

Causality in medical liability and the prevailing standard of probability: between absolute certainty, legal imputation and proof of the causal link in psychiatric pathologies

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Abstract

Medical liability faces one of its greatest challenges in establishing causation, particularly in cases involving scientific uncertainty, multifactorial disease etiology, and the inherent complexity of clinical practice. These circumstances make it difficult to demonstrate a direct causal relationship between the healthcare professional's conduct and the patient's injury. This study aimed to analyze the evolution of causation in medical liability and to assess the relevance of the preponderance of the evidence standard as a criterion for evaluating causation within the Colombian legal framework. A systematic literature review was conducted following the PRISMA guidelines, using major scientific databases to identify studies addressing medical liability, causation, standards of proof, and tort law.

The findings indicate that medical causation has evolved from being considered a purely factual issue to becoming an interdisciplinary legal problem that integrates tort law, evidentiary law, forensic medicine, bioethics, patient safety, and healthcare risk management. The review also reveals a gradual transition from traditional approaches based on absolute certainty toward evidentiary models grounded in the preponderance of the evidence, rational inference, dynamic allocation of the burden of proof, and loss of chance, particularly in cases characterized by informational asymmetry, multiple concurrent causes, and significant evidentiary difficulties. Furthermore, psychiatric disorders, injuries that are inherently difficult to prove, and the increasing use of emerging healthcare technologies, including artificial intelligence, intensify the complexity of causal attribution and require more flexible evidentiary standards.

The study concludes that the preponderance of the evidence standard provides a legally sound approach for addressing the epistemic limitations of contemporary medical science while ensuring effective judicial protection. Its progressive incorporation into Colombian medical liability law could promote a more balanced assessment of causation, strengthening both victims' access to justice and legal certainty for healthcare professionals through a comprehensive, rational, and context-sensitive evaluation of the available evidence.

Keywords: Medical liability, prevalent probability, causal link, psychiatric illness, harm.

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INTRODUCTION

Medical liability poses one of the most complex problems of tort law: the accreditation of the causal link between the conduct of the professional or the health institution and the damage suffered by the patient, especially when these occur in the psyche. Unlike other civil liability scenarios, the medical act takes place in contexts of scientific uncertainty, variable clinical evolution, plurality of possible causes, and information asymmetry between the patient and the health service provider. Therefore, proving that a medical action was the legally relevant cause of the damage is not always easy, which generates barriers for the patient. The difficulty increases when the harmful result can be explained by the underlying disease, by the patient's previous conditions, by risks inherent to the procedure, by institutional failures, or by the concurrence of several factors.

In Colombian law, medical liability requires the articulated analysis of the damage, the reprehensible conduct and the causal link. However, in judicial practice, causality often becomes the most difficult point to prove. It is not enough to prove that there was defective medical care or that the patient suffered damage. It must also be established that this damage occurred as a result of the conduct imputed to the professional, the clinic, the EPS, the IPS. This evidentiary requirement protects legal certainty, but it can also become a barrier for the victim when the damage occurs within a technical scenario that is beyond their direct knowledge.

The tension between causal certainty and comprehensive reparation acquires special importance in medical litigation. In some cases, requiring absolute proof of causality may ignore the probabilistic nature of medical knowledge. Medicine rarely operates with mathematical certainty. It often works with diagnostic hypotheses, risk factors, clinical evolution, statistics, antecedents, signs, symptoms, and degrees of probability. For this reason, evidentiary law must ask whether medical causality must always be demonstrated under a standard of strict certainty or whether, on the contrary, it can be assessed by criteria of prevailing probability, preponderance of evidence, or greater causal probability.

The prevailing probability standard allows us to affirm that a fact is proven when, based on the set of available elements, it is more likely that it has occurred than that it did not occur. In terms of medical liability, this criterion can become relevant when direct evidence is insufficient, when there are several causal hypotheses, or when the determining information is under the control of the health service provider. It is not a matter of replacing evidence with conjecture, nor of imposing liability without technical basis. It is a matter of rationally evaluating the available evidence, especially the medical history, expert concepts, applicable protocols, and the circumstances of the specific case (López-Oliva et al., 2024; Luna, 2021).

This debate is also relevant in the face of psychological, psychological or psychiatric damage derived from medical care. In these events, causality may present greater difficulties, because the damage does not always manifest itself immediately nor can it be verified through clinical tests or examinations. The emotional affectation, mental disorder, loss of autonomy, psychological suffering or psychological sequelae may depend on personal, family, clinical and

social factors. However, this complexity should not lead to its legal invisibility. On the contrary, it requires more careful, interdisciplinary evidentiary criteria that are compatible with the nature of the alleged damage.

From this context, this article analyzes causality in medical liability and examines the usefulness of the prevailing probability standard as a tool to assess the causal link in uncertainty scenarios. The research is based on a central concern: the proof of causality cannot be reduced to a formal requirement of absolute certainty when medical knowledge itself operates on degrees of probability. Therefore, it is necessary to study whether the prevailing standard of probability can offer a more adequate response to resolve complex medical controversies, without sacrificing evidentiary rigor or the defendant's guarantee of defense.

The review made it possible to identify documents related to medical liability, health negligence, causal link, burden of proof, evidentiary standard, prevailing probability, preponderance of evidence, and psychological or psychological damage with a medical-legal connection. The purpose of this review was not to carry out a clinical study, but to build a verifiable documentary support for the legal analysis of medical causality.

The article is structured in four parts. First, the elements of medical liability and the place of the causal link within the imputation trial are examined. Second, the evidentiary difficulty of causality in health contexts is analyzed, especially when several possible causes concur or when the information is in the possession of the medical institution. Third, the prevailing probability standard and its relationship with the burden of proof, the preponderance of the evidence, and the rational evaluation of the expert evidence are studied. Finally, the causality in psychological or psychological damages related to medical care is addressed, with the purpose of showing that the complexity of the damage cannot justify its exclusion from the legal analysis.

