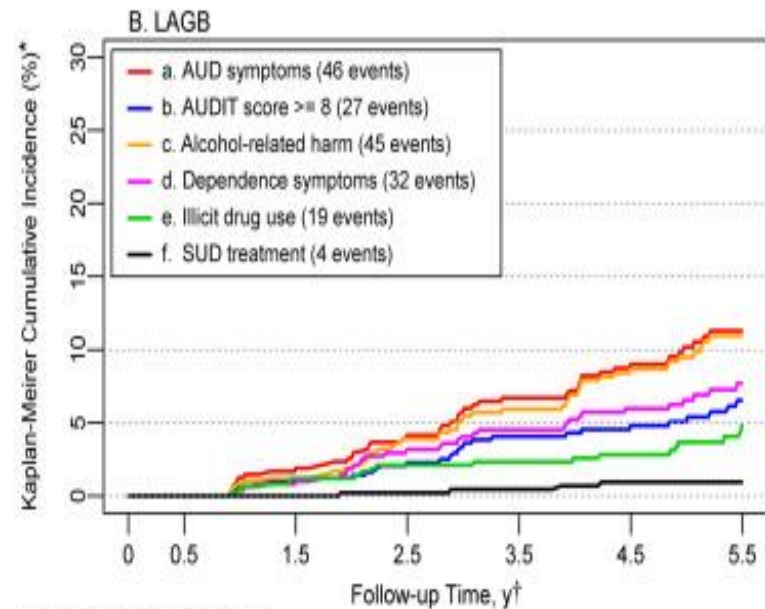
## Alcohol and other substance use after bariatric surgery: prospective evidence from a U.S. multicenter cohort study

Wendy C. King, Ph.D.<sup>a,\*</sup>, Jia-Yuh Chen, Ph.D.<sup>b</sup>, Anita P. Courcoulas, M.D., M.P.H.<sup>c</sup>,  
 Gregory F. Dakin, M.D.<sup>d</sup>, Scott G. Engel, Ph.D.<sup>e</sup>, David R. Flum, M.D., M.P.H.<sup>f</sup>,  
 Marcelo W. Hinojosa, M.D.<sup>f</sup>, Melissa A. Kalarchian, Ph.D.<sup>g</sup>, Samer G. Mattar, M.D.<sup>h</sup>,  
 James E. Mitchell, M.D.<sup>e</sup>, Alfons Pomp, M.D.<sup>d</sup>, Walter J. Pories, M.D.<sup>i</sup>,  
 Kristine J. Steffen, Pharm.D., Ph.D.<sup>e,j</sup>, Gretchen E. White, M.P.H.<sup>a</sup>, Bruce M. Wolfe, M.D.<sup>j</sup>,  
 Susan Z. Yanovski, M.D.<sup>k</sup>



Number of Patients at Risk

a.	1372	1248	1140	1043	947	578
b.	1432	1334	1230	1137	1041	643
c.	1399	1275	1170	1071	975	598
d.	1420	1317	1217	1121	1022	632
e.	1404	1316	1245	1158	1073	682
f.	1417	1330	1260	1177	1087	684

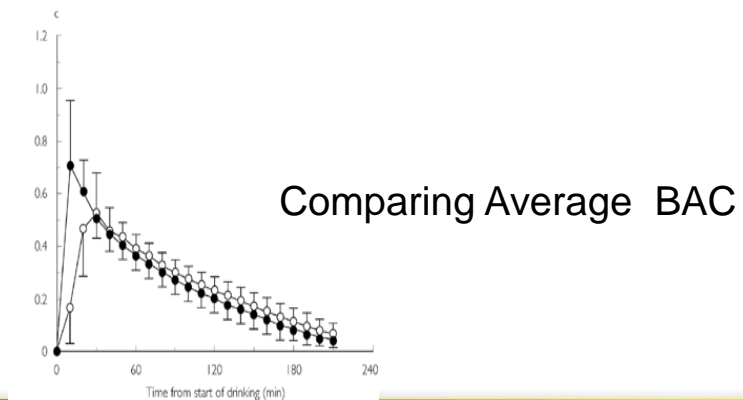
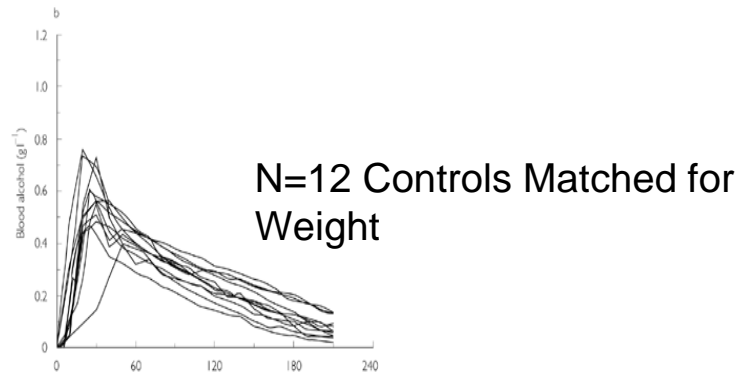
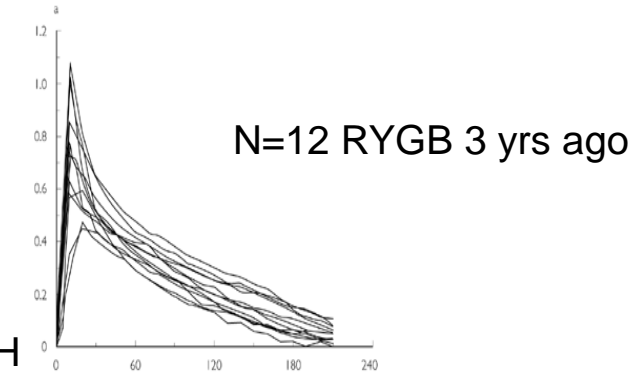


Number of Patients at Risk

a.	483	452	419	380	343	211
b.	506	479	448	409	377	232
c.	492	456	424	386	347	218
d.	503	476	440	402	367	223
e.	497	473	444	414	379	235
f.	500	473	448	414	379	233

# Faster Absorption of Ethanol and Higher Peak Concentration in Women After Gastric Bypass Surgery

~ 7oz wine 12% EtOH  
5 Minutes





UNIVERSITY *of*  
ROCHESTER  
MEDICAL CENTER

MEDICINE *of* THE HIGHEST ORDER