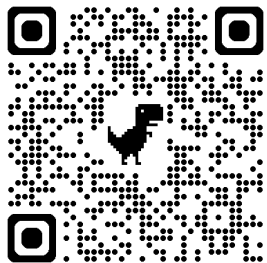


Research as I see it, in 10 Quotes

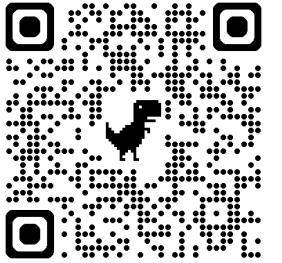
Michael Chary, MD PhD
2024 NYACEP Resident Research
Conference



**Weill Cornell
Medicine**
Emergency
Medicine

BLUF

- Science is worth doing if what your project fills you with awe.
- A Researcher is a Scientist who is paid to do Science.
- Nice work if you can get it
And you can get it if you try (Dr. Gershwin)



BIOGRAPHICAL SKETCH.

NAME: Michael A. Chary

POSITION TITLE

Assistant Professor

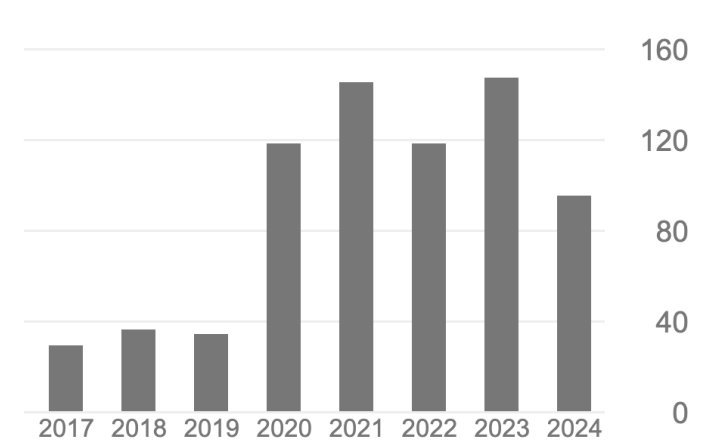
eRA COMMONS USER NAME: MCHARY

(Weill Cornell Medicine)

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE (if applicable)	MM/YY	FIELD OF STUDY
New York University, NY, NY	B.Sc.	12/2005	Neuroscience
Icahn School of Medicine at Mount Sinai, NY, NY	Ph.D.	05/2013	Neuroscience
Icahn School of Medicine at Mount Sinai, NY, NY	M.D.	08/2015	Medicine
NewYork-Presbyterian\Queens, NY, NY	Residency	06/2018	Emergency Medicine
Harvard Medical Toxicology Program, Boston Children's Hospital, Boston, MA	Fellowship	06/2020	Medical Toxicology

<input type="checkbox"/>	TITLE		CITED BY	YEAR
<input type="checkbox"/>	COVID-19: therapeutics and their toxicities MA Chary, AF Barbuto, S Izadmehr, BD Hayes, MM Burns Journal of Medical Toxicology 16, 284-294		138	2020
<input type="checkbox"/>	A review of natural language processing in medical education M Chary, S Parikh, AF Manini, EW Boyer, M Radeos Western Journal of Emergency Medicine 20 (1), 78		104	2019
<input type="checkbox"/>	Epidemiology from Tweets: Estimating Misuse of Prescription Opioids in the USA from Social Media M Chary, N Genes, C Giraud-Carrier, C Hanson, LS Nelson, AF Manini Journal of Medical Toxicology, 1-9		85	2017
<input type="checkbox"/>	Incidence of pediatric cannabis exposure among children and teenagers aged 0 to 19 years before and after medical marijuana legalization in Massachusetts JM Whitehill, C Harrington, CJ Lang, M Chary, WA Bhutta, MM Burns JAMA network open 2 (8), e199456-e199456		81	2019
<input type="checkbox"/>	Leveraging social networks for toxicovigilance M Chary, N Genes, A McKenzie, AF Manini Journal of Medical Toxicology 9, 184-191		67	2013
<input type="checkbox"/>	Geospatial correlation between COVID-19 health misinformation and poisoning with household cleaners in the Greater Boston Area MA Chary, DL Overbeek, A Papadimoulis, A Sheroff, MM Burns Clinical toxicology 59 (4), 320-325		44	2021



The most beautiful experience we can have is the mysterious. It is the fundamental emotion which stands at the cradle of true art and true science.