The hypothesis that guides the work argues that the prevailing probability standard can contribute to a more reasonable assessment of the causal link in medical liability, especially in cases of scientific uncertainty, damages that are difficult to prove or evidentiary asymmetry. Its application requires technical support and sufficient judicial motivation. It does not imply unduly weakening the evidence, but rather recognizing that medical causality is usually built from well-founded evidentiary inferences, and not always through absolute demonstrations.

RESEARCH METHODOLOGY

This research was developed under a qualitative, legal-documentary and interdisciplinary approach. Its purpose was to analyze causality in medical liability and to assess the usefulness of the prevailing standard of probability in the proof of the causal link, especially in contexts of scientific uncertainty, evidentiary asymmetry and damages that are difficult to prove. The purpose of the study was not to carry out a clinical or statistical measurement of medical results, but to construct a verifiable documentary corpus that would allow examining the legal-evidentiary problem of medical causality from academic, scientific, medical-legal and legal sources.

The methodological design combined the dogmatic-legal method, documentary analysis and a systematic review strategy organized under the PRISMA model. The dogmatic component allowed the study of the legal categories of damage, fault, medical negligence, imputation, burden of proof, evidentiary standard and causal link. The documentary analysis allowed the

review of specialized literature on medical liability, proof of causality, prevailing probability, preponderance of evidence and psychological or psychological damages. For its part, the PRISMA methodology was used as a transparency tool to organize the phases of identification, filtering, screening, eligibility and inclusion of documents. In this sense, PRISMA did not replace legal analysis, but was used as a complementary tool through a reproducible route of search, selection and classification of sources.

The review was carried out in five academic databases: PubMed, Scopus, SciELO, ScienceDirect and Web of Science. These databases were selected for their interdisciplinary coverage and for their usefulness in retrieving documents located at the intersection between medicine, law, bioethics, public health, legal medicine and health civil liability. PubMed allowed the recovery of biomedical and medico-legal literature. Scopus and Web of Science provided a wide coverage of indexed articles and interdisciplinary literature. SciELO made it possible to incorporate Latin American academic production, relevant to regional legal analysis. ScienceDirect complemented the search with scientific, health and medico-legal literature available in specialized journals.

The search strategy was built from three main equations. The first was aimed at recovering documents on medical liability, medical malpractice, malpractice, medical act, damage, and causal link.

("tort law" OR "medical liability" OR "medical malpractice" OR "medical malpractice" OR "medical act" OR "medical malpractice") AND ("causal link" OR "damage" OR "imputation regime" OR causation OR "causal link" OR "causal relationship")

The second was aimed at identifying literature on prevailing probability, preponderant probability, preponderance of evidence, evidentiary standard, burden of proof and causality.

("prevailing probability" OR "preponderant probability" OR "preponderance of the evidence" OR "evidentiary standard" OR "balance of probabilities" OR "burden of proof") AND ("causal link" OR "causality" OR "causation")

The third was designed to recover documents on psychological damage, psychological damage, psychiatric pathology, mental disorder, mental health, psychiatric injury, causal link and burden of proof, provided that there was a connection with medical liability, health litigation or medico-legal causality.

("psychic harm" OR "psychological harm" OR "psychiatric pathology" OR "mental disorder" OR "mental health" OR "psychiatric injury") AND ("causal link" OR "causality" OR "burden of proof" OR "prevailing probability") AND ("medical liability" OR "damage" OR "medical malpractice")

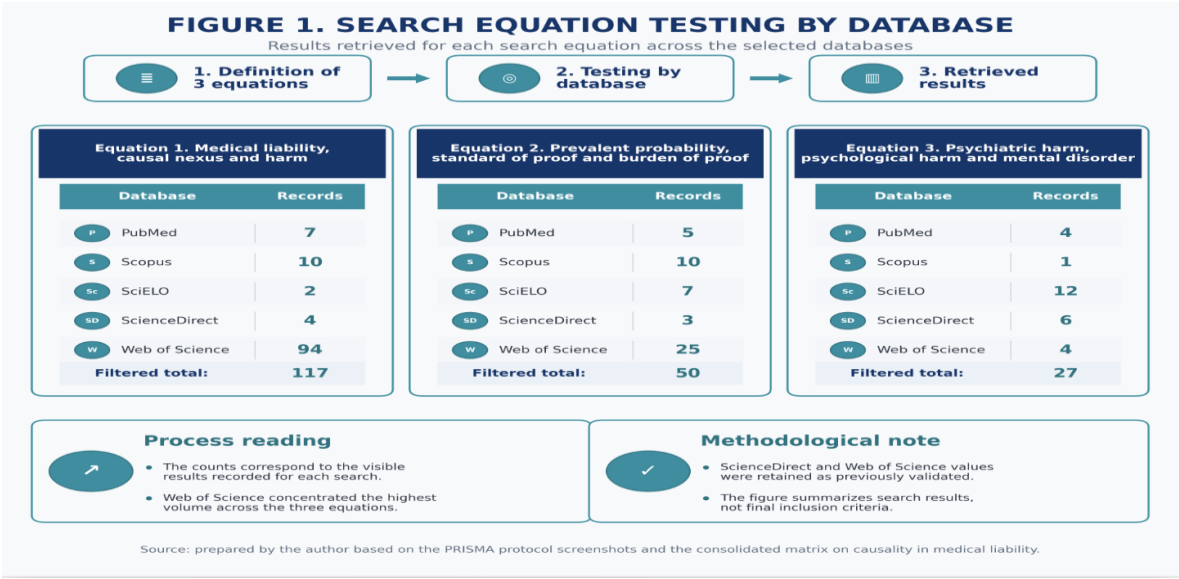
The equations were adapted according to the technical requirements of each database, especially in relation to the use of Boolean operators, parentheses, quotation marks, search language and temporal filters. Thus, the ScienceDirect database allows querying with a maximum of 8 Boolean indicators, so it was necessary to adjust query equations 1 and 3, as follows:

("tort law" OR "medical liability" OR "medical malpractice" OR "medical malpractice") AND ("causal link" OR "imputation regime" OR causality OR "causal link" OR "causal relationship")

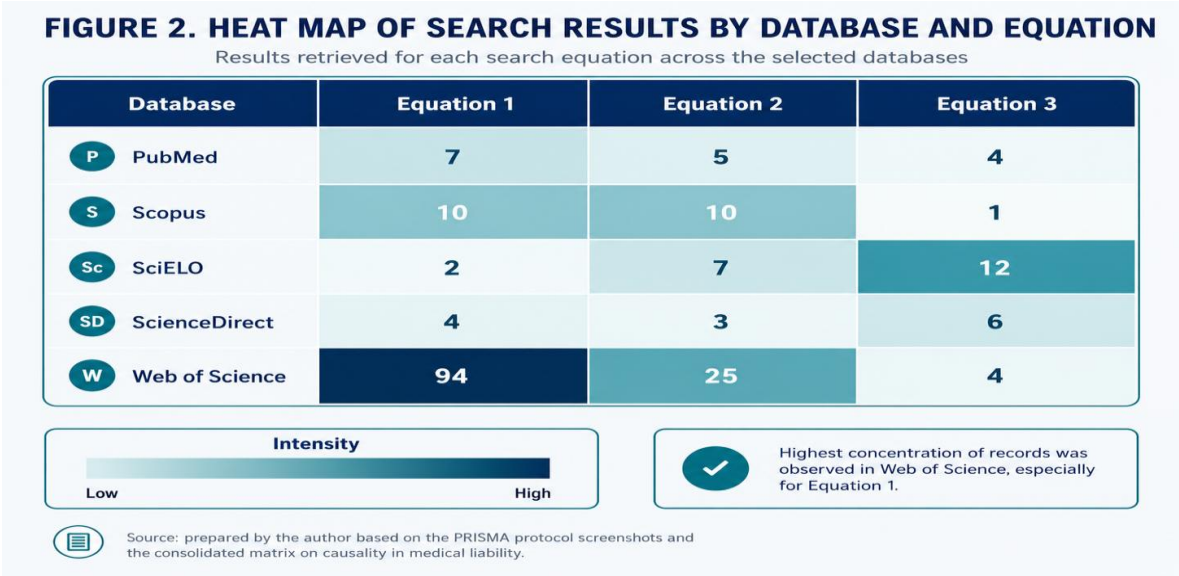
("psychic harm" OR "psychological harm" OR "psychiatric pathology" OR "mental disorder" OR "mental health" OR "psychiatric injury") AND ("causal link" OR "burden of proof" OR "prevailing probability")

Also, in order to avoid the leakage of gray literature, it was necessary to adjust query equations 3, in the Scielo database, as follows.

("psychic harm" OR "psychological harm" OR "psychiatric pathology" OR "mental disorder" OR "mental health" OR "psychiatric injury") AND ("causal link" OR "causality" OR "burden of proof" OR "prevailing probability")



To complement the quantitative reading of the search equations, the heat map allows visualizing the concentration of results by database and by applied equation. This representation makes it easier to identify, in a comparative way, which databases had greater capacity for document recovery and which equations offered broader or more specific results.



The temporal criterion applied was that of publications from 2021 onwards. This delimitation responded to the need to work with recent evidence consistent with the current state of the debate on medical liability, causality, evidentiary standards, and psychic damage. Exceptionally, it was recognized that some classic texts or doctrinal antecedents prior to 2021

could be useful for the theoretical framework, but were not part of the main corpus of PRISMA inclusion. Consequently, documents prior to 2021 were excluded from the main matrix, unless they were kept only as supporting antecedents outside the systematic corpus.

The inclusion criteria were as follows: articles published from 2021 onwards; documents related to medical liability, medical negligence, malpractice, medical act or health civil liability; texts that addressed causality, causal link, burden of proof; documents on psychological damage, psychological damage, psychiatric pathology, as long as they had a connection with medical act, negligence, litigation or medico-legal causality; and articles housed in verifiable academic databases.

The exclusion criteria included documents prior to 2021, texts without an identifiable author, records without sufficient academic traceability, duplicate publications, comments without substantive development, non-specialized opinion texts, and clinical sources with no link to medical liability, legal causality, or evidentiary standard. Documents were also excluded that, although they addressed issues of mental health, harm, or causality in a broad sense, did not have sufficient connection to the legal problem of medical liability or to the proof of the causal link.

The identification phase yielded a total of 194 records distributed among the five databases consulted. Subsequently, an interbase duplicate purge was carried out. In this phase, 13 duplicate records were identified, which were separated to avoid double counting and preserve the traceability of the process. After this purification, the corpus was made up of 181 unique records subjected to screening.

