

ERRORS IN OTOLOGY

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ABSTRACT

Successfully practicing medicine requires minimizing errors in diagnosis and treatment. Malpractice laws encourage litigators to ascribe all medical errors to incompetence and negligence. There are, however, many other causes of unintended outcomes.

This article describes common causes of errors and suggests ways to minimize mistakes in otologic practice. Widespread dissemination of common errors and their precursors can reduce the incidence of their occurrence. Consequently, governmental laws should be passed to allow a system of non-punitive, confidential reporting of errors and “near misses” that can be shared by physicians nationwide.

INTRODUCTION

Chances are good that you will commit an error during your next week of otologic practice. In performing any function, there is the possibility of an unintended outcome, i.e. a “mistake”. Mistakes happen to everyone everyday. Fortunately, most mistakes are trivial: they cause no harm or are easily recoverable.

Sports, like microsurgery hold our interest because they are often “played” at the limits of human ability. A baseball player with a batting average of 400 would be considered outstanding. But that means he is failing 60% of the time. Health care workers in an ICU have been shown to perform error-free 99.9% of the time and only rarely do these medical errors lead to any injury¹.

Malpractice laws encourage litigators to blame all medical errors on incompetence and negligence. These are, however, many other causes of unintended outcomes².

WHY ERRORS OCCUR

Why do even the best baseball players strikeout? Rather than ascribe a renowned athlete’s occasional failures as due to incompetence or negligence, most reasonable persons would attribute situational causes: e.g. wind, sun, fatigue, injury, a bad call, etc. Above all, they would probably indicate that it is impossible to get a hit every time because the task is inherently difficult. The more complex the behavior, the less likely that it can be repeated successfully.

Microsurgery is an inherently difficult task. Even the most experienced surgeon can inadvertently injure the facial nerve or the labyrinth. If a drill burr slips and injures the facial nerve, the goal of a litigator would be to convince the jury that the injury was due to incompetence or negligence. While these are possible causes, there are many other causes that must be considered:

- High Task Complexity

Anatomic changes increase the chance that even the most experienced surgeon may err. Examples include severity of disease, sclerosis, scar from prior surgery or radiation, tumor distortion and congenital anomalies.

- Haste

Time constraints also increase task complexity. Even an otherwise simple task can become difficult if its performance is time limited such as rushing to cauterize a bleeding artery adjacent to the facial nerve at the brainstem. Errors due to haste may be for “good” or “bad” reasons e.g. “Running late for a movie” vs. “The operating room supervisor says your last case will be canceled unless the present case is finished within the hour” vs. “Anesthesia is concerned about impending stroke if the procedure lasts much longer”.

- System and Resource Problems

Cost cutting by an HMO or insurer may disallow a preoperative CT scan or the availability of optimal tools e.g. microinstruments, laser, nerve monitor, improved prostheses, drill bits, etc.

- Technique

An inadvertent slip of the burr could injure the facial nerve even if the surgeon were experienced and knew exactly where the nerve was. Possible reasons include a momentary lapse of attention or a misjudgment (e.g. the surgeon used a cutting burr instead of a diamond burr which caught on a spicule of bone causing it to skip onto the nerve [vide infra]).

- Inexperience

Inadequate surgical case volume during or since training reduces the ability of the surgeon to deal with uncommon problems and increases the chance of technical errors.

- Altered state: Fatigue (an emergency at 4am), drugs or alcohol.

AUTOMATIC BEHAVIOR ARRAYS

Negligence is a blatant disregard for the consequences of an act such as an angry, drunk teenager driving recklessly. Most errors in medicine, however, are likely due to errors of attention. These errors are often due to 1) unrecognized changes in conditions, 2) fatigue, or 3) disruption of an “automatic behavior array”.

