Whatever Gets Measured, Gets Managed – Merit in Medical Malpractice

ABSTRACT: This article focuses on medical malpractice lawsuits and examines a specific decision-making method called CCC+C. Behind any medical malpractice lawsuit, there is a complication. Many complications are medical errors, but most are random errors-of- nature. Errors-of-nature do not represent departures from applicable standards of care. Traditional decision-making in medical malpractice is abductive/inductive reasoning. Abductive/inductive reasoning Is critical thinking, but it does not definitively distinguish a random error-of-nature from a medical error. Not only does this incentivize the lawsuit, but the vacuum is fill by artificial intelligence platforms such as EvenUp, ProPlaintiff and MyCase, which justifies the lawsuit with the financial value of the complication. Hence, CCC+C is developed . It uses deductive reasoning. Deductive reasoning is critical thing, but it measures a complication with statistics. Since attorneys and medical experts are fluent in deductive reasoning and are statistically literate, if they use CCC+C, medical malpractice becomes more efficient and effective. Whatever gets measured, gets managed.

INTRODUCTION:

Two hundred thousand lawsuits are filed per year[1] The number of medical malpractices cases among them is unclear.[2] The National Practitioner Data Bank reports 22,000 medical malpractice lawsuits, but the report only includes settlements and plaintiff verdicts. [3] According to the AMA, these account for 33.3% of all medical malpractice lawsuit, which are litigated. [4] If so, there is a total of potentially 66,000 filed per year, 44,000 of which are not settlements or plaintiff verdicts. Another source reports that 85,000 medical malpractice lawsuits are filed per year.[5] In either case, medical malpractice lawsuits are big business in the USA worth at least $56-billion/year. If only 22,000 reported cases end favorably for the plaintiff, many medical malpractice lawsuits are frivolous.

Many, if not all claims, which attorneys review, are vetted by artificial intelligence before one is represented, If that is not enough, they are examined by medical experts. Fundamental to these analyses is

the benchmark of legal thinking, abductive/inductive reasoning.[6] Because all claims are so vetted , attorneys assert that all claims they represent are "legitimate." Claims may be legitimate, but are they meritorious?

Because of preponderance of evidence, vetting by abductive/inductive reasoning does not definitively differentiate an error-of-nature from a medical error. Consequently, some frivolous claims are represented by plaintiff attorneys, when they should be dismissed and some meritorious ones are rejected when they should be represented. More likely than not, more meritorious cases are rejected by attorneys than are represented by them. All represented cases, meritorious or not, are defended by defense attorneys and some meritorious claims are defended, when they should be settled. Hence, there are tremendous costs to all this inefficiency.

Also, because of "permissible inference," which is a doctrine allowing jurors to conclude medical malpractice based on other notions when there is no definitive proof, a frivolous claim can prevail in court.[7] Hence, a frivolous medical malpractice lawsuit accrues to the advantages of both plaintiff and defense attorneys for whom such lawsuits are their livelihood. .

Nevertheless, all medical malpractice lawsuits have 4 characteristics in common: (1) There is one **dependent variable,** the underlying complication, and two **independent variables**, the standard of care and the medical intervention. (2) There is an **affirmatory hypothesis.** (3) There is the **level of significance** of "preponderance of evidence." (4) All are presumed **legitimate.** There is Rule 56 as the critical "gatekeeping" mechanisms for merit used by all states. Twenty-nine states require affidavits of merit and for the 21 states, which do not, federal Rule 56 for summary judgment is sufficient.

Abductive/inductive reasoning is traditional in medical malpractice because these 4 features suit it. However, they also suit deductive reasoning. The independent and dependent variables are the same. Rather than using an inflexible affirmatory hypothesis, proving that " the medical intervention departs from the standard of care" to the satisfaction of a jury, deductive reasoning uses a flexible null hypothesis, testing "the

medical intervention comports with the standard of care " to the satisfaction of statistical significance, Rather than using preponderance of evidence, which is 50% probability plus a scintilla, as the benchmark for decision-making, deductive reasoning uses 95% probability as the benchmark. Rather than measuring merit by a certificate or by a federal rule, deductive reasoning measures merit by a number. This is how deductive reasoning is distinguished from abductive/inductive reasoning.