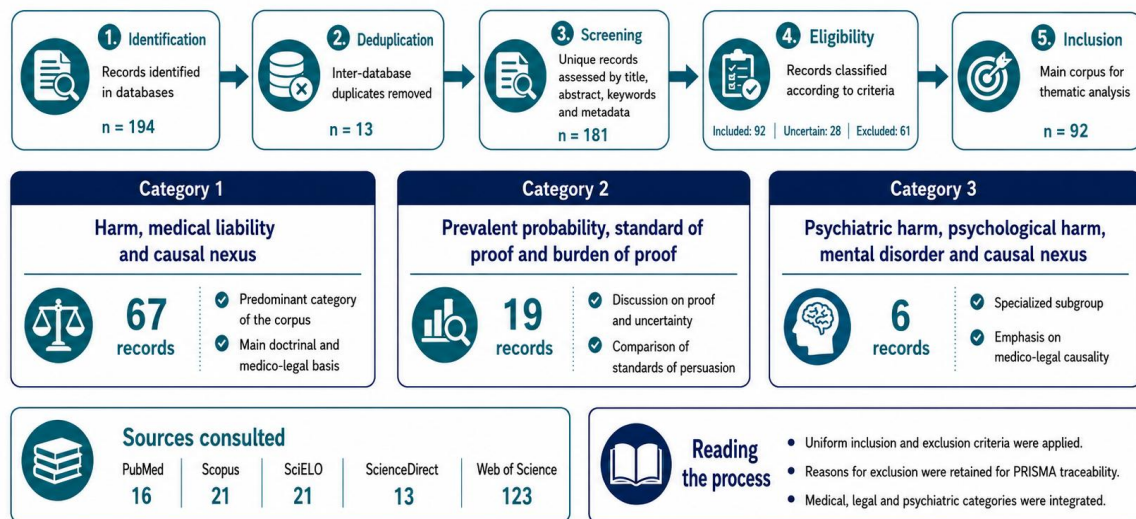
During the screening phase, titles, abstracts, keywords, metadata, DOI, source of publication, and thematic relevance were reviewed. Each record was classified in an extraction matrix with fields aimed at identifying relevant data from the paper. This matrix allowed the traceability of each decision to be preserved and arbitrary exclusions to be avoided.

In the eligibility phase, the documents were valued according to their substantive relationship with the object of research. Priority was given to those that contribute to the analysis of the object of the research. Documents with an indirect but potentially useful relationship were classified as doubtful. This category was kept for later review, without automatically integrating it into the main corpus of analysis.

As a result of the PRISMA process, of the 181 unique records screened, 92 were included in the main corpus, 28 were classified as doubtful, and 61 were excluded. The included documents were organized into three analytical categories. The first category grouped the texts on damage, medical liability, and causal link, with 67 records. The second category included documents on prevailing probability, evidentiary standard, burden of proof, and preponderance of evidence, with 19 records. The third category included documents on psychological damage, psychological damage, mental disorder, burden of proof, and causal link in these scenarios, with 6 records, as shown below.

FIGURE 3. PRISMA FLOWCHART

Selection and classification of articles on causality in medical liability



Consolidated PRISMA matrix: 181 unique records refined from 194 records identified in five databases.

The research did not perform meta-analysis or statistical evaluation of clinical effects. Its scope was legal-documentary. Therefore, the PRISMA results were used to construct a supporting corpus, not to formulate epidemiological conclusions. The purpose was to strengthen the methodological basis of the article and offer a transparent route for selecting sources for the dogmatic and evidentiary analysis of causality in medical liability.

RESULTS

Causality is one of the most complex problems within contemporary medical liability. Far from being reduced to the simple verification of a cause-effect relationship between the actions of the health professional and the harm suffered by the patient (Peña et al., 2024), its analysis requires understanding the particularities of clinical practice, the uncertainty inherent in scientific knowledge, and the limitations of judicial evidence. This difficulty has been noted in studies on clinical negligence, in which the uncertainty of the evidence appears as a relevant factor to explain the complexity of health claims and their legal and social effects (Carter et al., 2021).

The evolution of medicine, the increase in mental illnesses, and highly specialized procedures have shown that the determination of the causal link cannot be approached through exclusively linear criteria, since multiple biological, organizational, and technological factors often intervene that make it difficult to reconstruct the process that led to the harmful result. In this scenario, causality is configured as a problem of legal assessment of the evidence, rather than as a matter of simple material verification of the facts. For this reason, the medico-legal literature has insisted on the need to use causal analysis methodologies that allow the relationship between the medical event, the clinical history, the alternative hypotheses, and the attributed harm to be assessed in an orderly manner (Meilia et al., 2021).

This reality has driven a progressive transformation of the traditional approaches with which medical liability has historically been studied. The discussion is no longer limited to establishing whether there was culpable conduct and damage, but also incorporates issues related to evidentiary standards, the distribution of the burden of proof, the loss of opportunity, scientific uncertainty, the accreditation of psychological damage, and the

challenges arising from the incorporation of new technologies in the provision of health services.

Likewise, comparative experience shows that these problems transcend the particularities of each legal system and respond to a common concern to build imputation mechanisms capable of offering balanced responses to scenarios characterized by causal complexity. From this perspective, the following sections develop the main aspects that structure the debate on causality in medical liability and allow us to understand the reasons that justify the growing relevance of the prevailing probability standard in the resolution of health disputes.

Medical causality as a complex problem of imputation

Causality is one of the most complex elements of health liability, as it cannot be studied in isolation, but in close relation to problems of professional fault, scientific uncertainty, expert evidence, institutional liability, and complex health litigation (Hösükler et al., 2021; Carter et al., 2021; Meilia et al., 2021). Unlike other areas of civil liability, in which the relationship between conduct and damage is usually more evident, medical practice takes place in scenarios characterized by the concurrence of multiple biological, clinical, and organizational factors that make it difficult to reconstruct the causal process.

The evolution of the diseases, the patient's pre-existing conditions, the successive intervention of various health professionals, the limitations of scientific knowledge and the variability in the response to treatments make the determination of the causal link transcend a simple empirical verification to become an exercise in technical and legal assessment of the available evidence.