- Albert Einstein

A brown-throated thrush,
- in German Halzenfugel
- in Chinese Chung Ling

Interesting, not
mysterious



Even if you know all those names for it, you still know nothing about the bird.

You only know something about people; what they call the bird. Now that thrush sings, and teaches its young to fly, and flies so many miles away during the summer across the country, and nobody knows how it finds its way.

Mysterious



- Richard Feynman

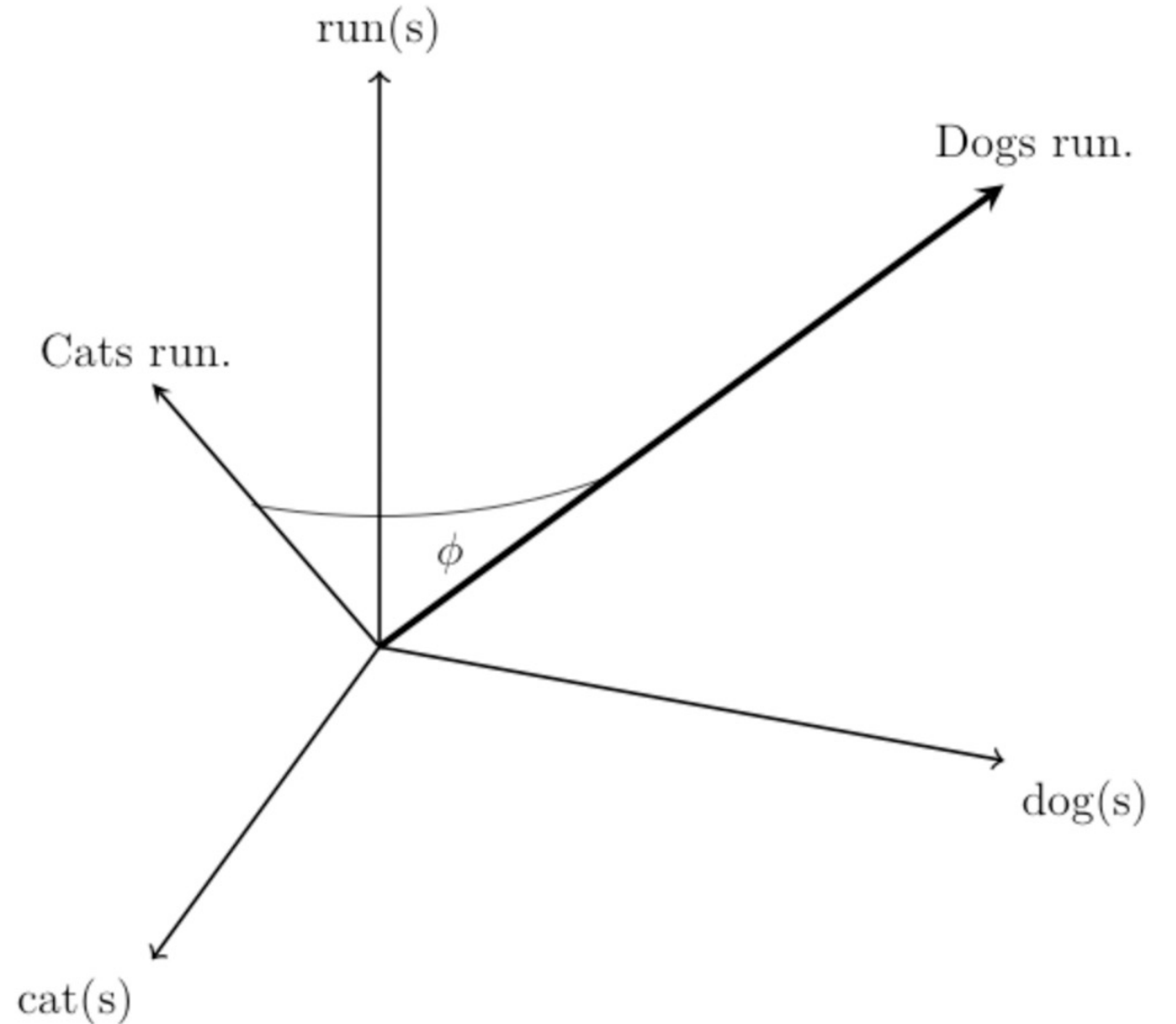
Signs & Symptoms of Dextromethorphan Exposure from YouTube

