

Better to Be Lucky Than Good? Errors in Medicine

WILLIAM BINDER, MD

AT A RECENT DEPARTMENTAL morbidity and mortality conference, a casual comment from a radiology colleague attending the meeting hushed our group. In response to a delayed diagnosis of an epidural abscess, he remarked that the diagnostic error rate of radiologic interpretation is believed to be between 3%–5%.¹ Errors are even higher in emergency radiology. In one study out of Massachusetts General Hospital, abdominal/pelvic CTs reviewed by an outside attending radiologist found a 26% discrepancy between readers. In the same study, the CT was re-reviewed by the original radiologist and a 32% discrepancy rate was found.² Globally, about 1 billion radiographic examinations are performed worldwide annually. At a 4% error rate, this translates into 40 million errors.¹

A discrepancy is not always an error – “somewhere between a clear-cut error and the inevitable difference of opinion in interpretation is an arbitrary division defining the limit of professional acceptability.”³ However, errors do occur. In my own personal experience as an emergency physician, I have occasionally encountered errors which were usually, but not always, minor. Several months ago a 64-year-old teacher and soccer coach presented one evening



with neck pain. His pain had begun about four days earlier without provocation. He could not relate any trauma to the pain, but it did not “feel right.” After examining the patient, and checking basic labs (creatinine), I elected to do a CTA of the neck, which was read as negative. I discharged the

patient home with ibuprofen, but three hours later I received a call regarding an “overread” by an attending radiologist of the patient’s study – he had a subtle right-sided carotid dissection. My remote suspicions had been confirmed and the patient returned, merely inconvenienced as no harm was done, and anticoagulation was initiated.

In this case, information and cognitive overload likely contributed to a diagnostic error. Radiologists have a significant workload on overnight shifts, and with each CT scan composed of scores of images, it is not difficult to imagine that an abnormality might be missed. In emergency departments, radiologists face the daunting task of interpreting thousands of images per evening with little knowledge of the patient’s history (due to the systemic deficiency/efficiency of electronic ordering systems), while managing interruptions, fatigue,

cognitive biases, and inattentional blindness. To underscore this, in a study performed at the Brigham and Women’s Hospital in Boston, a dancing gorilla 48 times larger than an average lung nodule was inserted into the last case of a series of lung nodule cases reviewed by 24 radiologists; 83% of the radiologists did not see the gorilla.⁴

In my specialty (emergency medicine) error comes in many forms and for many reasons. Emergency physicians are interrupted on average 13 times per hour or over 100 times per 8-hour shift.⁵ Interruptions signify additional data

To underscore this, in a study performed at the Brigham and Women’s Hospital in Boston, a dancing gorilla 48 times larger than an average lung nodule was inserted into the last case of a series of lung nodule cases reviewed by 24 radiologists; 83% of the radiologists did not see the gorilla.⁴

Link to online article, images:

www.ncbi.nlm.nih.gov/pmc/articles/PMC3964612

inputs. This cognitive loading leads to multi-tasking, which, in turn, impacts emotional intelligence, and can result in a decreased attention span and a disregard for important information. Additionally, it causes slower reaction times, and foments burnout, all of which lead to diagnostic errors.^{6,7} Yet while workloads increase, our neurons do not.

Other errors are due to atypical presentations of infrequent diseases.

Some studies suggest that 30–40% of all acute aortic syndromes are initially misdiagnosed, and other studies have documented a missed diagnosis on initial evaluation in 27%–55% of patients that is not revealed until a postmortem examination.^{8,9,10,11} In some cases, misdiagnosed patients were inappropriately treated and some received antithrombotic therapies.¹¹ The infrequency of this event contributes to this misdiagnosis rate.^{12,13} It is estimated that a busy emergency physician seeing about 3000–4000 patients annually will diagnose only 1 case of acute aortic dissection (AAD) every 3–4 years.