There are several decision- making methods, which are designed to discourage certain practices that can lead to a medical malpractice lawsuit, if left unchecked. None prevent a single frivolous medical malpractice lawsuit caused by a random error-of-nature. The "Four Cs"(compassion, communication, competence, charting), which is often confused with CCC+C is one such method. [8] Now comes CCC+C (collate, compare, calculate, certify), which is based on deductive reasoning. It is designed to determine errors-of-nature and to discourage frivolous legal proceedings against blameless accused doctors. CCC+C is modeled on ACE+V (analyze, compare, evaluate, validate). [9] ACE+V is a forensic decision-making method, which uses deductive reasoning. It is designed to determine fingerprints. It discourages frivolous legal proceedings against blameless accused parties in a criminal investigation.

MATERIAL AND METHODS:

From these 4 common characteristics , CCC+C is developed to distinguish a medical error from a random error-of- nature.

Step 1: Collate:

This step is **abductive/inductive reasoning.** Abductive/inductive reasoning organizes the standard of care and the medical intervention into corresponding phases according to their respective duty so that the corresponding phases can be compared.

The standard of care represents the epitome of excellence in the general population and includes all duties expected of any competent practitioner. The medical intervention is a representative sample of the general population and includes how these duties are actually performed.

Abductive/inductive reasoning uses "preponderance of evidence," which is no more significant than "more likely than not." In abductive/inductive reasoning, the difference between the two independent variables, alone, is sufficient to determine medical malpractice. As soon as "more likely than not "is satisfied, the comparison is over.

Abductive inductive reasoning ignores one very important consideration. There is one transcendent duty in all phases — "primum, non nocera (first, do no harm)." This duty obligates a practitioner to take all necessary precautions when making a "calculated risk" to avoid a medical error, The benefit must outweigh the harm.

Figure 1: The 10 phases in CCC+C and their respective duties

1. *The* ***Presentation Phase*** - the initial encounter for this medical condition. The duty is to determine medical stability and to prepare a differential of diagnoses by performing a history, thereby identifying all risks and preexisting conditions, and a physical examination including vital signs.
2. *The* ***Investigation Phase*** -the duty is a complete medical work-up (labs, EKG, imaging studies, consultations, previous medical records, etc.).
3. *The* ***Interpretation Phase*** -the duty is to understand the relevance of all results.
4. *The* ***Diagnostic Phase*** -the duty is to arrive at an appropriate final diagnosis and prognosis.
5. *The* ***Deliberation Phase*** -the duty is to determine alternative medical interventions
6. *The* ***Informed Consent Phase*** -the duty is to disclose risks, benefits, and complications of these alternatives to the patient and/or to the patient's representative.
7. *The* ***Selection Phase*** -the duty is to select the safest most effective management from among these choices with the knowledge and approval of the patient and/or the representative.
8. *The* ***Technical Phase*** - the duty is to exercise due caution in each detail of management in the medical intervention selected.
9. *The* ***Recovery Phase*** -the duty is to appropriately respond to progress and to complications.
10. *The* ***Discharge Phase*** – the final encounter for this medical condition. The duty is to determine that the patient has recovered sufficiently from this medical condition to conclude management and/or to arrange follow-up appointments and appropriate referrals.

Step 2: Compare:

With this step the comparison just begins. It is **deductive reasoning.** The difference between each phase in the standard of care and its counterpart in the medical intervention implicates a complication as either a **medical error**, caused by a breach of duty, or an **error-of-nature**, caused by random chance. The comparison uses 3 discrete **functional variables** to establish if the complication is an error-of nature or a medical error. They are background risk, relative risk, and incident risk.