Michael Chary, Emily H. Park, Andrew McKenzie, Julia Sun, Alex F. Manini, Nicholas Genes 

Published: February 12, 2014 • <https://doi.org/10.1371/journal.pone.0082452>

- Words can form the basis of a coordinate system, just like x- and y-axes.
- Semantic operations have a geometric interpretation


 **Mysterious**



Epidemiology from Tweets: Estimating Misuse of Prescription Opioids in the USA from Social Media

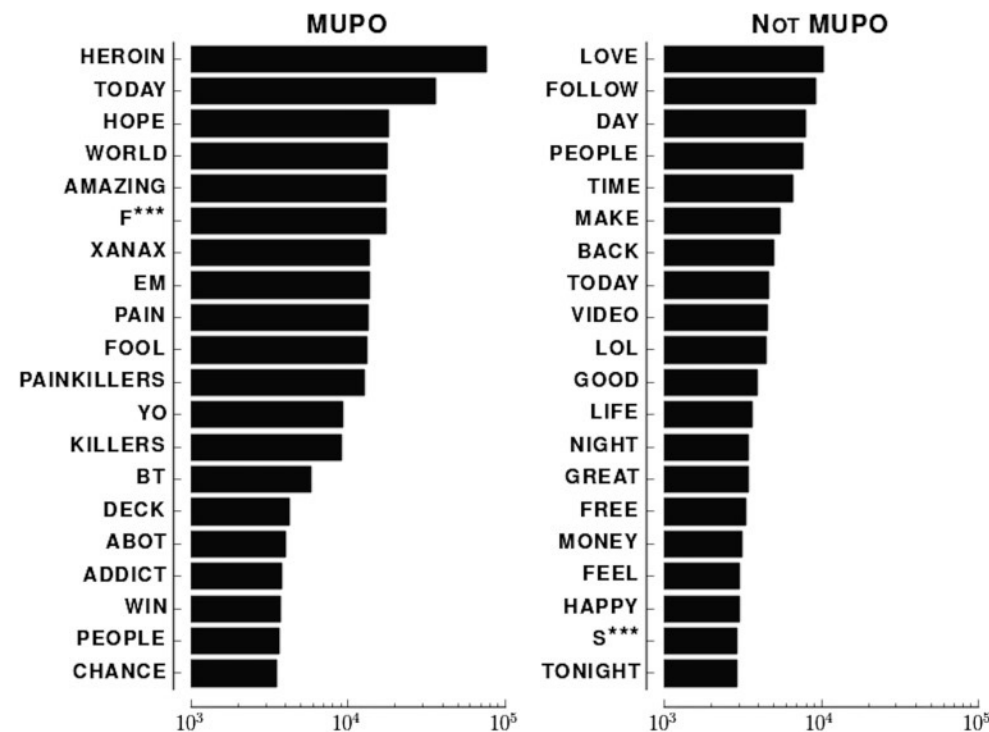
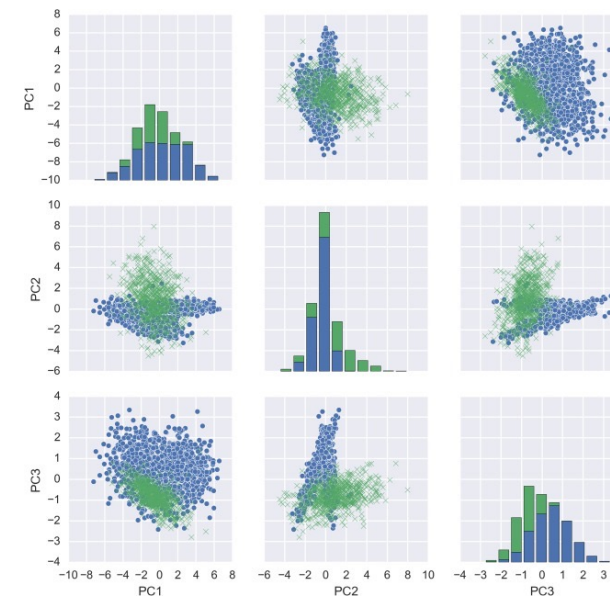
Original Article | Published: 22 August 2017