Sometimes it is better to be lucky than good. Recently, a 54-year-old electrical engineer presented with vague symptoms of a tingling sensation in his leg and hand. His strength was normal and his symptoms had mostly abated when he saw my colleague in the triage area of the emergency department. The triage nurse was concerned about a stroke, and the physician acquiesced and ordered a protocolized study of the brain and neck vessels. A CTA revealed an aortic dissection distal to the subclavian with extension into the carotid artery.

So, what is an acceptable level of error? Some authors state diagnostic

error stands at around 10%–15% in both the medical system and emergency department, although less than 10% of errors are reported.^{14,15} While this figure seems high, it is hard to imagine that any error is acceptable to a patient. Physicians recognize the inevitability of error but have a similarly low threshold regarding the standard of care. Historically, 2% or more of myocardial infarctions are missed in the emergency department.¹⁶ With higher quality cardiac enzyme studies, in combination with risk prediction scores, we have likely cut this number in half, and emergency physicians now consider a miss rate for MI up to 1% acceptable.^{17,18,19,20}

Yet this discussion begs the question, can we do better with every disorder across every field of medicine? A delayed diagnosis (or missed diagnosis) of an AAD or an epidural abscess can have devastating consequences. In emergency medicine, algorithms have increasingly been used to reduce error and risk. Yet systems' failures and information overload continue to impact the specialty and error rates have not budged. Perhaps solutions are close at hand. Machine learning, a subset of artificial intelligence in which computers can parse data through algorithms

without being explicitly programmed, has been demonstrated to improve triage processes, smooth the perturbations in ED operations, and has been used to predict disposition for infants and toddlers with bronchiolitis and to more accurately diagnose retinopathy of prematurity.^{21,22,23} Artificial Intelligence has been used in radiology, dermatology, and other fields to improve diagnostic outcomes. Primary care has already been affected and specific protocols and precision medicine can be initiated based on a genomic and social analysis of patient data. Eric Topol and others believe that such machine learning will allow physicians to spend more time with patients, and less time doing data entry, thereby contributing to improved history taking and decreasing error. Indeed, in the current environment, over 50% of a primary care physician's time is spent entering data into the EHR.²⁴ In the emergency department it is likely that data input and analysis, which currently takes hours and is performed imperfectly, will take seconds to minutes. It is possible that errors will decrease. Until that time comes, however, we will aspire to be both lucky *and* good. ♦

References

1. Brady AP. Error and Discrepancy in Radiology: Inevitable or Avoidable. *Insights Imaging*. 2017; 8: 171-182.
2. Abujudeh HH, Boland GW, Kaewlai R, Rabiner P, Halpern EF, Gazelle GS, Thrall JH. Abdominal and pelvic computed tomography (CT) interpretation: discrepancy rates among experienced radiologists. *Eur Radiol*. 2010;20(8):1952–1957.
3. Waite S, Scott J, Gale B, Fuchs T, et al. Interpretive Error in Radiology. *AJR*. 2017; 208: 739-749.
4. Drew T, Vo MLH, Wolfe JM. The Invisible Gorilla Strikes Again: Sustained Inattentional Blindness in Expert Observers. *Psychological Science*. 2013; 24: 1848-1853.
5. Kellogg KM, Wang E, Fairbanks RJ, Ratwani R. 286 Sources of Interruptions of Emergency Physicians: A Pilot Study. *Annals of Emergency Medicine*. 2016; 68: S111-112.
6. El-Sharif N, Hawthorne HJ, Forsyth KL, Abdelrahman A, et al. Physician Interruption and Workload During Emergency Department Shifts. *Proceedings of the Human Factors and Human Ergonomics Society Annual Meeting*. 2017; 61: 649-652.
7. Byyny RL. Information and Cognitive Overload: How Much is Too Much? *Pharos*. 2016. Autumn: 1 – 7.
8. Elefteriades JA. Physicians should be legally liable for missing an atypical aortic dissection: CON. *Cardiol Clin*. 2010;28(2):245-252. doi:10.1016/j.ccl.2010.02.001.
9. Hines G, Dracea C, Katz DS. Diagnosis and management of acute type A aortic dissection. *Cardiol Rev*. 2011;19(5):226-232. doi:10.1097/CRD.0b013e3182203ed9.
10. Asouhidou I, Asteri T. Acute aortic dissection: be aware of misdiagnosis. *BMC Res Notes*. 2009;2(1):25. doi:10.1186/1756-0500-2-25.