Background risk is the probability that the complication is a random error-of-nature. It is a baseline statistic almost always found in medical literature.[10] For example, in the general population of preterm low birthweight newborns, the background risk for cerebral palsy is 15%. In other words, there is a 15% chance that cerebral palsy is inevitable just as a chance occurrence.

Since the standard of care is an ideal medical intervention under the direct control of an ideal practitioner, any complication associated with the standard of care, is never a medical error and can only represent the background risk.

Relative risk indicates the extent a difference between a phase in the standard of care and its counterpart in the medical intervention is influenced by human error. This considers how the benefit outweighs the harm. It is a "risk ratio." If there is no difference, the relative risk is 1. If there is a difference, the relative risk is greater than 1.[11]

How much greater depends on the yardstick. The yardstick for this measure is the "threshold risk ratio" for a medical error. The threshold risk ratio is 100%,which is a constant for a medical error, divided by the background risk. For example, the threshold risk ratio for cerebral palsy in preterm low birthweight newborns is 100%/15% = 6.66

A relative risk greater than 1 is not necessarily a medical error. A medical error must have a relative

risk equal to or greater than the threshold risk ratio.

Incident risk is the probability that the complication in the medical intervention is a medical error.[12] For each phase of the medical intervention, incident risk = relative risk x background risk. Hence, there is a "test sample" of 10 incident risks. Collectively, incident risks represent the entire medical intervention. Individually, an incident risk is a sampling variability. An incident risk greater than the background risk, but less than 100%, usually is a "calculated risk." However, an incident risk of 100% or greater is always a medical error. In fact, it qualifies as "res ipso loquitur."[13] For now, suffice it to say that a sampling variability is a random error-of-nature **until proven otherwise,** which us another way of saying "primum non nocera."[14]

Figure 2: Comparing the Phases in the Standard of Care and the Medical Intervention

1. *The* ***Presentation Phase*** *-*
Standard of care = background risk μ
Medical intervention = background risk x relative $risk_1$ (≥1) = incident $risk_1$ (≤100%)
2. *The* ***Investigation Phase*** *-*
Standard of care = background risk μ
Medical intervention = background risk x relative $risk_2$ (≥1) = incident $risk_2$ (≤100%)
3. *The* ***Interpretation Phase*** *-*
Standard of care = background risk μ
Medical intervention = background risk x relative $risk_3$ (≥1) = incident $risk_3$ (≤100%)
4. *The* ***Diagnostic Phase*** *-*
Standard of care = background risk μ
Medical intervention = background risk x relative $risk_4$ (≥1) = incident $risk_4$ (≤100%)
5. *The* ***Deliberation Phase*** *-*
Standard of care = background risk μ
Medical intervention = background risk x relative $risk_5$ (≥1) = incident $risk_5$ (≤100%)
6. *The* ***Informed Consent Phase*** *-*
Standard of care = background risk μ
Medical intervention = background risk x relative $risk_6$ (≥1) = incident $risk_6$ (≤100%)
7. *The* ***Selection Phase*** *-*
Standard of care = background risk μ
Medical intervention = background risk x relative $risk_7$ (≥1) = incident $risk_7$ (≤100%)
8. *The* ***Technical Phase*** *-*
Standard of care = background risk μ
Medical intervention = background risk x relative $risk_8$ (≥1) = incident $risk_8$ (≤100%)
9. *The* ***Recovery Phase*** *-*
Standard of care = background risk μ
Medical intervention = background risk x relative $risk_9$ (≥1) = incident $risk_9$ (≤100%)

10. *The **Discharge Phase*** –
Standard of care = background risk μ
Medical intervention = background risk x relative risk$_{10}$ (≥1) = incident risk$_{10}$(≤100%)

Step 3: Calculate:

This step is **statistical analysis** and gives meaning to the phrase *until proven otherwise.* "Until proven otherwise" means proving that the collective difference in the test sample is "statistically significant" from the background risk and, hence, the difference is not random chance.[15]

In CCC+C, the hypothesis that is tested is called the "null hypothesis." It is "null" because it typically predicts that the difference between the general population and the representative sample is **null**. The null hypothesis specifically states "there is ***no statistically significant difference*** between the standard of care and the medical intervention in question." The null hypothesis is either retained or rejected.