Volume 13, pages 278–286, (2017) [Cite this article](#)

[Michael Chary](#) , [Nicholas Genes](#), [Christophe Giraud-Carrier](#), [Carl Hanson](#), [Lewis S. Nelson](#) & [Alex F. Manini](#)

 1931 Accesses  53 Citations  140 Altmetric  16 Mentions [Explore all metrics](#) →

- In these semantic spaces, conceptually similar phrases cluster together



Candyflipping and Other Combinations: Identifying Drug-Drug Combinations from an Online Forum

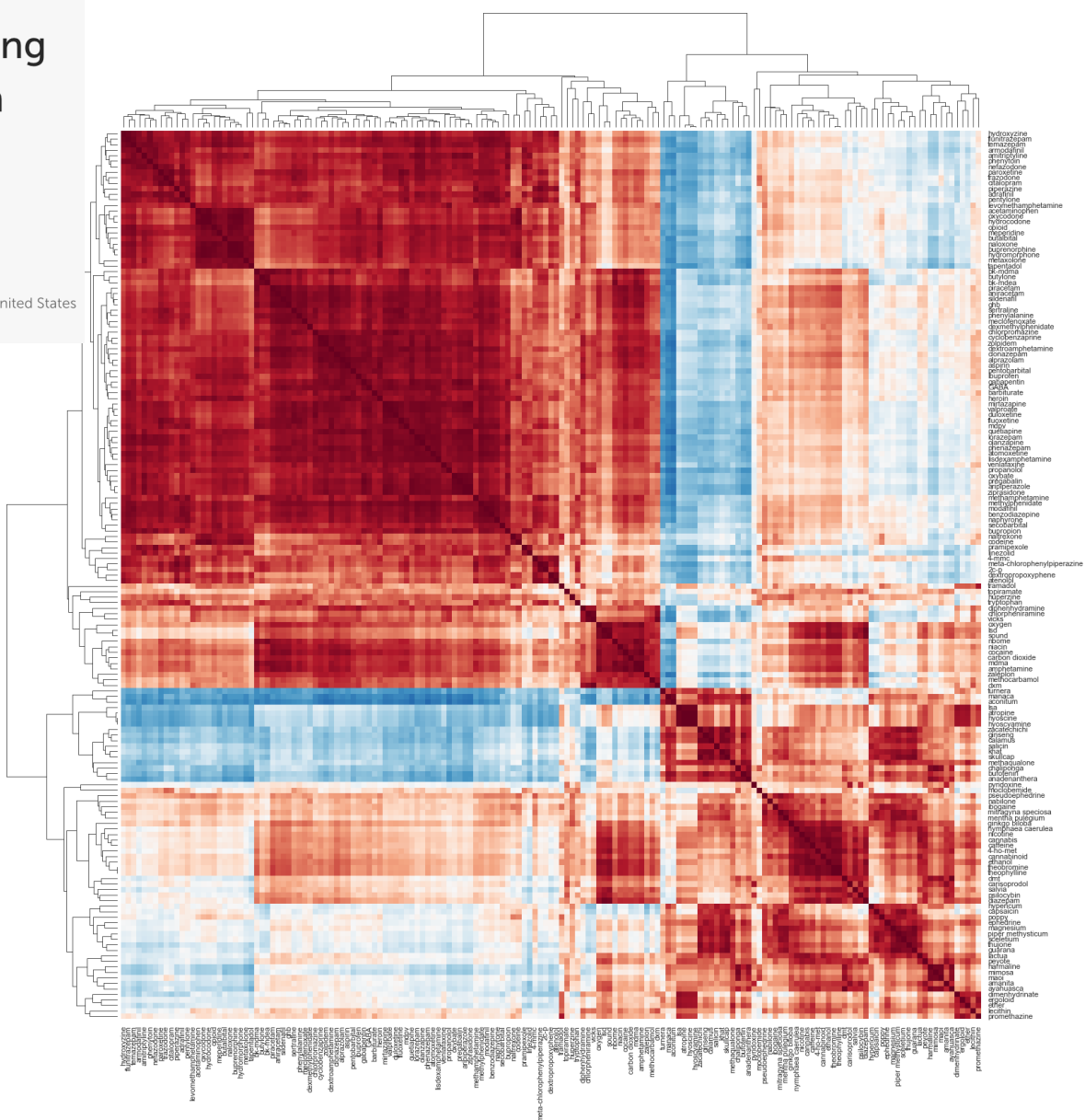
 Michael Chary^{1*}  David Yi²  Alex F. Manini³

