



ELSEVIER



## LETTER FROM AMERICA

# A medical model for predicting plastic surgical outcomes

### Two parables on predicting outcomes

- Once upon a time when airport security was lax and AIG was called American International Group, a property and casualty actuary calculated the odds of there being a bomb on an airplane as one in a million, and, using probability theory, he calculated the odds of there being two bombs on an airplane as one in a trillion. He then decided that whenever he would travel by plane to carry his own bomb.
- Two IV drug users were in a drug house. The first had just finished and had some liquid left in his syringe. He asked his friend, "Want some?" His friend said, "No man, you don' wanna share no needles, 'cause if you do you can get AIDS or HepC." The first user then said, "Hey, everythin's cool. So long as you're wearin' a condom it's safe."

Although we may smile at these stories, too often we are guilty of making the same errors in logic. We unrealistically expect our surgical skills to grant a form of immunity to our patients — to prevent pathological processes from happening. All too frequently, we fail to accurately predict the causal relationships between our plastic surgical treatments and our patients' ultimate outcomes.

### Lessons from the past

Predicting outcomes is one of our most important responsibilities in providing medical care. For centuries, society held surgeons in lower regard than physicians. Why? Before the invention of general anesthesia, surgeons could accomplish little more than drain pus and amputate parts. Physicians had special gifts; they could accurately predict important vital outcomes — who would live and who would die.<sup>1</sup> Society still rewards those whom it believes have the ability to foresee the future. Those at the pinnacle of compensation in the financial world are rewarded for this very ability; they are called hedge fund managers. They are

rewarded for successfully predicting which investments will yield the greatest future financial returns. Curiously, one of the most accurate hedge fund managers in recent times is a physician.<sup>a</sup>

### Antibiotics and vaccines — cures and preventions

Physicians cured nothing until antibiotics were developed in the twentieth century. However, in the 18th century, physicians regularly prevented some diseases from occurring. Today, James Lind and Edward Jenner are honored, not because they were the first to discover how to prevent scurvy and smallpox, respectively, but because they performed prospective clinical trials, reported their results and convinced others that their preventive measures could yield successful outcomes.

Just as Lind and Jenner used logic to demonstrate the efficacy of limes and cowpox pustules, so too should we, as plastic surgeons, use logic to accurately predict our patients' outcomes. Otherwise, we are no better than the misguided actuary and drug user.

Physicians distinguish drugs that cure illness from drugs that prevent illness, for example, antibiotics versus vaccines. (Table 1) Similarly, plastic surgeons should distinguish between procedures based upon their expected outcome. Are our procedures curative or preventive? Our

<sup>a</sup> Michael Burry M.D., a former neurology resident at Stanford started a hedge fund rather than complete his training, first predicted the demise of subprime mortgages and subsequent worldwide economic meltdown. Burry shorted subprime mortgages by purchasing a complex type of financial derivatives called residential mortgage backed credit default swaps. While the world's economy sank into recession, Burry made millions of dollars for himself and his investors. See Lewis M. Betting on the Blind Side. Vanity Fair. April 2010. <http://www.vanityfair.com/business/features/2010/04/wall-street-excerpt-201004?currentPage=all> [Accessed July 11, 2012].

**Table 1** Goals of antibiotics vs. vaccines.

	Goal
Antibiotic	Cure
Vaccine	Prevention

failure to distinguish between the two can yield “uninformed” consent and disgruntled patients.

Examples of the distinction between the two types of procedures can be seen when we treat bone or joint problems. Treating a fracture is like administering an antibiotic. The type of fracture matters not; it can be a wrist fracture, phalangeal fracture, nasal fracture or zygomatic fracture. The type of treatment matters not, for the treatment can be with plaster, plates, pins or screws. What matters is that the treatment will typically heal the fracture. However, the treatment will no more *prevent* the same bone from fracturing in the future than will a dose of penicillin prevent a sailor from getting gonorrhea on his next voyage. Fusing a fragmented joint is akin to vaccination. Once a joint is fused, it cannot become arthritic. A fusion no more “cures” arthritis than cowpox cures smallpox. This important distinction is shown for some aesthetic procedures categorized by their goals. (Table 2)

By using this model, the murky matter of understanding repeat pathology is clarified. Is a lesion discovered in the same anatomic area recurrent disease or new pathology? If a basal cell carcinoma or Dupuytren’s cord is excised, is the next one in the neighborhood a recurrence or new disease? Obviously, if either patient or surgeon mistakenly believes that excisional surgery for a basal cell carcinoma or Dupuytren’s contracture has prophylactic powers then both will be disappointed. However, if the surgeon clearly explains to the patient the disease process and prognosis before embarking upon excision, then they will have a healthier relationship.

### “Time is the plastic surgeon’s greatest ally, and at the same time his most trenchant critic.”<sup>2</sup>

The key to our being able to explain the predicted outcome is our own understanding. That is what Gillies meant when he wrote the above heading in 1920. If we lack understanding, then we are deluding ourselves. It is one thing to delude ourselves; it is a far greater sin to misinform our patients. American plastic surgeons learned this from personal experience. Before breast implants were banned by the Food and Drug Administration, if a patient had asked some of us how long her gel implants would last, we confidently predicted that long after she had died, if her remains were to be exhumed, two gel implants would be proudly sitting beside some ribs unless her death had been caused by a head on collision with each vehicle traveling over 75 miles per hour. Eventually, we learned the limits of our knowledge, that silicone shells fatigue over time and that late implant failure was not solely caused by life threatening trauma.<sup>3</sup>

Challenges remain. We must strive to collect accurate data and improve our ability not only to predict if an

**Table 2** Goals of aesthetic procedures.

Procedure	Goal	Reason
Rhinoplasty	Prevent	Hump will not regrow
Facelift	Cure	Improves position and shape Does not stop gravitational or time effects
Submental lipectomy	Prevent	Fat cells will not regrow
Neurotoxin	Cure	Paralyzes muscles that cause wrinkles Wears off
Organic filler	Cure	Increases volume/but resorbs
Inorganic filler	Cure	Increases volume Does not prevent further volume loss
Mastopexy	Cure	Improves position and shape Does not stop gravitational or time effects
Breast augmentation (implant)	Cure	Increases volume Implant shell will eventually fatigue

outcome is curative or preventive, but also our ability to predict the clinical course. When will the outcome be achieved and how long will it last? This is the goal in Gillies’ phrase “medical science in its search for surgical truth”.<sup>4</sup>

### Financial disclosure

None.

### Conflict of interest

None.

### References

1. Freshwater MF. Are we hand doctors or hand surgeons? *J Hand Surg* 2011;**36**:945–6.
2. Gillies HD. *Plastic surgery of the face*. London: Henry Frowde Oxford University Press; 1920. 34.
3. Freshwater MF. The PIP crisis – déjà vu all over again? *J Plast Reconstr Aesthet Surg* 2012;**65**:840–3.
4. Freshwater MF. “Plastic Consumption” [sic] and the “search for surgical truth”. *J Plast Reconstr Aesthetic Surg* 2012;**65**:543–5.

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5 August 2012