SUICIDE
Recognition, Treatment, & Prevention

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### Suicide Legend:

- **FLORESCENT YELLOW** = highlight
- **DARK RED** = completion
- **RED** = attempt
- **ORANGE** = plan
- **YELLOW** = thoughts/ideation
- **DARK BLUE** = depression
- **GREEN** = prevention
- **BLUE** = males
- **PINK** = females
Suicide Definitions:

**Suicide** injury self-inflicted

**Assault** injury inflicted upon another person

**Suicidal behavior:**
- Thoughts/Ideation
- Plans
- Attempts
- Completion
Suicide
Definitions: Suicidal behavior

Thoughts/Ideation
- Passive – the desire without the urge.
- Active – the desire, urge and plan.
Suicide Behavior: Attempts vs. Completions

- **Suicide attempts** - the most common method in is **drug overdose**, but it is fatal (completed) in less than 3% of cases.
- **Suicide attempts** with a **firearm** are fatal (completed) in about 85% of cases.
- **Firearms** are the most commonly used method of suicide among **males** (56.9%).
- **Poisoning** is the most common method of suicide worldwide for **females** (34.8%).
Murders versus School Massacres: Distinguishing Characteristics

- **Murders** (most) are crimes of passion committed in rage or fear (fight or flight response).
- **Mass murder** is the intentional killing of multiple victims by a single offender within a 24 hour period of time, and these account for less than one percent of all violent crimes.
- **School massacres** (a subset of mass murder) are planned out in advance with careful deliberation and lack of emotion by “pseudo-commandos.” Less than 0.001% of teenagers die in such shootings.
Mass Murderers

Adolescent Versus Adult

Adolescents

• **Almost always tell** friends before hand.
• Tend to belong to a clique of **misfits or a disenfranchised group**.
• Usually **victims of bullying** which is **motivational for attacking the school** (the Columbine principal was described as a “sadistic bully”).
• Frequently they are proxies for a “**violence coach**” who teaches them (e.g. Charles Manson).

Adults

• **Tell no one!**
The 10 leading causes accounted for 74.1% of all deaths in the United States in 2016.
Leading causes of death in perspective

- war
- pregnancy & birth
- medical complications
- murder
- undetermined events
- mental health disorders
- transport accidents
- suicide
- musculoskeletal disorders
- diabetes
- non-transport accidents
- infections
- kidney disorders
- digestive disorders
- nervous system disorders

- heart & circulatory disorders
- cancer
- respiratory disorders
Suicide

Rates: Perspective

- Remember, these suicide rate numbers are all double digits divided by 100,000; therefore 0.000xx%
- 2016, a total of 2,744,248 resident deaths were registered in the United States—31,618 more deaths than in 2015.
- All-cause death rates decreased significantly for age groups 65–74 (0.5%), 75–84 (2.3%), and 85 and over (2.1%).
# Suicide Rates: Country 2017

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<th>Rank</th>
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<table>
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<th>Country</th>
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### Suicide Rates: WHO Region Americas 2015

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<tr>
<td>Guyana</td>
<td>29.0 / 100,000</td>
</tr>
</tbody>
</table>
Suicide
U.S. stats 2015

All suicides
- Number of deaths: 44,193
- Deaths per 100,000 population: 13.3
- Cause of death rank: 10

Firearm suicides
- Number of deaths: 22,018
- Deaths per 100,000 population: 6.9

Suffocation suicides
- Number of deaths: 11,855
- Deaths per 100,000 population: 3.7

Poisoning suicides
- Number of deaths: 6,816
- Deaths per 100,000 population: 2.1

Emergency department visits for self-inflicted injury: 575,000
Suicide
U.S. stats 2015

- **Males 4:1** (except physicians)
- **Men who attempt suicide** are more likely to succeed than **women** (except female physicians)
- **Peak suicide rates for men:** 40 to 44 years old*
- **Peak suicide rates for women:** 50 to 54 years old*
- **Spring** is the time when worldwide suicide rates peak
- Most are suicide victims **not** being treated!
- There have been more deaths in Afghanistan by suicide than by active duty!