¹ Department of Emergency Medicine, NewYork-Presbyterian Queens, Flushing, NY, United States

² Bronx High School of Science, Bronx, NY, United States

³ Division of Medical Toxicology, Department of Emergency Medicine, The Icahn School of Medicine at Mount Sinai, Flushing, NY, United States

You can also identify combinations of drugs that people are using. Illicit and for self-treatment.



NNF = 20 (I'm at 6)

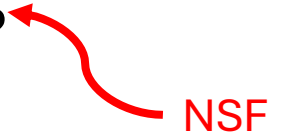
- LRP for 6 years
- EMF/NIDA
- NIH ROAD Trip
- EMF/EMRA no
- MTF no x 2
- DP5 cut in final round
- DoD no x 3
- R21 no x 1 (resubmitting)
- R01 (under review)
- R01 (in preparation)

So what?

- How does this decrease substance use disorders?
- How does this help discover new drugs?



- What does this teach us about language?
- About the computational representation of language?



- Could this track other phenomena? ← DoD
- How does this advance EM? ← EMF
- How does this advance Tox? ← MTF

Every good scientist is half B.F. Skinner and half P. T. Barnum

-- Seymour Skinner

- There are more scientists working now than in the history of humanity until 1950.
- Science is funded by companies or governments to do specific things.
- Thus, scientists compete for limited funds.
- Other scientists judge the competition.
- In a commoditized market, marketing differentiates

I cared about the geometry of semantic spaces.
Fundors cared about how it could address their priorities.



MATT GROENING

Someone has to pay the bills

Don't hate the player, hate the game

-- Ice-T

Soft Money

Article Processing Fees

Indirect Costs

Funding Priorities

EMF Emergency Medicine Foundation®
research • education • patient care

MORE THAN \$1 MILLION FUNDED THIS YEAR TO PIONEER CHANGE

Research Topics:

- Racial Disparities in DNAR Decisions
- Youth Substance Abuse and Linkage to Care
- ED Heart Disease Detection with AI
- Outcomes and Recovery after ED Visits in Dementia Patients
- Factor Xa Inhibitor Reversal in Intracranial Hemorrhage
- Sleep Hygiene Interventions for Dementia Patients
- Prehospital Trauma Triage
- ED Vaccination Surveillance
- Skilled Nursing Facility Capacity and Hospital Crowding
- Heat Treatment for Catheter Salvage in Central Line Infections
- Qualitative Analysis of Coaching in EM
- Defining Diagnostic Excellence
- Acute Care Pricing: Hospital and Market Influences
- Chest Pain and ASCVD Risk Stratification
- Care-Partner Evaluation and Sourcing in the ED
- Personal External Exposome in Children with Asthma
- Nanoparticle Drug Delivery for Intracerebral
- ED Group Ownership Impact
- Biomarkers Predicting Outcomes in Ischemic Stroke
- Mechanisms of Cerebral Edema Post-TBI
- Peripheral Tissue Perfusion in Sepsis
- Blood-brain Barrier Dysfunction in Mild TBI

Visuals: Ambulance, hospital bed, chest X-ray, MRI scans, laboratory tests, group meeting, AI icon, heart rate line.

Specific Aims Pages Help Frame My Thinking

One person dies every 7 minutes from an opioid overdose. Buprenorphine reduces death from opioid use disorder by 50%. Less than 50% of people who start buprenorphine adhere to treatment after 6 months. Those who discontinue buprenorphine are as likely to die from an overdose in the following year as those who never started buprenorphine. People who use fentanyl are the group most likely to discontinue buprenorphine treatment. Thus, there is an urgent need to improve adherence to buprenorphine in those who use fentanyl. Despite extensive research on barriers to adherence, there is a critical lack of strategies with real-world efficacy.

P. T. Barnum

People describe self-treating opioid use disorder online, collectively evaluating multiple treatment strategies for real-world efficacy. Qualitative studies demonstrate that this online commentary describes combining pharmacologic and non-pharmacologic strategies. Although qualitative research provides valuable framing, we need to use computational (“Big Data”) methods to analyze enough online comments to draw statistically valid quantitative conclusions. A key limitation of current computational methods is that they cannot fully capture the strategies described online because they do not combine qualitative and quantitative information with the detail of manual analysis. By overcoming this limitation, we can

The overall goal of our research is to decrease death from opioid use disorder using real-world evidence. Our goal in this proposal is to identify strategies with real-world efficacy that improve adherence to buprenorphine from online commentary. Laying the foundations for this study, we developed computational tools to extract names and doses of medications from online comments and a unique data set of 68,017 unique comments from 3 social media sites discussing strategies to increase adherence to buprenorphine. As preliminary data, we applied Jarvis to 50% of our data set, 34,008 comments.

Neither but useful,
engaging with the
literature

B. F. Skinner

Furious Activity is No Substitute for Understanding

- Rev. H. H. Williams

PLOS MEDICINE

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ESSAY

Why Most Published Research Findings Are False

John P. A. Ioannidis

Published: August 30, 2005 • <https://doi.org/10.1371/journal.pmed.0020124>

Why Current Publication Practices May Distort Science

Neal S Young , John P. A Ioannidis, Omar Al-Ubaydli

Published: October 7, 2008 • <https://doi.org/10.1371/journal.pmed.0050201>

[Home](#) > [Scientometrics](#) > [Article](#)

Evolving patterns of extreme publishing behavior across science

Published: 26 July 2024

Volume 129, pages 5783–5796, (2024) [Cite this article](#)

For a successful technology, reality must take precedence over public relations, for nature cannot be fooled.

-- Richard Feynman

- Individuals are named in grants that last for 5 years
- Individuals or small teams cannot conduct clinical trials at the scope needed for robust evidence and produce convincing and robust evidence every 3 years.
- Screening Tools, Ecological Fallacy

[Review](#) > [Acad Emerg Med.](#) 2021 Dec;28(12):1379-1388. doi: 10.1111/acem.14312.

Epub 2021 Jun 28.