For every "null hypothesis," there is an "alternate hypothesis." The alternate hypothesis is the antithesis of the null hypothesis. It specifically states "there is a ***statistically significant difference*** between the standard of care and the medical intervention in question." When the null hypothesis is rejected, the alternate hypothesis is proven.

The test used to determine statistical significance is the "single sample T-test."[16] It makes statistical analysis as simple as abc.

(a) Determine **a**lpha. Alpha is a level of significance. It is a conscious choice by any investigator. For some investigators, alpha is "preponderance of evidence," the sine qua non for decision-making in law. This means 50% probability plus a scintilla more. Preponderance of evidence corresponds to an alpha of 0.5.[17]

For other investigators, alpha is "95% confidence," the sine qua non for decision-making in science. In this circumstance, alpha is 0.05.[18]

Hence, in CCC+C, alpha depends on the conscious choice of an investigator and is either 0.05 or 0.5 depending in their predilections toward science or the law.

Whatever value for alpha is determined. it corresponds to a coordinate, ranging from 0 to 1.0 on the X -axis of a normal distribution curve. The curve represents the general population of all treatments for a given medical condition. Alpha is the tipping point that separates medical interventions, which depart from the standard of care, from those, which comport with it. That is why alpha is the "level of significance."

(b)Fill in the **b**lank . There are 3 blank data fields, which must be recorded to complete the test. (1) The population mean, μ. It is filled in with the background risk, which represents the standard of care; (2) The test sample, which is the medical intervention in question. It is filled in with the 10 incident risks. (3) The tail or the side of the data distribution curve, which is used to reject or to retain the null hypothesis. It is filled in with "one " or "upper," which corresponds to the higher coordinates on the distribution curve

(c) Complete the test by clicking **c**alculate. The *p value* is the result. *P value* is a coordinate on the same X-axis between 0 and 1.0. However, *p value* represents the medical intervention in question. When *p value* ≤ alpha or alpha ≥ *p value*, a medical intervention departs from the standard of care and the null hypothesis is rejected . When *p value*> alpha or alpha <*p value,* a medical intervention comports with the standard of care and the null hypothesis is retained.

Figure 3: Hypothesis Testing

1. **The Null Hypothesis (H_o):** "*There is no statistically significant difference between the background risk, representing the standard of care, and the test sample of 10 incident risks, representing the medical intervention; therefore, the complication is an error-of-nature, unrelated to the medical intervention, and the medical intervention comports with the standard of care."*
2. **The Alternate Hypothesis (H_a): "***There is a statistically significant difference; hence, the complication is a medical error; the medical intervention departs from the standard of care, and the medical intervention is the proximate cause."*
3. **Statistical Analysis**: The "single sample T-test" is found in most statistics software**.**
4. **The Level of Significance :**alpha (α)
5. **The Test Sample :** incident $risk_1$ incident $risk_2$ incident $risk_3$ incident $risk_4$ incident $risk_5$ incident

risk$_6$incident risk$_7$ incident risk$_8$ incident risk$_9$ incident risk$_{10}$

6. **The Population Mean** (mu μ): background risk.
7. **The *P value*** : This is the result. If *p value* is equal to or less than alpha , the difference is statistically significant and the null hypothesis is rejected. Otherwise, it is retained.

Step 4: Certify:

This step determines **"merit."** Regardless of how lawyers define "legitimate," legitimate is not merit. Merit is the probability that data and material facts, which retain or reject the null hypothesis, are reliable. Because merit is a measurement, all cases have merit. Some cases have more merit than others. However, when merit = 0 or has a negative value, there is no reliability in the data or facts to support a decision to retain or to reject the null hypothesis. When a lawsuit has 0 or negative merit; it is frivolous and, if the null hypothesis is rejected, it should have been retained or vi se versa.