*2017 data
Suicide and Homicide Rates in the United States, 2000–2016

Source: WISQARS Fatal Injury Reports, 1999–2016
Suicide Deaths in the United States by Sex, 2000–2016

Source: WISQARS Fatal Injury Reports, 1999–2016
Suicide Regional Rates
United States Suicide Rates – Geographical Distribution (County Level)

Rates per 100,000 population
Rates appearing in this map have been geospatially smoothed

Source: WISQARS 2008-2014
Suicide
Rates: States 2016

Ten U.S. states, 9 in the West, had age-adjusted suicide rates in excess of 20 per 100,000 = 0.00020%

- Montana (25.9)
- Alaska (25.8)
- Wyoming (25.2)
- New Mexico (22.5)
- Utah (21.8)
- Nevada (21.4)
- Idaho (21.4)
- Oklahoma (21.0)
- Colorado (20.5)
- South Dakota (20.2)

- West Virginia 19.3
- Oregon (17.8)
- Arizona (17.7)
- Vermont (17.3)
- Texas (12.6)
- California (10.5)
- US Average (13.5)
Suicide Rates: Geographic Region/State

U.S. suicide rates appear to be highest among residents of the so-called "Intermountain West" region, but why?

- Low population density?
- More white males?
- High prevalence of gun ownership?
- High-altitude living (and the metabolic stress that results)?
- Population density, gun ownership, and race do **NOT** fully explain suicide prevalence, and after accounting for these factors, **high altitude appears to be a risk factor for suicide!**
Suicide
Rates: Geographic Region/State

Does altitude and metabolic stress from insufficient intake of oxygen lead to suicide?

- Asthma and air pollution have been linked to increased suicide rates around the world.
- People living at an elevation of 6,500 feet above sea level (about the average altitude found across Utah) appear to have a 1/3 higher risk for suicide than those living at sea level.
- This is worldwide for example people in South Korea living at 6,500 feet above sea level have a 125% higher risk for suicide than those living at sea level.
Suicide Risk: Occupation Farmers & Physicians

- The highest mortality rates for suicide are found in physicians and farmers.
- A national study found that mortality due to suicide and self-injury among white male US physicians is 70% higher than other professionals, and suicide rate among female physicians is 3-4 times more prevalent than the general population.
Suicide
Risk: Occupation Farmers & Physicians
Suicide
Risk: Occupation Physician: Types

- **Psychiatrists** have a higher rate of suicide, even higher than colleagues from other sub disciplines.
- **Specialties** that have better access to drugs such as anesthesiologists
- Physicians working in the **emergency room and dentistry** may also have a higher rate
- **Suicide** was the second-leading cause of resident death - and the most common cause of death among male residents: however, rates of suicide for residents appeared to be much lower compared with people aged 25 to 34 in the general population.
- **Suicidal feelings** play significantly in how well physicians are able to find and address the warning signs of suicide in others.
- **Physicians**, are a strong-minded, strong-willed stoic group, and discount their own emotional state
Suicide
Risk: Occupation Physicians & Medical students

- Exact numbers unknown, but the number most often used is approximately 300 to 400 physicians/year, or perhaps a doctor a day commit suicide.

- After accidents, suicide is the most common cause of death among medical students. In one study, 9.4% of fourth-year medical students and interns reported having suicidal thoughts in the previous two weeks.

- Suicide in medical students is most likely to occur just prior to beginning clinical rotations, and prior to or at the beginning of residency.

- On the other hand: Baylor College of Medicine survey of 70% of U.S. medical schools found only 6 suicides among medical students between 2006 and 2011.
Suicide
Risk: Occupation Physicians & Medical students

- Underreporting of suicide as the cause of death by sympathetic physicians certifying death skews the statistics; consequently, the real incidence of physician suicide is probably higher.

- Physician suicide is not an isolated to North America! Studies from Finland, Norway, Australia, Singapore, China, Taiwan, Sri Lanka, and others have shown increased prevalence of anxiety, depression, and suicidality among students and practitioners of medicine.
Psychiatrists have a higher rate of suicide, even higher than colleagues from other sub-disciplines. Specialties that have better access to drugs such as anesthesiologists. Physicians working in the emergency room may also have a higher rate.

**TYPES OF SUICIDE**

- Jumping off a bridge
- Pills
- Becoming an independent physician
Suicide

**Risk Factors:** Suicide and Suicide Attempts US children 2017

- Often associated with **depression**
- Family history of **suicide attempts**
- Exposure to violence
- **Impulsivity**
- **Aggressive** or disruptive behavior
- Access to firearms
- Bullying
- Feelings of hopelessness or helplessness
- Acute loss or rejection
- Irritability and **psychomotor agitation** were the strongest predictors of suicide attempt.
Suicide Risk: Mnemonic

SADPERSONAS

- **S** = sex (male except female physicians)
- **A** = age (elderly males)
- **D** = depression (unipolar, bipolar & other psychiatric disorders & family history)
- **P** = previous attempt
- **E** = EtOH or other drugs (only 27% had positive BAC)
- **R** = rational thinking lacking
- **S** = social supports lacking
- **O** = organized (lethal) plan
- **N** = no spouse (NOT protective for female physicians)
- **A** = availability of lethal means
- **S** = sickness (chronic)
Suicide
SADPERSONAS - SEX