An umbrella review of effect size, bias, and power across meta-analyses in emergency medicine

[Austin J Parish](#)^{1 2}, [Denley M K Yuan](#)², [Jason R Raggi](#)², [Oluyemi O Omotoso](#)², [Jason R West](#)², [John P A Ioannidis](#)^{1 3 4 5 6}

Results: A total of 332 articles contained 431 eligible meta-analyses with a total of 3,129 individual study outcomes; of these, 2,593 (83%) were from randomized controlled trials. The median OR across all studies was 0.70. Within each meta-analysis, the earliest study effect on average demonstrated larger benefit compared to the overall summary effect. Only 57 of 431 meta-analyses (13%) both favored the experimental intervention and did not show any signal of small study effects or excess significance, and of those only 12 had at least one study with 80% or higher power to detect an OR of 0.70. Of these, no interventions significantly decreased mortality in well-powered trials. Although the power of studies increased somewhat over time, the majority of

RESEARCH METHODS/ORIGINAL RESEARCH · Volume 73, Issue 6, P565-576, June 2019

[Download Full Issue](#)

The Results of Randomized Controlled Trials in Emergency Medicine Are Frequently Fragile

[Jamin Brown, DO](#)   · [Aaron Lane, DO](#) · [Craig Cooper, BS](#) · [Matt Vassar, PhD](#)

If you can meet with Triumph and Disaster and Treat those Two Imposters the Same Rudyard Kipling, If--

- Clear communication about the work explains your work to future scientists

Also have to effectively communicate to

- Reviewers of grants and papers (frenemies)
- Administration (to whom you are either an asset or a liability)
- PR, Self-Promotion

Still working on this



- Rejection is part of the game
- Reviewers are unpaid, undermotivated, and overworked.



Moreover, I attribute my success in computer science to my son too.

My son forced me to systematically examine what matters in life – what really matters – and in the end, I came to appreciate a quote from his namesake, Bertrand Russell, more than I could have ever imagined:

“The *good life* is one inspired by love and guided by knowledge.”



From this day forward, I will spend my time on problems and solutions that will matter. I will make a difference.

My first year as a tenure-track professor cannot be described as anything other than an abject failure. I was so desperate to publish and raise funds that I began thin-slicing my research and submitting lots of poor quality papers and grant proposals.

-- Matt Might

I am **primarily** figuring out how to get a computer to understand human language. That will allow us to bring the knowledge of the world to bear on every issue.

Articulating Purpose

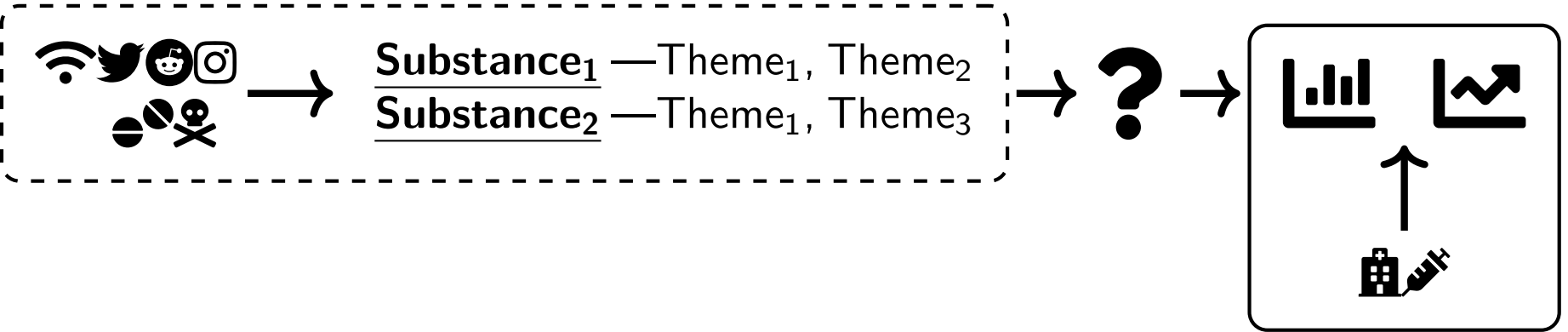


And help us transcend this mortal coil.