Consequently, medical liability can no longer be limited exclusively to the analysis of the individual conduct of the health professional, but requires the incorporation of institutional, organizational, and systemic dimensions, such as quality of care, observance of the *lex artis*, clinical protocols, incident reporting systems, care risk management, malpractice insurance models, and alternative redress mechanisms. This expansion of the analysis is consistent with recent literature, which has shown that malpractice claims and incident reporting systems constitute two complementary dimensions to understand healthcare failures, prevent their recurrence, and strengthen patient safety from an institutional perspective and not just an individual one (Vetrugno et al., 2022).

This evolution responds to the recognition that many adverse events are the result of complex failures in the organization of health services and not only of individual errors. In this context, the study of causality acquires an interdisciplinary dimension that integrates knowledge from tort law, evidentiary law, forensic medicine, clinical epidemiology, bioethics, and patient safety, with the purpose of establishing whether there is a legally relevant connection between the medical action and the damage for which reparation is claimed.

From this perspective, the central problem is no longer only to determine whether the damage was the result of a certain medical action, but also to establish the degree of conviction that the judge must reach when the scientific evidence does not allow categorical answers to be offered (Luna, 2018). This circumstance has prompted a progressive revision of the traditional criteria for assessing the causal link and has favored the development of more flexible evidentiary standards, aimed at resolving controversies characterized by scientific uncertainty,

the plurality of causes, and the practical impossibility of reaching absolute certainty.

Precisely in this scenario, the prevailing standard of probability acquires special relevance, the application of which seeks to harmonize the requirements of judicial evidence with the limitations inherent in contemporary medical knowledge. Indeed, it has been noted that medical liability processes present particular evidentiary difficulties, derived from the informational asymmetry, the technical complexity of the procedures and the frequent impossibility of reaching absolute certainty about the causal link, which justifies resorting to evidentiary assessment criteria based on sufficiency, reasonableness and prevailing causal probability (Kratenko & Moroz, 2021).

The evolution of the evidentiary standard: from absolute certainty to prevailing probability

The determination of the causal link in medical liability has traditionally been conditioned by the requirement to prove a sufficiently certain relationship between the conduct of the health professional and the alleged damage. This approach responds to a classic conception of civil liability, according to which the attribution of damage presupposes the demonstration of a direct causal link between the event giving rise to it and the damage claimed. However, the development of medical sciences has shown that many adverse events are due to complex biological processes, of multifactorial etiology and uncertain evolution, in which obtaining an absolute causal explanation is, in many cases, unattainable.

This reality has led to questioning the sufficiency of traditional models of evidentiary assessment, built on a rigid conception of certainty, and has favoured the consolidation of criteria that allow the judge to make decisions based on the available evidence, assessed according to parameters of rationality, sufficiency and probability. Along these lines, the doctrine has highlighted that institutions such as the dynamic burden of proof, the loss of opportunity and the comprehensive assessment of expert evidence are mechanisms aimed at balancing the evidentiary difficulties inherent in medical liability, avoiding imposing on the victim a burden of proof incompatible with the complexity of scientific knowledge (Gómez, 2021).

Within this evolution, the preponderance of the evidence *or* balance of probabilities *standard acquires special relevance*, widely developed in the systems of the Anglo-Saxon tradition and progressively incorporated into contemporary doctrinal debate. This standard does not require demonstrating that an event occurred with absolute certainty, but rather proving that, based on the available evidence, it is more likely that the damage was the result of the conduct imputed than of any other reasonably plausible explanation. In this way, judicial analysis is no longer based on the search for absolute scientific truth to focus on a rational assessment of the evidence that allows a sufficient degree of conviction to be reached compatible with the requirements of the process (Smith, 2021; Freeman, 2021; Carter et al., 2021).

These transformations respond to structural problems that characterize medical liability. Where the informational asymmetry between patient and provider, the concurrence of multiple etiological factors, the successive participation of different professionals, the complexity of treatments, and the dependence on highly specialized knowledge make it difficult to reconstruct the causal process through traditional evidence schemes. Consequently, the judge rarely has full scientific certainty and must build his decision based on standards of evidentiary sufficiency, rational inferences, and contextual analysis of the

evidence (Kratenko & Moroz, 2021; Gómez, 2021; Zielinski et al., 2022; Maroudas, 2024).

Within this evolution, the loss of opportunity acquires special relevance, a figure that allows us to understand those cases in which the final damage cannot be directly attributed to the medical act, but a legally relevant decrease in the chances of cure, survival or better prognosis can be demonstrated. This construction connects causality with scientific uncertainty and evidentiary standards, particularly when the omitted or delayed medical conduct does not constitute the exclusive cause of the damage, although it does significantly influence the causal course of the harmful result (Gómez, 2021; Lievens, 2023; Kratenko, 2022).

From this perspective, the prevailing probability does not imply a decrease in evidentiary rigor or an automatic reversal of the burden of proof. On the contrary, it constitutes an assessment criterion that seeks to harmonize the limitations inherent in medical knowledge with the requirements of due process and comprehensive reparation. Its application makes it possible to resolve controversies characterized by scientific uncertainty without renouncing the rationality of the judicial decision, favoring a comprehensive appreciation of the medical history, expert evidence, epidemiological evidence and the other elements available to establish the existence of a legally relevant causal link.

This evolution is especially important in those cases in which the damage derives from diseases of multifactorial etiology or from psychic affectations whose manifestation and evolution make it difficult to demonstrate a direct causal relationship.

Causality in psychiatric pathologies and damages that are difficult to prove

The difficulties in proving the causal link reach their maximum expression when the alleged damage corresponds to psychiatric pathologies or psychological conditions whose etiology does not respond to a single triggering factor. Unlike many physical injuries, whose existence and evolution can be corroborated by objective clinical tests, mental disorders usually develop from the interaction of biological, genetic, environmental, social and personal factors that make it difficult to identify an exclusive cause.