11. Sundt TM. Intramural hematoma and penetrating aortic ulcer. *Curr Opin Cardiol*. 2007;22(6):504-509. doi:10.1097/HCO.0b013e3282f0fd72.
12. Strayer RJ. Thoracic Aortic Syndromes. *Emerg Med Clin North Am*. 2017; 35: 713-725.
13. Alter SM, Eskin B, Allegra JR. Diagnosis of Aortic Dissection in Emergency Department Patients is Rare. *West J Emerg Med*. 2015;16:629-31. doi:10.5811/westjem.2015.6.25752.
14. Anderson AG, Abrahamson K. Your Health Care May Kill You: Medical Errors. *Stud Health Technol Inform*. 2017;234:13-17.
15. Schnapp BH, Sun JE, Kim JL, Strayer RJ, Shah KH. Cognitive Error in an Academic Emergency Department. *Diagnosis*. 2018; 5: 135-142.
16. Pope JH, Aufderheide TP, Ruthazer R, et al. Missed Diagnoses of acute cardiac ischemia in the emergency department. *New Engl J Med*. 2000;342(16):1163-1170. doi:10.1056/NEJM200004203421603.
17. Moy E, Barrett M, Coffey R, Hines AL, Newman-Toker DE. Diagnosis. 2015; 2: 29 - 40.
18. Long B. Missed Myocardial Infarction in the Emergency Department. *emDocs*. Sept. 27, 2015. Accessed June 22, 2019.
19. Schriger DL, Mechine M, Wiechmann W, Carmelli G. Emergency Physician Risk Estimates and Admission Decisions for Chest Pain: A Web-Based Scenario Study. *Ann Emerg Med*. 2018;72:511-22.
20. Than M, Herbert M, Flaws D, et al. What is an acceptable risk of major adverse cardiac event in chest pain patients soon after discharge from the emergency department?: a clinical survey. *Int. J Cardiology*. 2013; 166: 752-754.
21. Liu N, Zhang Z, Ho AFW, Ong MEH. Artificial intelligence in emergency medicine. *Journal of Emergency and Critical Care Medicine*. 2018; 2: 82.
22. Stewart J, Sprivulis P, Dwivedi G. Artificial intelligence and machine learning in emergency medicine. *Emerg Med Australas*. 2018.
23. Brown JM, Campbell JP, Beers A, et al. Automated Diagnosis of Plus Disease in Retinopathy of Prematurity Using Deep Convolutional Neural Networks. *JAMA Ophthalmology*. 2018; 136: 803-810.
24. Arndt BG, Beasley JW, Watkinson MD, Temte JL, et al. Tethered to the EHR: Primary Care Physician Workload Assessment Using EHR Event Log Data and Time Motion Observations. *Annals of Family Medicine*. 2017; 15: 419-426.

Author

William Binder, MD, Associate Professor of Emergency Medicine, The Warren Alpert Medical School of Brown University; Co-Editor-in-Chief, *Rhode Island Medical Journal*.

Correspondence

William_Binder@brown.edu



Aetna is proud to support the members of the Rhode Island Medical Society.



©2019 Aetna Inc.
2017276



You have lives in your hands.

But you've also got your hands full, managing the complex risks that are unique to your world.

RIMS and HUB International have developed a customized insurance solution to help physicians and clinic administrators proactively protect what matters most.

Our insurance and risk management specialists can help you balance the practice and the business of healthcare, so you can plan confidently for the future and ensure the best care for your patients.

For more information, visit hubinternational.com/rimed

Put our global resources and local expertise to work for you.