- Not building a chatbot to increase access to testing services
- Not being a data analyst attaché
- Not drug discovery (directly)
- Not improving a prediction system

Key Barrier to Progress: Extracting Quantitative Data from Online Commentary

Motivation: Online Data Provides Real-World Evidence on Substance Use and Self-Treatment



Dose-response curve \Rightarrow substance mediates an effect.

If we could extract dose-effect associations from social media, we could:

directly **compare** real-world data with data from controlled studies

test quantitative hypotheses with real-world data.

ultimately, **infer** substance efficacy from real-world data

Payoff

Jarvis, A Solution in Two Parts: Grammar & Entity Recognition

Drugs are uncountable nouns.

If used as countable nouns, shorthand for dosage. *Two oxycodone.

Doses are also *noun phrases with measure words*



I snort 4 m30s a day. Happy nods.

- ✓ m30s is an *entity* (substance)
- ✓ 4 m30s a day is a *noun phrase* (dosage)
- ✗ snort is a verb
- ✗ happy is an adjective (modifier)

I slithied 4 flors a gortle.

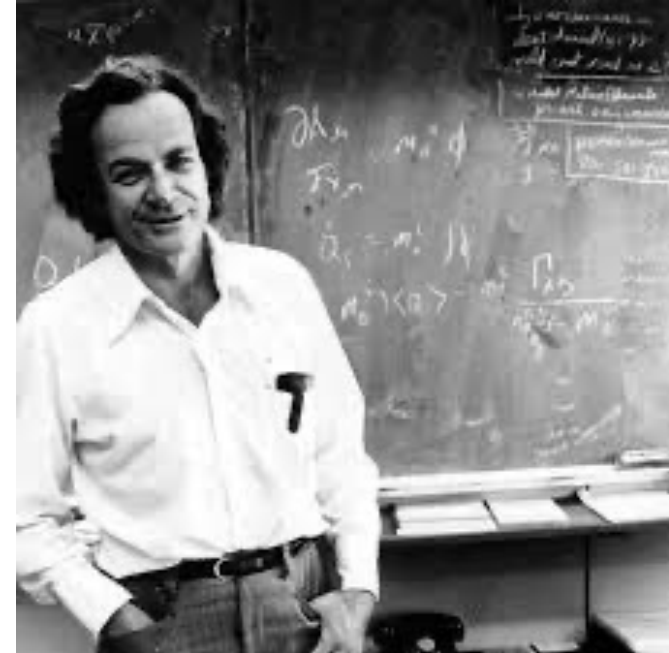
- ✓ flors is an *entity* (substance)
- ✓ 4 flors a gortle is a *noun phrase* (dosage)
- ✗ slithied is a verb

Omnia aliena sunt. Tempus tantum nostrum est

-- Seneca

- Be honest, not strategic
- Glory is fleeting (Sic transit gloria professoris)

- What motivates me is the pleasure of finding things out
- And making new technology
- And talking with scholars

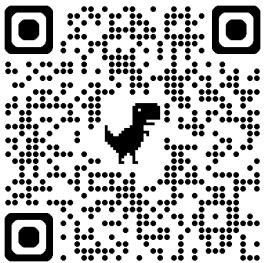


“Nobody ever figures out what life is all about, and it doesn't matter. Explore the world. Nearly everything is really interesting if you go into it deeply enough.”

— Richard P. Feynman



Science is worth doing only if your project fills you with awe.
To get paid to do it, you have to pitch and tailor your pitch.
Science isn't the only way to be a Scholar (QI, Media, Tech, MedEd).
There are interesting things that aren't Science (Atul Gawande, Oliver Sacks,
Tony Stark, Michael Crichton, Tom Swift)



Thank You

NYPQ

- Manish Sharma, DO, MBA
- Saumil Parikh, MD, MS
- Lily Hu

WCM

- Rahul Sharma, MD, MBA
- Junaid Razzak, MD, DrPH

Michele Burns, MD (BCH)

Alex Manini, MD, MS

Ed Boyer, MD, PhD

Michelle Lai-Becker, MD

Tony Rosen, MD

Radhika Sundararajan, MD, PhD

Rama Rao, MD