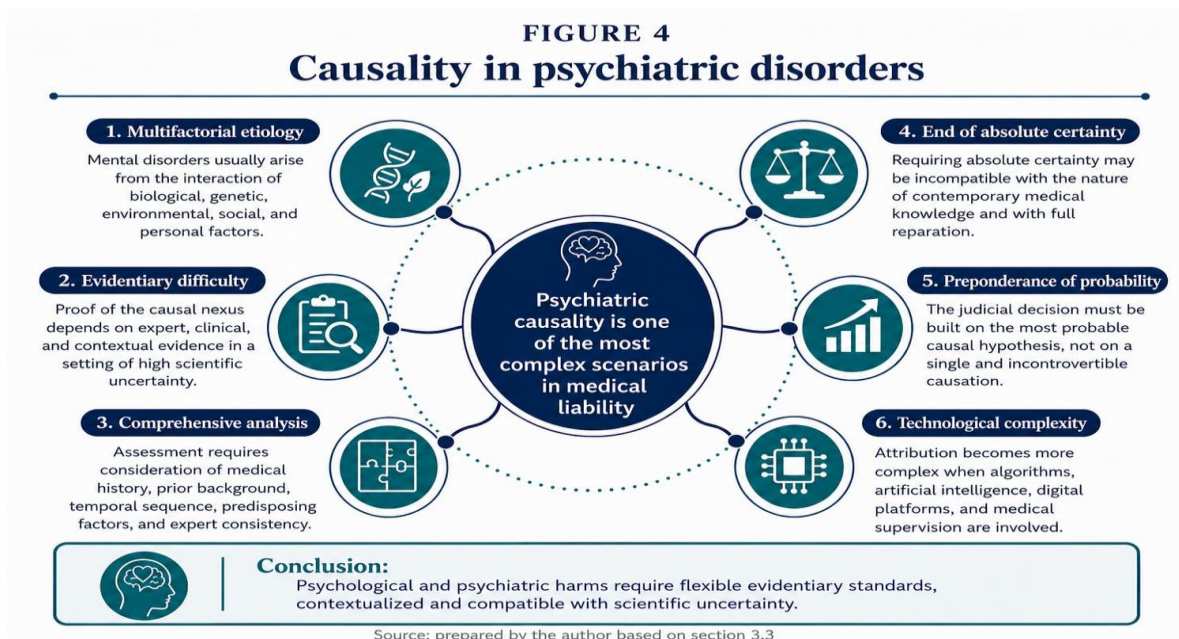
This reality makes psychiatric causality one of the most complex scenarios for medical liability, as it forces the judge to assess predominantly expert, clinical and contextual evidence, in an area characterized by high levels of scientific uncertainty. Along these lines, medico-legal studies have shown that claims for alleged psychiatric malpractice require specialized forensic evaluations, precisely because the determination of the damage, its origin and its relationship with medical action requires analyzing clinical variables, personal history and contextual elements that do not always allow a direct or linear causal attribution (Cesur et al., 2022).

The growing understanding of mental disorders as multifactorial phenomena has also transformed the way in which the law approaches the proof of the causal link. Science agrees that requiring a demonstration based on criteria of absolute certainty can lead, in these cases, to solutions that are incompatible with the nature of contemporary medical knowledge and with the principle of comprehensive reparation. Along these lines, it has been highlighted that the damages derived from medical negligence are not always exhausted in objectively verifiable physical injuries, but can include personal, emotional or psychological effects whose assessment requires attention to the clinical context, the patient's experience and the

reasonableness of the alleged causal connection, without imposing a burden of proof incompatible with the complexity of the damage suffered (Lee, 2024).

Consequently, the assessment of psychic damage requires a comprehensive analysis that considers the patient's medical history, the patient's personal history, the temporal sequence of events, the existence of predisposing factors, and the consistency of the expert evidence, allowing the construction of sufficiently well-founded causal inferences even when it is not possible to identify a single and incontrovertible causal relationship.

In order to synthesize the findings presented, Figure 4 illustrates the main factors that affect the determination of the causal link in psychiatric pathologies, showing that the complexity of these damages requires a comprehensive assessment



This context explains why psychiatric pathologies are one of the main areas of application of the prevailing probability standard in medical liability. The etiological complexity of mental disorders, added to the need to assess clinical history, patient evolution, therapeutic context and expert evidence, means that the judicial decision cannot depend on absolute certainty about the cause of the damage, but on a rational reconstruction of the most likely causal hypothesis. Along these lines, medico-legal studies on alleged psychiatric malpractice show that the evaluation of these cases requires a specialized forensic examination of the clinical, contextual and evidentiary characteristics of the alleged damage, which confirms the need to resort to assessment standards compatible with the uncertainty inherent in this type of pathology (Cesur et al., 2022).

The review also shows that medical causality is not limited to objectively verifiable bodily injuries, but includes psychological and psychiatric damages whose accreditation requires a more complex clinical reconstruction (Cesur et al., 2022; Lee, 2024). This confirms that evidentiary standards must be adapted to damages whose manifestation is progressive, multifactorial or predominantly psychic (Cesur et al., 2022; González et al., 2021; Lee, 2024).

The causal complexity increases when automated systems, artificial intelligence algorithms, digital platforms, smart medical devices, or shared clinical decision models are involved (Luna

et al., 2023). In these cases, the attribution of damage no longer depends exclusively on the actions of the healthcare professional, but also on technological design, medical supervision, compliance with protocols, and specialized expert evaluation (Nolan, 2023; Terranova et al., 2024; Morales Santos et al., 2024).