SEX : Males versus Females 2016

- Male suicide is the 7th leading cause of death for males
- Female suicide is the 14th leading cause of death for females.
- Female doctors have a higher risk of suicide than male doctors
Suicide

SADPERSONAS - SEX

SEX: Female Physicians

- Compared with the general population male physicians have about 40% higher risk
- Women physicians commit suicide at 130% higher rate (female physicians have about a 3 times higher risk of committing suicide than male physicians).
- Women in general have more depression than men so female physicians are at greater risk.
- 50% to 75% of all women in surgical specialties have at one point or more than once been gender-based harassed or sexually harassed.
Female physicians attempt suicide far less often than females in the general population, BUT their suicide completion rate equals that of male physicians.

Female physicians suicide completion rate far exceeds that of the general population (2.5-4 times the general population suicide completion rate)!
Suicide
SADPERSONAS - SEX

SEX: Female Physicians
Characteristics of female physicians who had attempted suicide:

- Depression & poor current mental health, family history of psychiatric disorder.
- EtOH abuse or dependence, cigarette smoking, sexual abuse,
- Social supports lacking with domestic violence, more severe harassment.
Suicide

**ADPERSONAS** - **AGE**

**AGE:** Physicians

- Suicide rates increase abruptly by age among doctors
Suicide
SADPERSONAS - DEPRESSION

DEPRESSION: Physicians

- Depression is at least as common in the medical profession as in the general population, affecting an estimated 12% of males and up to 19.5% of females.
- Depression is even more common in medical students and residents, with 15-30% of them screening positive for depressive symptoms.
Suicide SA D PERSONAS – DEPRESSION (psychiatric disorder)

DEPRESSION (psych d/o): Physicians

- 85-90% of people in general who commit suicide had been suffering from some type of psychiatric disorder.
- More than 50% of physicians who sought help and later committed suicide had been diagnosed with psychiatric disorders.
Suicide

SADPERSONAS – DEPRESSION (psychiatric disorder)

Main disorders associated with a high risk for suicide, and the highest risk is among people with mood disorders and anxiety disorders.

- Depression - Major Depressive disorder (MDD)
- Depression - Bipolar disorder (especially mixed features)
- Schizophrenia (4.9%)
- Anxiety disorders
Suicide

SA PERSONAS – DEPRESSION (psychiatric disorder)

- Substance use disorders
- Attention deficit hyperactivity disorder (ADHD)
- Eating disorders
  such as anorexia nervosa and bulimia.
- Trauma & Stressor-Related Disorders (Acute stress disorders)
- **Lowest** increased risk is organic mental disorders, dementia and mental retardation.
**Suicide**

**SADEPERSONAS – DEPRESSION** *(psychiatric disorder)*

**Hospitalization:** Psychiatric

- 1\textsuperscript{st} day and 1\textsuperscript{st} week after discharge are particularly high-risk
- Within a month 43%
- Before 1\textsuperscript{st} follow-up 47%
- 1\textsuperscript{st} day and 1\textsuperscript{st} week after discharge
Suicide

**SADPERSONAS – DEPRESSION** *(psychiatric disorder)*

**SADPERSONAS – DEPRESSION** *(psychiatric disorder)*

**Schizophrenia**

- Most *completed suicides* occur early after onset, but risk is lifelong.
- High IQ
- Hallucinations and delusions seem to be protective.
Suicide

SADPERSONAS - DEPRESSION

DEPRESSION: Physicians

- Litigation-related stress can precipitate depression and, occasionally, suicide. The suicide note of a Texas emergency physician, written the day after he settled a malpractice case, read, “I hope that my death will shed light on the problem of dishonest expert testimony.”

- Any settlement in a malpractice case is by law reported to the National Practitioner Data Bank, which is yet another source of distress and stigma that can contribute to depression.
Suicide
SAD PERSONAS - PREVIOUS ATTEMPT

PREVIOUS ATTEMPT: Suicidal behavior is familial

- Family history of suicide increases risk of suicide attempts and completed suicide.
- Family history of SUICIDE ATTEMPT increases risk of SUICIDE ATTEMPTS
Suicide
SAD PERSONAS - PREVIOUS ATTEMPT

PREVIOUS ATTEMPTS vs. Completions: All

- **Common Suicide Phenotype**
  Studies suggested the existence of a common suicide phenotype that includes both attempt and completion.