Many of our daily tasks are performed in an almost automatic fashion with little conscious thought³. They consist of a sequence of behaviors that are triggered by external or internal stimuli. These Automatic Behavior Arrays (ABA's) account for a majority of our daily tasks. Without them, each task would require unreasonably high levels of mental effort that are typically reserved for only infrequent, short periods of problem-solving throughout the day.

An experienced driver, for example, has developed numerous arrays of automatic behaviors. Sitting in the driver's seat acts as a stimulus that triggers a “car start-up routine”: placement and turning of the key in the ignition, setting the rear view mirror, depression of the accelerator, shifting into drive, looking for traffic, etc.

ABA's, however, are prone to failure especially if there is a break in the routine. Using the car example, if the driver is distracted upon entering because he notices that his daughter left a toy on the seat, disruption of the “car start-up” routine might result in failure to set the rear view mirror. If it is not noted and corrected in a timely fashion, the chances of an accident occurring are increased. This is example of the concept of “magnification of small differences” wherein a small change in initial conditions can lead to a major change in the final outcome.

Even a perfectly executed ABA can lead to error. This can occur if subtle changes in conditions are not recognized to prompt the individual to select another behavior. Thus, errors can occur from either disruption of an appropriate ABA or persistence with an ABA which is no longer effective.

ABA disruption often occurs by diversion i.e. an unexpected or novel event causing a break in routine. Teleologically, we must ignore irrelevant stimuli to prevent relinquishing useful ABA's and yet be attentive enough to respond to new, possibly relevant changes. Consequently, an ever-changing balance occurs between forces that select for either persistence or abandonment of an ABA. The inherent difficulty in deciding which is the correct behavior at any given time is a frequent source of errors.

Rectification errors

If someone recognizes their performance is not effective, they may try to correct their behavior. This change may or may not be effective. It could worsen the situation because the correct modification can rarely be known beforehand without trial and error. Simply searching for a more effective method, however, may lead to even greater problems i.e. “rectification errors”.

For example, a golfer suddenly finds that her swing is off - her balls are slicing 20° to the right of the flag. The ideal “cure” would be to identify which part of the swing is in error and change it. But there are dozens of possible alterations in swing mechanics. Many are very subtle and there is no absolute way of knowing which component is causing this new error.

Let us assume that in this case the cause of the slice is due to slight malpositioning of her stance. Unfortunately, our golfer might conclude that the cause is due to a faulty grip on her club. If she now tries to compensate for a slice by gripping the club differently, a new error is introduced. Unless this inappropriate alteration coincidentally happens to completely offset the actual cause, there may now begin an entire cascade of compounding errors. Furthermore, even if our golfer determined the correct cause of her slice, compounding errors could still occur as she tries to find just how much and in what direction, her stance should change. In sports jargon, an athlete is said to have “choked” when one error leads to a total collapse of acceptable performance. Thus, even a sincere attempt to improve performance can deteriorate into a “comedy of errors”.

MINIMIZING ERRORS

“Measure Twice, Cut Once”

Errors of Attention can be minimized by initiating system changes including protocols, duplication and monitoring. For example, to reduce the chance of operating on the wrong ear, a protocol including duplication is as follows: an erasable board in the OR is marked with the patient’s name, allergies and side to be operated on. The board is marked by both the circulating nurse and the surgeon. The nurse makes her determination by asking the patient and checking the consent form. The surgeon checks his or her office records and the audiogram. Examples of monitoring are becoming increasingly common today including CO₂, blood pressure and facial nerve monitors.

Anticipation of Error

Recognizing the most common errors in an operation, a surgeon can modify the choice or sequence of events to either reduce the chance of error occurring or to minimize the severity of its consequences.

For example, even a careful surgeon can lose control of a drill and injure the facial nerve during a labyrinthectomy. This risk is increased when operating on a right ear because the clockwise rotation of the burr causes it to roll towards the facial nerve which is just to the right of the horizontal semicircular canal. Recognizing the possibility of this error, a surgeon could leave the facial recess closed and the incus in place to prevent the drill from rolling into the facial recess. Another option is to use a diamond burr on reverse (rotating counter-clockwise) so that its tendency will be to roll away from the facial nerve.