Daniel Nissi, LIA • 800-649-9111 • daniel.nissi@hubinternational.com



Advocacy | Tailored Insurance Solutions | Peace of Mind

Woodstock, a Festival of Peace, Music and Providing Medical Care

KENNETH S. KORR, MD

THIS MONTH MARKS THE 50th anniversary of what was billed as “An Aquarian Exposition: 3 Days of Peace and Music,” commonly known as Woodstock. The “three days that rocked the world,” as it was later described, from August 15–17, 1969, would become the defining event of the Woodstock Generation.



and medical support services accordingly. A local general practitioner was contracted to organize medical care and he hired 18 physicians, 36 nurses and 27 medical assistants to cover 8-hour shifts in a 30-bed hospital tent and several trailers.¹

Attendance estimates proved woefully inadequate

and ultimately more than 400,000 people flocked to the festival site, clogging access roads and overwhelming food and support services. On Thursday, the day before the Festival was set to start, the call went out for additional physicians and nurses from local hospitals and New York City. In addition, two US Army Hueys and Air Force medics

were deployed from the West Point Military Academy about 60 miles from the site. And then there were the numerous volunteers, physicians, nurses, residents and other medical personnel who had come just to hear the music and stepped up to help out.

In retrospect, it was my first medical “gig” and while I didn’t get paid per se, I did get a free meal of brown rice and veggies after each shift from the Hog Farm kitchen.

Having just completed my first year at the University of Madrid medical school, I was one of those volunteers. I remember working two 4-hour shifts and it was a heady experience taking care of patients while listening to Richie Havens, Joan Baez, Crosby, Stills, &



Crowd at Woodstock listens to Joe Cocker performing at the Woodstock Festival on Sunday, Aug. 17, 1969. [WIKIPEDIA]

**WOODSTOCK
MUSIC & ART FAIR
presents
AN
AQUARIAN
EXPOSITION
in
WALLKILL, N.Y.**

FRI., AUG., 15

**Joan Baez
Arlo Guthrie
Tim Hardin
Richie Havens
Incredible String Band
Sweetwater
Ravi Shankar**

SAT., AUG., 16

**Keef Hartley
Canned Heat
Creedence Clearwater
Grateful Dead
Janis Joplin
Jefferson Airplane
Santana**

SUN., AUG., 17

**The Band
Jeff Beck Group
Blood, Sweat and Tears
Joe Cocker
Crosby, Stills and Nash
Iron Butterfly
The Moody Blues
The Who
Johnny Winter**

All programs subject to change
without notice



Art Show—Paintings and sculptures on trees, on grass, surrounded by the Hudson valley, will be displayed. Accomplished artists, "Ghetto" artists, and would-be artists will be glad to discuss their work, or the unspoiled splendor of the surroundings, or anything else that might be on your mind. If you're an artist, and you want to display, write for information.

Crafts Bazaar—If you like creative knickknacks and old junk you'll love roaming around our bazaar. You'll see imaginative leather, ceramic, bead, and silver creations, as well as Zodiac Charts, camp clothes, and worn out shoes.

Work Shops—If you like playing with beads, or improvising on a guitar, or writing poetry, or molding clay, stop by one of our work shops and see what you can give and take.

Food—There will be cokes and hotdogs and dozens of curious food and fruit combinations to experiment with.

Hundreds of Acres to Roam on—Walk around for three days without seeing a skyscraper or a traffic light. Fly a kite, sun yourself. Cook your own food and breathe unspoiled air. Camp out: Tents, water, restrooms, and camping equipment will be available.

Music starts at 4:00 P.M. on Friday, and at 1:00 P.M. on Saturday and Sunday—It'll run for 12 continuous hours, except for a few short breaks to allow the performers to catch their breathe.