The investigator performing the study prepares a notarize report, which is shared with all parties involved in the lawsuit, including the malpractice carrier. Ultimately, the report provides a measurement for merit. Merit is any number, positive or negative, up to and including 100%. For a medical expert, the report serves as a "certificate of merit." The report documents the details of the decision-making employed by the investigator plus the results. In addition, the report specifies compliance with standards for admissible evidence. These standards are articulated in the Daubert Decision.[19] The Daubert Decision requires "known error rates." CCC+C has known error rates called type-I and type-II errors.

In statistics, **type-1 error** is the probability of rejecting a true null hypothesis. A "true" null hypothesis refers to a medical intervention in question, which is the same as the standard of care and there is no statistically significant difference between them. However, when there is a type -I error, an investigator determines that there is a difference when, in fact, there is none, and a true null hypothesis is rejected.

Type-I error is regarded as an "error of commission." In CCC+C, type-1 errors influence the determination of relative risks. The function committed by the investigator is the selection of a capricious set of relative risks, which would reject a true null hypothesis. Any action that proceeds without a rational basis is a bias. Since there is no rational basis for the selection of this set , type-1 error represents a "selection bias."

Not only is rejecting a "true" null hypothesis irrational, but, when rejected , the alternate hypothesis is automatically accepted by default. "Accepted by default" is also irrational. Because capricious relative risks fail to prove a "true positive," type-I error is said to prove a "false positive. " The alternate hypothesis is this "false positive.

Type-I error has a quantitative value. The quantitative value is alpha. Because alpha is a conscious choice by an investigator, type-I error is not calculated. Like it or not, in the law, when a true null hypothesis is rejected and a false positive is accepted, these are done as deliberate choices and type-I error is 50%. In science, this same deliberate choice has a type-I error of only 5%.

Type-II error is entirely different. It is the probability of retaining a false null hypothesis. More correctly, type-II error is the probability of failing to reject a false null hypothesis before it is retained . A "false" null hypothesis refers to a medical intervention, in which the difference between the 2 independent variables is statistically significant. However, the investigator fails to determine the difference and a false null hypothesis is retained. Ergo, there is a type-II error.

Type-II error is regarded as an "error of omission. " The "omission" is the failure to determine whether the null hypothesis is false before retaining it. The function, which is actually committed by the investigator, is the avoidance of relative risks when determining a phase in the test sample, which causes the null

hypothesis to be retained when it should be rejected. Since there is no rational basis for this avoidance, type-II error represents an "avoidance bias."

By avoiding correct systematic relative risks, which would otherwise prove a "positive," type-II error is said to prove a "negative." Because failing to determine that a null hypothesis is false before it is retained, the retained false null hypothesis is this negative.

Type-II error, also, has a quantitative value. That value is beta. Beta = 1 – **power**.[20] Beta, however, is not by conscious choice of an investigator; it must be calculated. Power is a complex and esoteric "sensitivity analysis," which determines that the difference between the standard of care and the medical intervention is not by random happenstance**.** The calculation of power depends on the size of the test sample and the standard deviation among incident risks in the test sample.

Power represents the probability that the result of the test is not a false null hypothesis by random chance . Because type-II error is 1 – power, type-II error represents the probability that the result of the test is a false null hypothesis by random chance. The real error is by design and not by random chance. It is the irrational failure to determine whether the null hypothesis is false before it is retained. In other words, the error by design occurs when determining relative risks.

Consequently, because power is complicated, it is rarely calculated and type-II error is rarely acknowledged. In contrast, alpha, as the conscious choice of an investigator, is never calculated, but type-I error is always acknowledged. Nevertheless "known error rate" is a standard in CCC+C. If type-I error is known, type-II error must, also, be known, if, for no better reason, than to comply with the standard of "known error rate."