These concepts can be extended to other aspects of otology. For example, a drill can easily slip and tear the tympanomeatal flap while widening the external auditory canal. This error can be reduced by taking a piece of foil from the suture package and placing it as a protector next to the flap.

Training

Board certification and national courses benefit the public by enhancing the competence of otolaryngologists. Residency training programs provide similar benefits by attempting to select capable individuals (intelligence and skill) and assuring proper training and clinical experience. Although “tracking” of residents into various subspecialties has been controversial, program directors can take a positive role by realizing that not every resident has the prerequisite skills to be an adept microsurgeon and not every program has sufficient clinical volumes to assure competency. Because program directors are naturally reluctant to withhold a resident for only a few deficiencies, national guidelines should recognize this fact and make accommodations for it.

Certificates of Added Qualifications (CAQ’s) are a possible means to assure competency in specialized areas but are controversial due to a variety of complex socioeconomic factors. Consequently, academic programs that cannot provide adequate caseloads should find alternative opportunities in the private sector, restrict their graduates from performing untrained procedures (restricted hospital privileges) or discontinue their program.

LEGAL IMPLICATIONS OF REPORTING ERRORS

There are numerous ways in which medical errors can be reduced including 1) initiating system changes, 2) assuring competence and 3) disseminating information on past errors. The latter two means, however, require legal and legislative changes to improve their effectiveness.

When negligence and incompetence do in fact lead to injury, they should be identified and addressed. Unfortunately, the current legal system hinders effective peer review as well as the individual physician’s ability to share this information so others can learn avoid similar mistakes. Dr de Leval, MD, a cardiovascular surgeon interested in minimizing medical errors has stated that “incompetence is tolerated at many levels because dealing effectively with it may lead to a nightmare of legal entanglements with employers, families, colleagues, unions, threats of suits, etc.”⁴.

If we are to make substantial changes in reducing errors (and consequently the need for malpractice suits), legislation must allow the medical field the chance for assuring competency without undue fear of lawsuits of another kind e.g. anti-trust and defamation.

Similarly, program directors must be able to make difficult decisions (e.g. holding

back unsatisfactory residents or restricting future hospital privileges) without fearing unjustified legal retaliation by the trainee.

“The paradox of modern quality improvement is that only by admitting and forgiving error can its rate be minimized.”⁵ D Blumenthal

Errors are excellent teacher. Widespread dissemination of common errors and their precursors can reduce the incidence of their occurrence. As Leape² has recommended, governmental laws should be passed to allow a system of non-punitive, confidential reporting of errors and “near misses” that can be shared by physicians nationwide. Such a system has shown significant benefits for the Federal Aviation Association where prompt reporting of dangerous situations are not penalized and analysis of errors and near misses are reported in pilot magazines. An “Errors in Otolaryngology” column in a well-read journal would serve its readership (and patients) well.

“Those who cannot remember the past are condemned to repeat it”
- George Santayana

Legislation must allow physicians to openly share the cause and cures of common medical errors so that our patients are not condemned to experience the same problems “newly discovered” by each physician unaware of what has gone before.

¹ Gopher D, Olin M, Donchin Y et al: The nature and causes of human errors in a medical intensive care unit. Presented at the 33rd annual meeting of the Human Factors Society, Oct. 18, 1989, Denver, Colorado.

²Leape, L: Error in Medicine. JAMA 272: 1851-1857, 1994

³ Reason J: Human Error. Cambridge University Press, Cambridge 1990

⁴ de Leval, Marc, Francois K, Bull C, Brawn w, Spiegelhalter D: Analysis of a cluster of surgical failures. J Thorac Cardiovasc Surg 1994; 107: 914-24.

⁵ Blumenthal D: Editorial: “Making medical errors into treasures” JAMA 1994, 272: 1867-8.