Please Print

☐ Send me information on the WOODSTOCK MUSIC & ART FAIR

Send me _____ tickets for Fri., Aug. 15, at \$7.00 each

Send me _____ tickets for Sat., Aug. 16, at \$7.00 each

Send me _____ tickets for Sun., Aug. 17, at \$7.00 each

Send me _____ 2 day tickets for Fri. & Sat., Aug. 15, 16, at \$13.00 each

Send me _____ 2 day tickets for Sat. & Sun., Aug. 16, 17, at \$13.00 each

Send me _____ Complete 3 day tickets for Fri., Sat., Sun., Aug. 15, 16, 17, at \$18.00 each

Name _____

Address _____

City _____ State _____ Zip _____

Be sure to enclose a self-addressed, stamped envelope, with your check or money order (no cash please) payable to: WOODSTOCK MUSIC, P.O. BOX 398, RADIO CITY STATION, NEW YORK 10019

Magazine advertisement for the "Aquarian Exposition" of the "Woodstock Music & Art Fair," from *Ramparts* magazine, vol. 8, no. 2 (Aug. 1969), pg. 70. [WIKIPEDIA]



Kenneth S. Korr, MD, on motorcycle, in 1969.

Then there were the "Bad Trips" from LSD, mescaline and Psilocybin. The Festival had hired 85 members of a New Mexico commune known as the "Hog Farm" to provide food and shelter and they were also very experienced with "trip tents." Their philosophy was to provide a safe, quiet and reassuring environment and gently talk trippers down without the need for Thorazine. All told, there

were 797 reported bad trips, and only 28 required medication.²

In addition, there were 176 cases of asthma requiring treatment, 23 epileptic seizures, 57 cases of heat exhaustion and 250 people that had to be transported to local hospitals, including one woman in labor. There were only two deaths during the Festival weekend – a young man crushed by a tractor in his sleeping bag and a man who suffered a heroin overdose and was Medivac'd out to a local hospital, where he died the next day. By contrast, the city of Buffalo, with a comparable population, had 40 deaths during the same weekend.³

Perhaps most of all, it was the incredible spirit of community and "good vibes" that prevented the Festival from becoming a public health nightmare. This success is a tribute to the adept improvisation of medical providers and the vibrant volunteer spirit that took

over medical care during that trying weekend.¹ Not only the physicians, nurses and medical providers, but also many police and fire personnel and the local townspeople turned out to provide food and water and additional support.

I went back to Bethel 20 years later and what had been a sprawling, chaotic Festival site (the fourth largest city in NY State at the time) had now reverted to pristine rolling hillsides and fields of grain. The contrast was striking.

Though 50 years have passed, the festival experience continues to resonate with me. I still tend to patients, and play the guitar, inspired by my first "medical gig" and the performing artists of my generation. ♦

References

1. Abruzzi W. "A White Lake Happening." New York State Department of Health. p.2. 2 Sept. 1969.
2. Joshpe G: Joshpe's Journey. Stonecrest Publishers. Stamford, N.Y. p. 87. 2001.
3. EMS at Woodstock, JEMS, May 2010.

Author

Kenneth S. Korr, MD, is Associate Professor of Medicine Emeritus, Warren Alpert Medical School of Brown University and Associate Editor of the *Rhode Island Medical Journal*



Rhode Island's Medical Staffing Experts!

As a Valued Sponsor of the Rhode Island Medical Society, Favorite Healthcare Staffing provides a comprehensive range of staffing services at preferred pricing to RIMS members.

Serving the Rhode Island healthcare community since 1981, Favorite continues to set the standard for quality, service, and integrity in medical staffing. Call today and let us show you why we are The Favorite Choice of Physician Practices and Healthcare Professionals across the US!

Summer Special

10% off any Permanent Placement fee

Offer valid through August 31, 2019



*Favorite Healthcare Staffing
is a Valued Sponsor of the
Rhode Island Medical Society*



Quality Staffing, Exceptional Results!

Phone: 401.354.7115

Email: MedicalStaffing@FavoriteStaffing.com

Joint Commission Health Care
Staffing Services Certification



AA / EOE / M / F / V / D