Because type-II error is calculated, it can be known. There are 3 general rules for type-1 and type-II errors. First, type-I and type-II errors refer to the same null hypothesis and, hence, to the same medical

intervention. Even if a true null hypothesis is retained , there are type-I and type-II errors.

Second, for every type-I error there is a corresponding type-II error. Type-I errors occur when choosing relative risks, which would reject the null hypothesis, if true. Type-II errors occur when choosing relative risks, which would retain the same null hypothesis, if false. Both are biases by the investigator when determining the test sample .

However, the size of the test sample is not influenced by bias. In CCC+C, the sample size is constant. There are always 10 phases. Under the circumstance that 10 phases in the test sample are constant, when alpha is 0.05, power is typically 80% and type-II error is 20%[21] Using the same yardstick of 10 phases, when alpha is 0.5, power is 99.35% . Type-II error is, therefore, 0.65%.

Third, alpha and beta must always be inversely related, meaning that, if alpha is high, beta is low and vi se versa. This only makes sense because , when the probability that the rejected true null hypothesis is high, the probability that the same null hypothesis, if retained, is false, must be lower. Since, when type-I error is 5 %, type-II error is 20% and, when type-I error is 50%, type-II error is 0.65%, alpha and beta are inversely related.

These equivalent values for type-II errors are compatible with these general rules.[22] Also, quantifying type-II error complies with the standard of "known error rate."

The reason type-I and type-II errors are important is "whatever gets measured, gets managed" This also applies to biases. Biases are measured by type-1 error and type-II error.

Whenever there are choices to be made, there are biases. For example, alpha is a choice. Beta may be a calculation, but it is contingent on the choice of alpha . Hence, both alpha and beta are influenced by a structural or cognitive bias , which is built into all algorithms of decision-making, called a confirmation bias. Confirmation bias influences 2 other biases, which cause the systematic distortion of data and material facts

when determining relative risks. These two biases are the aforementioned "selection bias," and "avoidance bias.' Collectively, these biases undermine the reliability of certainty about conclusions pertaining to retaining or to rejecting the null hypothesis. Biases undermine merit.

In abductive/inductive reasoning there is the awareness of bias, but there is, also, the acceptance of it. Nothing can be done. Just because biases are inevitable does not presume that biases cannot be managed. Deductive reasoning is quantitative. It has structural safeguards, which measure and manage theses biases. Needless to say, there are other biases that are social and cultural in nature, such, as "researcher bias," "observer bias" and "sympathy bias." However, they overlap with selection bias, avoidance bias, and confirmation bias. Safeguards even manage their influences.

For the purpose of discussing the safeguards, when the scenario causes a null hypothesis to be retained, the safeguard is designated as H_o and, when the scenario causes a null hypothesis to be rejected, it is designated as H_a. H_o and H_a have their "complements. " For instance, the complement of H_o is 100%- H_o and the complement of H_a is 100% -H_a. Collectively, these safeguards not only provide an understanding of selection bias, avoidance bias and confirmation bias but they do so with all biases, which overlap. This is not possible with abductive/inductive reasoning.

1. **Selection bias** is probability that the selection of relative risks is the cause a null hypothesis is retained when it should be rejected or vi se versa. When the safeguard is H_o, selection bias corresponds to type-I error. When H_a, selection bias is the complement of H_o, 100% - type-I error.

2. **Avoidance bias** is the probability that the avoidance of relative risks is the cause a null hypothesis is retained when it should be rejected or vi se versa. When the safeguard is H_o, avoidance bias corresponds to type-II error. However, when H_a, avoidance bias is 100% - type-II error.

3. **Confirmation bias** is caused by the choice of alpha, which, ultimately effects beta and the

connection between a complication, which is an unpreventable random error-of nature, and a complication, which is a preventable medical error. Confirmation bias is the probability that the conscious choice of alpha is the cause the null hypothesis is retained when it should be rejected or vi se versa. Confirmation bias is the average of selection bias and avoidance bias depending on the safeguards of H_o and H_a.