- **Heritability** of suicide plan/attempt 44%, and that of serious suicide attempt to be 55%.

- **Suicidal Ideation** may present as a separate phenotype

- **Heritability** of suicide suicidal ideation is about 43%.
Suicide
SADPERSONAS – EtOH (or other drugs)

EtOH (or other drugs)
- Suicide from EtOH misuse is greater among women than among men.
- EtOH (BAC) at autopsy was ZERO in 73%
- Those who self-harm have a much greater risk opioid use disorders and mixed intravenous drug use is greater than that for alcohol misuse
Suicide
SADPERSONAL RATIONAL THINKING LACKING

RATIONAL THINKING LACKING: Physicians

- Most physicians treat themselves at least on occasion, and treatment of depression is no different. However, thought processes are clouded by depression and the consequences of self-treatment are often not anticipated.

- Failure to obtain consultation and treatment for depression needlessly and significantly increases the risk of physician suicide.
Suicide
SADPERSONAS - SOCIAL SUPPORT GROUPS LACKING

SOCIAL SUPPORT GROUPS LACKING

Why would a physician, who has had at least basic training in medical school about psychiatric disorders, **NOT** get professional help?

The basic culprits:

- The stigma attached to mental illness
- Ruggedness and fierce independence in some doctors who eschew any form of medical care,
- Apprehension about confidentiality breaches and salacious gossip at work,
- Fear of losing one’s hospital privileges,
- Concern about losing one’s job,
- Anxiety about having problems obtaining or renewing one’s medical license,
- Worries about exclusion clauses in disability insurance.
Suicide
SADPERSONAS - ORGANIZED (LETHAL) PLAN

ORGANIZED (LETHAL) PLAN: Physicians

- Greater knowledge of and better access to lethal means, so physicians have a far higher suicide completion rate than the general public.
Suicide

SADPERSONNAS - No spouse

No spouse

- **Marriage** is in most populations considered to be **protective** against emotional distress.
- This does **NOT** seem to be true for **female physicians**.
Suicide

Social Support Groups Lacking
Licensing boards, employers, hospitals, and credentialing agencies

Negative consequences of disclosure or admission:
- loss of medical privacy and autonomy
- repetitive and intrusive examinations
- licensure restrictions
- discriminatory employment decisions
- practice restrictions
- hospital privilege limitations
- increased supervision
Suicide
Social Support Groups Lacking

- More than 60% of physicians with suicidal ideation indicated they were reluctant to seek help due to concern that it could affect their medical license.
- Volunteering support or assistance unasked may seem like an affront to a colleague. Thus, the concerned colleague or partner may say nothing.
- To admit one’s inability to another colleague is to admit failure.
Suicide
Social Support Groups Lacking

- Most physicians assume that any state agency or treating physician will share confidential information about them to the licensing authority.

- Additionally, any lack of disclosure on an employment or credentialing application can be cited as grounds for termination or decredentialing.
Suicide

Availability of lethal means: Physicians
Suicide
SADPERSONAS – Sickness (chronic)

Sickness (17 chronic illnesses)
- TBI (OR = 8.80)
- Sleep disorders (OR > 2.0)
- HIV/AIDS (OR > 2.0)
- Chronic pain (especially back pain)
- Cancer
- CHF
- COPD
- Epilepsy (risk varies across different types and in relation to the severity).
- Asthma
- Diabetes
- Chohn’s
- Arthritis
- More than one chronic condition
Suicide
Treatment: “antidepressants” & hospitalization

- Physician depression and its associated suicide risk stress the need immediate treatment and confidential hospitalization can be lifesaving—more so than in other populations.
Suicide Treatment: Myths

- Talking about suicide is **NOT** dangerous!
- **Suicide contract:** “Contracting for safety” is **NOT** effective!
Suicide

Treatment: ECT

- ECT anti-suicidal effects in patients with unipolar disorder and bipolar depression;
- ECT NO anti-suicidal effects in the patients with bipolar mania and mixed state.
Suicide Treatment: Unintended consequences

- Soon after the start of the selective serotonin reuptake inhibitor (SSRI) era, which started in 1987, suicide rates in young adults between 10 and 24 years of age began declining steadily between 1990 and 2003.
- The FDA required a “black box” warning to package inserts for antidepressants because of increased risk of suicidal thoughts and behavior (suicidality) in children and adolescents. In 2007, the FDA extended the age range up to 24 years of age.
Suicide Treatment: Unintended consequences