Challenges for the Colombian context

The transformations identified around the causal link and evidentiary standards acquire special relevance in the Colombian context, where medical liability continues to face important challenges derived from the complexity of clinical practice and the difficulties in proving the causal relationship between the conduct of the health professional and the harm suffered by the patient. Although Colombian jurisprudence has recognized the need to make some evidentiary criteria more flexible through institutions such as the dynamic burden of proof, the loss of opportunity, and the comprehensive evaluation of expert evidence, significant tensions persist regarding the degree of conviction required to declare liability in those cases characterized by scientific uncertainty, multifactorial etiologies, or insufficiency of direct evidence.

This situation highlights the need to review whether traditional imputation criteria continue to offer adequate responses to the challenges posed by contemporary medicine. Indeed, the incorporation of advanced technologies, such as artificial intelligence systems in health, has questioned the sufficiency of classic models of medical liability based exclusively on individual fault, since the production of damage may depend on a complex interaction between the professional, the health institution, the technological design, the protocols for use, and the supervision of the system applied to the medical act (Maroudas, 2024).

In this scenario, comparative experience constitutes a useful reference to evaluate the evolution of Colombian law in the field of medical causality and to identify alternatives that allow the protection of patients' rights to be harmonized with the guarantees of due process and legal certainty for health professionals. This approach is relevant because comparative studies on medical malpractice show that the evidentiary difficulties of the causal link are not exclusive to one legal system, but appear in different legal systems and require a review of the distribution of the burden of proof, the role of expert evidence, and the criteria for judicial assessment in the face of scenarios of clinical uncertainty (Kratenko & Moroz, 2021).

The study of doctrine and recent jurisprudence shows that the national debate is increasingly influenced by tendencies aimed at replacing models based on absolute certainty with assessment schemes based on the sufficiency of evidence, rational inference and prevailing probability. Analyzing these developments is especially relevant to determine whether the Colombian legal system has sufficient normative and jurisprudential foundations to consolidate an evidentiary standard in accordance with the causal complexity of medical liability and with the current requirements of tort law.

Problems related to medical causality arise transversally in different legal and health systems. Although normative rules differ between legal systems, scientific uncertainty, difficulty in proving the causal link, and reparation of damage are common challenges (Hösükler et al., 2021; Carter et al., 2021; Kratenko & Moroz, 2021; Hernández-Herrero & Cuevas, 2022).

Where, causality plays a preventive role within health systems. Its analysis allows identifying

patterns of malpractice, strengthening incident reporting mechanisms, improving clinical risk management, and reducing institutional exposure to litigation. Consequently, causality not only fulfills a retrospective function of attribution of responsibility, but also a prospective function aimed at strengthening patient safety and quality care systems (Vetrugno et al., 2022; Ademe et al., 2022; Matumba et al., 2022).

In the Colombian context, institutions such as the dynamic burden of proof, loss of opportunity, patient self-determination, and specific causality are of particular importance. These debates reflect the need to make the evidentiary assessment more flexible when the victim faces material difficulties in demonstrating the causal link in highly complex clinical scenarios (Gómez, 2021; Parra Sepúlveda et al., 2024).

Overall, it can be argued that causality in medical liability must be approached from an interdisciplinary perspective that integrates civil law, evidentiary law, legal medicine, bioethics, health risk management, and clinical practice. This need demonstrates that the proof of the causal link cannot rest exclusively on a formal conception of the cause-effect relationship, but requires a contextual, technical, and legally reasoned assessment of the available evidence (Porzionato et al., 2022; Franchuk & Mikhaylichenko, 2022; Meilia et al., 2021; Yang et al., 2024).

In this way, the contemporary debate continues to focus on the imputation of medical damage, but they also show the need to deepen the study of the prevailing standard of probability as an ideal mechanism to resolve controversies characterized by scientific uncertainty, causal plurality, and damages that are difficult to prove, particularly those associated with psychological effects derived from the medical act (Smith, 2021; Carter et al., 2021; Cesur et al., 2022; Terranova et al., 2024).

DISCUSSION

The results allow us to argue that causality constitutes the critical axis of contemporary medical liability. Malpractice is not analyzed only from the culpable conduct of the professional, but also from the difficulty of legally reconstructing the relationship between the medical act, the damage, and the clinical and institutional conditions that surrounded the harmful result. In this sense, medical causality cannot be understood as a simple operation of material verification, but as a process of evidentiary assessment in which clinical evidence, expert knowledge, scientific uncertainty, and legal rules of imputation intervene (Carter et al., 2021; Meilia et al., 2021; Luna, 2020).

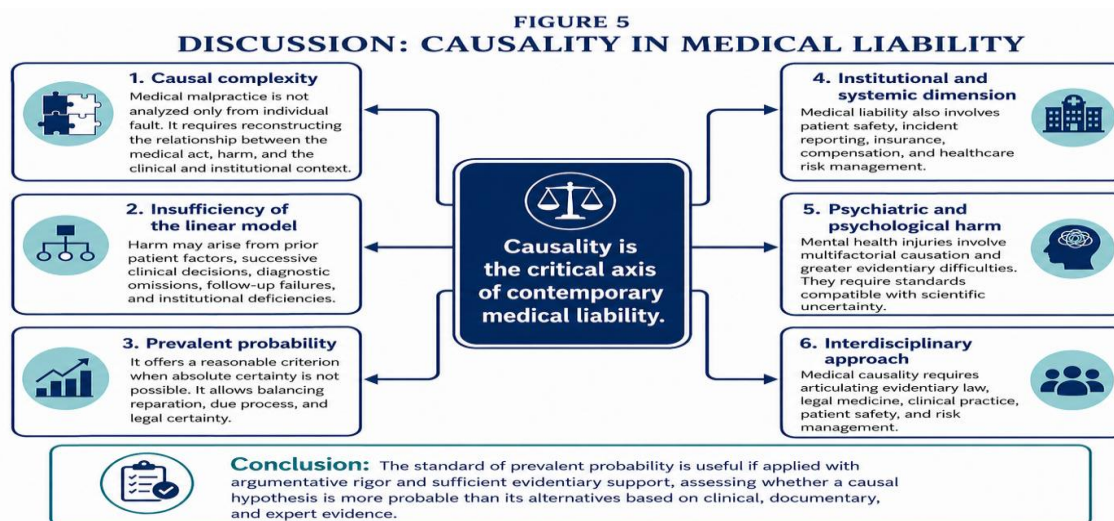
Traditional imputation models are insufficient when they are based on a strictly linear conception of causality. In medical practice, harm can be caused by the interaction of previous patient factors, successive clinical decisions, diagnostic omissions, follow-up failures, risks inherent to the procedure, and institutional deficiencies. For this reason, the need to assess alternative causal hypotheses and reconstruct the causal link through rational methodologies has been insisted on, especially when the available evidence does not allow absolute certainty to be reached about the origin of the damage (Meilia et al., 2021; Franchuk & Mikhaylichenko, 2022; Brown, 2024).