Merit equals 100%, which is the probability that all data and material facts in a medical malpractice lawsuit are reliable, minus the summation of selection bias, avoidance bias and confirmation bias. Because other biases overlap with these three biases, a medical malpractice lawsuit has an observable value for merit. Whatever gets measured, gets managed.

Figure 4: The Certified Report

1. Conclusions: (1) The null hypothesis is retained or rejected. (2) The complication is a medical error or an error-of-nature; (3) the medical intervention comports with or departs from the standard of care; (4) there is or there is no proximate cause.
2. The scientific method and hypothesis testing are generally accepted norms.
3. CCC+C is peer review and is published in scientific literature
4. The medical expert is qualified. CV is attached.
5. **Error**- Alpha =0.05 or 0.5. (1) When type-I error is 5%, type-II error is 20%. (2) When type- 1 error is 50%, type-II error is 0.65%.
6. **Bias-** (1) <u>When the safeguars is H_o:</u> selection bias = Type-1 error and avoidance bias = type-II error. (2) <u>When the safeguard is H_a:</u> selection bias = 100%- Type-I error and avoidance bias =100%-type-II error. (3) Confirmation bias is the average of selection bias and avoidance bias.
7. **Merit** is 100% minus the sum of selection bias, avoidance bias and confirmation bias.

CONCLUSION:

The following hypothetical medical malpractice case serves as an example of how this applies.

The facts in the case are : a 16-year-old girl conceives in and lives in a third-world county until 17 weeks of gestation and receives no prenatal care. In the United States, she begins prenatal care at 20 weeks of gestation and is found to have a sexually transmitted infection. At 25 weeks, she develops toxemia, is admitted to the hospital, is referred to perinatologists , and a sonogram diagnosis a small for gestational age fetus and oligohydramnios. Labor is induced. The premature infant has cerebral palsy. A lawsuit is filed. The defendants are the hospital and the perinatologists. The lawsuit alleges that the induction of labor, and the failure to perform a cesarean section for fetal indications is the cause of cerebral palsy in this preterm, low birthweight newborn.

The plaintiff's side uses abductive/inductive reasoning. Abductive /inductive reasoning is critical thinking. The affirmatory hypothesis is "cerebral palsy in this preterm newborn is caused by the failure to perform a cesarean section for fetal indications." There are 10 corresponding phases in the medical intervention and the standard of care. Only one phase, in the medical intervention, the technical phase, differs from its counterpart.

However, other than "preponderance of evidence," there are no quantitative criteria to measure "cause and effect." Preponderance of evidence is sufficient for the plaintiff's side to rest their case by concluding that the medical intervention departs from the standard of care and is the proximate cause of cerebral palsy. Other than the certificate of merit, which serves to validate the affirmatory hypothesis, there is no formal measure for the value of merit.

Alternatively, the defense's side uses deductive reasoning in the guise of CCC+C. They agree that there are 10 corresponding phases and that the technical phase of the standard of care differs from its counterpart in

the medical intervention. However, CCC+C uses hypothesis testing. The null hypothesis states that the medical intervention comports with the standard of care and is not the proximate cause of cerebral palsy.

The background risk for cerebral palsy in the general population of all preterm newborns is 15%. To create a test sample, which represents the medical intervention in question, they use the threshold risk ratio, 100% / 15% = 6.66 as the rationale for the systematic assignment of all relative risks.

All corresponding phases are consistent with having knowledge of the circumstance in the aforementioned 3rd world country. The progressive toxemia and the sonogram add to the decision for delivery. The "informed consent phase" for the standard of care requires that the mother is notified of all potential risks. In the "informed consent phase" for the medical intervention, the mother is notified that, because of circumstances which precede prenatal care and because of the sonogram , the fetus may already be adversely impacted. This is clearly documented in medical records although it is largely ignored by the plaintiff's team

Also documented is the mother's steadfast refusal of a cesarean section for fetal indications, but she agrees to maternal indications. In the one differing phase, the technical phase, an induction is indeed different from a primary cesarean section. During induction, the mother's condition remains stable and there are no signs of acute fetal distress. The induction proceeds to a vaginal delivery. The newborn requires resuscitation and an extended stay in the neonatal ICU.