Results:
- **SSRI** prescriptions for youths decreased by approximately 22% in both the U.S. and the Netherlands after the warnings were issued.
- In the Netherlands, the youth suicide rate increased by 49%.
- U.S., youth suicide rates increased by 14% which was the largest year-to-year change in suicide rates in this population since the CDC began systematically collecting suicide data in 1979.
Suicide

Treatment: Unintended consequences

U.S. Suicide rate ages 5-19
Suicide Treatment

**Unintended consequences:** Netherlands Suicide rate up to age 19
Suicide
Genetics vs. Environment

On the other hand:
Twin study of suicide in Schizophrenic psychosis showed environment to be most important!
- 60% concordance with the shared-family environment vs 40% to the nonshared (unique) environmental effects (i.e. personal experiences).
- Adoptees have an OR 3.70 for suicide attempt
Suicide Genetics

Molecular genetic studies have mixed results...stay tuned!
- Among 590 suicide attempt polygenes implicated
- Several developmentally important functions (cell adhesion/migration, small GTPase and receptor tyrosine kinase signaling),
- 16 of the suicide attempt polygenes have previously been studied in SB (BDNF, CDH10, CDH12, CDH13, CDH9, CREB1, DLK1, DLK2, EFEMP1, FOXN3, IL2, LSAMP, NCAM1, nerve growth factor (NGF), NTRK2 and TBC1D1).
- Single-nucleotide proteins (SNPs) from MRAP2 (melanocortin 2 receptor accessory protein 2) - a gene expressed in brain and adrenal cortex and involved in neural control of energy homeostasis, - appear to provide susceptibility to suicidality.
- These suggested the importance of a polygenic neurodevelopmental etiology in suicidal behavior, even in the absence of major psychiatric diagnoses.
Suicide
CRH

Expression of corticotropin releasing hormone receptors type I & type II mRNA

- Corticotropin-releasing hormone (CRH) is a key neuroendocrine factor implementing endocrine, immune and behavioral responses to stress.
- CRH exerts its action through **two major receptors**, CRH-R1 and CRH-R2.
- Strong expression of **CRF-R2** in human pituitaries and the ratio of CRH-R1/R2 in the pituitary appears to be protective.
A Blood Test for Suicide

SKA2 methylation

- **SKA2** is expressed in the brain’s prefrontal cortex and involved in cortisol suppression and is linked to stress reactions via glucocorticoid receptor transactivation.

- There are significantly reduced levels of the product of gene SKA2 in people with mental illness.

- In a subset of subjects who died by suicide, researchers found an epigenetic modification that caused higher levels of methylation at the SKA2 gene.
A Blood Test for Suicide

SKA2 methylation

- Prefrontal cortex of the brain is involved in inhibiting negative thoughts and controlling impulsive behavior.
- The "epigenetic" changes in DNA that occur during a person's lifetime – in this case methylation -- may be influenced by exposure to stressful situations such as combat and increase the risk of suicide!
A Blood Test for Suicide

SKA2 methylation

- The test (looking for methylation at the SKA2 gene) was used to predict which patients had thought about or attempted suicide, and accuracy rate was 80%.

- Among people with more severe risks of suicide, the test’s accuracy rate jumped to 90%.
How can suicide be prevented?

Important risk factors are:
- Depression and other mental disorders
- Substance abuse
- Prior suicide attempt
- Family history of suicide
- Family violence including physical or sexual abuse
- Firearms in the home
- Incarceration
- Exposure to the suicidal behavior of others, such as family members or peers

However, it is important to note that many people with these risk factors are not suicidal, while others who are contemplating suicide may not have any of these risk factors.
Suicide

**Treatment: fMRI**

Promising approach to identify suicidal individuals

- suicidal and non-suicidal participants have different brain activation patterns for specific thoughts,
- analyzing alterations how the brains of suicidal individuals represent death, cruelty, trouble, carefree, good and praise.
- Method can tell whether someone is considering suicide by the way that they are thinking about these death-related topics with 91% accuracy.
- Method can identify people who had made a previous suicide attempt from those who only thought about it with 94% accuracy (The program was able to accurately distinguish the nine who had attempted to take their lives).
Suicide

Treatment: **fMRI** Brain activation pattern for "death"

Suicide Attempters

Control Group
Suicide

Treatment: fMRI

- The CMU technique overcomes the property of fMRI smearing together the signals from brain events that occur close together in time (like the reading of two successive words in a sentence). This makes it possible to decode thoughts containing several concepts.
Suicide Treatment: Social Support

- **Courts** have determined that negative consequences are impermissible.
- Resultant examinations and restrictions are based on stereotypes and are deemed discrimination under Title II of the Americans with Disabilities Act (ADA).