At this point, the prevailing probability standard is especially important. Its usefulness does

not lie in arbitrarily reducing the requirements of proof, but in offering a reasonable criterion for deciding when full certainty is incompatible with the nature of medical knowledge. The victim often faces difficulties arising from information asymmetry, dependence on technical evidence, and the impossibility of accessing all the clinical elements necessary to demonstrate the causal link absolutely. In this context, the prevailing probability makes it possible to balance the need for reparation with the guarantees of due process and legal certainty for health professionals (Kratenko & Moroz, 2021; Smith, 2021).

Another significant aspect is the shift of medical liability from an exclusively individual reading to an institutional and systemic understanding of harm. Malpractice claims, incident reporting systems, insurance models, and compensation mechanisms should be understood as dimensions related to patient safety. This implies that it allows the identification of repeated failures, organizational weaknesses, and healthcare risks that can be corrected through protocols, clinical auditing, and institutional risk management (Vetrugno et al., 2022; Chen et al., 2024; Voroneanu-Popa et al., 2022).

Psychological and psychological damage show that causality represents one of the most difficult scenarios for medical liability, because mental disorders tend to have a multifactorial origin. Unlike many physical injuries, psychological effects are not always verifiable by simple objective evidence, nor can they be attributed to a single trigger. Their accreditation requires assessing multiple antecedents and contexts, which confirms the relevance of evidentiary standards compatible with scientific uncertainty (Cesur et al., 2022; Lee, 2024). In order to synthesize this interaction, Figure 5 presents the main components that affect the accreditation of causality.



In this sense, the study evidenced the need for an interdisciplinary approach that articulates evidentiary law, forensic medicine, patient safety, risk management, and clinical practice. This perspective is essential to understand why medical causality cannot be resolved with rigid formulas, but through a contextual assessment of the available evidence (Carter et al., 2021; Porzionato et al., 2022; Hernández-Herrero & Cayón de las Cuevas, 2022).

In summary, it is possible to affirm that the prevailing probability standard offers a useful tool to deal with problems of medical causality, provided that it is applied with argumentative rigor and sufficient evidentiary support. It is not a matter of presuming medical responsibility or replacing evidence with indications, but of assessing whether a causal hypothesis is more likely

than its alternatives based on the set of clinical, documentary and expert evidence. The main contribution of the standard lies in this balance: to prevent scientific uncertainty from unfairly preventing the reparation of victims, without ignoring the procedural guarantees of health professionals and institutions (Gómez, 2021; Kratenko & Moroz, 2021; Cesur et al., 2022).

CONCLUSIONS

Causality is one of the critical points of contemporary medical liability. The current discussion is not limited to the verification of culpable medical conduct and damage, but focuses on the difficulty of legally reconstructing the causal link in clinical contexts characterized by scientific uncertainty, plurality of intervening factors, high technical specialization and information asymmetry between patient, professional and health institution.

The attribution of damage continues to be the central axis of responsibility. However, medical causality cannot be approached through an exclusively linear logic, since the harmful result can be derived from the interaction between the patient's previous conditions, successive clinical decisions, diagnostic failures, follow-up omissions, risks inherent to the procedure, organizational deficiencies and problems associated with the quality of the service.

The research also led to the conclusion that traditional models of evidentiary assessment are insufficient when they require levels of certainty that are incompatible with the nature of medical knowledge. In medical liability scenarios, the proof of causal link is rarely presented as an absolute demonstration. This reality justifies the relevance of the prevailing probability standard as a rational criterion for judicial decision.

The prevailing probability standard should not be understood as an arbitrary reduction of the evidentiary requirements or as an automatic presumption of medical liability. Its function is to allow the judge to assess, based on the available evidence, which causal hypothesis is more likely than the others. In this way, this standard offers a balanced response to the impossibility of achieving absolute certainty, without ignoring the procedural guarantees of health professionals or the need to effectively protect the rights of patients.

Likewise, in cases where it is difficult to prove cause, institutions such as the dynamic burden of proof, the loss of opportunity, and the contextual assessment of expert evidence make it possible to correct procedural imbalances without eliminating the obligation to prove. These tools are especially relevant for Colombian law, insofar as they allow the comprehensive reparation of damage to be harmonized with due process and legal certainty.

Finally, causality in medical liability must be addressed from an interdisciplinary perspective, capable of integrating evidentiary law, legal medicine, clinical practice, patient safety, institutional risk management, and new health technologies. The incorporation of artificial intelligence, digital platforms, and highly specialized procedures will increase the challenges of causal imputation. Therefore, Colombian law must move towards more rational, technical, and contextualized evidentiary evaluation criteria, which allow for reparation of unjustly caused damages without turning medical liability into a system based on conjecture.

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