The defense asserts that, because the mother, who is fully cognizant, leaves no choice but to induce labor, the difference in the performance of duty in the technical phase increases the risk of human error, but not enough to exceed the threshold risk ratio. They assign a relative risk of 6 for the technical phase. Hence, the incident risk is 90%, which, in the general population of preterm deliveries that have no other risk factors , corresponds to a 90% probability that the failure to perform a cesarean section can be the proximate cause of

neonatal injury. However, until proven otherwise, this incident risk is just a sampling variability and ,as such, is a random error-of-nature.

In the nine other phases, incident risks are 15%. Collectively, 10 incident risks, nine of 15% and one of 90%, represent the entire medical intervention from admission to discharge. The population mean(μ), representing the standard of care, is 15%, which is the chance of cerebral palsy regardless of the mode of delivery for any premature newborn. Alpha is 0.05. When using the single sample T-test, the *p value*= 0.171718. Since the *p value* is greater than alpha, the null hypothesis, which is "the medical intervention, comports with the standard of care and the cerebral palsy is unrelated to the medical intervention," is retained.

Since alpha is 0.05, type-I error is 5% . Therefore, type-II error is 20%. Furthermore, because Ho is the safeguard, selection bias is 5%; avoidance bias is 20%, and confirmation bias is 12.5% .

The notarized report describes all the above and concludes that there is a 95% probability that cerebral palsy is unavoidable and that the medical intervention comports with the standard of care. Furthermore, merit = 100% - (5%+20%+12.5%) = 62.5%. There is a 62.5% probability that all data and all material facts which support the retention of the null hypothesis, are reliable.

Next, because abductive/inductive reasoning does not specify error rates and CCC+C does, the defense attorney adapts the plaintiff's abductive/inductive reasoning to deductive reasoning. It is perfectly reasonable to make this adaptation. [23] After all, if the adaptation uses the same independent and dependent variables and the same level of confidence as abductive/inductive reasoning, the result in the adaptation should be the same as abductive/inductive reasoning. In any case, the plaintiff attorney always has the right to dispute the adaptation.

In testimony, it is learned that the plaintiff's medical expert could have chosen "95%" but, instead, elects to use "preponderance of evidence. " Hence alpha is 0.5. Everything else being equal, when using the

single sample T-test, the *p value* is 0.171718. Since the *p value* is less than alpha , the null hypothesis is rejected and the conclusion is the medical intervention departs from the standard of care. This is consistent with the result from abductive/inductive reasoning ,

However, deductive reasoning specifies type-I and type-II errors. Since type-I error is 50%, type-II error is 0.65%. Because the safeguard is H_a , selection bias is 50%; avoidance bias is 99.35% and confirmation bias = 74.68%. The notarized report of the adaptation documents that merit = 100% - (50%+ 99% + 75%) = -124%, which stands in stark contrast to 62.5%

The plaintiff attorney disputes the adaptation of abductive/inductive reasoning to CCC+C because it is unconventional and because one must be statistical literate to comprehend it. It is too nuanced . Therefore, the plaintiff attorney motions to exclude CCC+C as inadmissible.

However, the strategy backfires when the judge denies the motion. The jury concludes that CCC+C may be unconventional, but abductive/inductive reasoning is not nuanced enough. They agree with the defense that, under the circumstances present in this case, cerebral palsy would result even if there is a cesarean section for fetal indications. In the final analysis, statistically literate or not, jurors know merit when the see it.

Although this case is hypothetical, it mirrors Byrom, et al, vs. Johns Hopkins Bayview Medical Center, which culminates in the largest jury verdict in US history, $229.6-million.[24] Two years later, the verdict is overturned by an appellate court. [25] One must wonder how the jury might have decided if CCC+C was used in court as described herein.

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