CAUSAL UNCERTAINTY IN CHINESE MEDICAL MALPRACTICE LAW - WHEN THEORIES MEET FACTS

YU Xiaowei∗

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Abstract

Causal uncertainty is frequently encountered in medical malpractice cases, both in China and in other legal systems. Under the traditional "all-or-nothing" approach of proof rules, the prevalence of causal uncertainty makes proof of causation highly problematic in medical malpractice lawsuits. The cutting-edge development at the national level is to apply proportional liability in response to evidentiary uncertainty over causation. After examining both "law on the books" and "law in action" pertaining to medical malpractice, it is found that although the new Chinese Tort Liability Law lacks evident rules that handle the problem of causal uncertainty, Chinese courts are so active and flexible that they systematically employ proportional liability to the trial of medical malpractice cases. The proportional liability approach can be justified from both legal and law and economics perspectives.

Keywords: causal uncertainty, proportional liability, medical malpractice, causation, law and economics, Chinese law

I. INTRODUCTION

In recent years, there is a growing public awareness of the seriousness of conflicts or disputes between health care providers and patients over the cause of iatrogenic injury (negligence or non-negligence) and/or the amount of compensation for iatrogenic injury (hereinafter medical disputes) in the People's Republic of China. Comprehensive empirical studies in China show that medical disputes are prevalent and is becoming more frequent.[1] However, what often grabs the headlines more is widespread violence against health care providers. A series of nationwide empirical studies[2] show that about

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[1] *See e.g.* Zheng Xueqian (郑雪倩) et al., *Dui 326 Suo Yiliao Jigou Yiliao Jiufen he Qinquan Shijian de Diaocha Baogao* (对326所医疗机构医疗纠纷和侵权事件的调查报告) [*An Investigation on the Medical Dissensions and Infringement Events in 326 Medical Institutions*], 6 ZHONGGUO YIYUAN (中国医院) [CHINESE HOSITAL] 24 (2002) (reporting that 98.47% of all the surveyed 326 hospitals nationwide reported that they had experienced serious medical disputes in 2002). Song Xuri (宋旭日), *Yueyang Shi Yiliao Jiufen Diaoyan Baogao* (岳阳市医疗纠纷调研报告) [*Research of Yueyang Medical Disputes*] (Apr. 2011) (unpublished master thesis, Hunan Daxue (湖南大学) [Hunan University]) (reporting the number of medical disputes increased at an average rate of 13.6% annually in Yueyang for the period 2007-2010). Liu Ruimin (刘瑞明) & Feng Yuli (冯钰丽), *Dui Gongli Yiyuan Yiliao Jiufen de Diaocha yu Sikao* (对公立医院医疗纠纷的调查与思考) [*An Investigation into and Reflection on Medical Disputes Involving Public Hospitals*], 2013 WEISHENG JINGJI YANJIU (卫生经济研究) [HEALTH ECONOMICS RESEARCH] 60 (2013) (reporting the number of medical disputes in 9 public hospitals in Foshan, Guangdong Province had gone up from 17 in 2008 to 33 in 2011).

[2] Zheng Xueqian (郑雪倩) et al., *supra* note 1. Zheng Xueqian (郑雪倩) et al., *Guonei Yiliao Jiufen Diaocha yu Guowai Yiliao Jiufen Chuli* (国内医疗纠纷调查与国外医疗纠纷处理) [*Medical Dispute*

56.1%~63.7% of the surveyed physicians are physically threatened or injured, and roughly 35.58%~96% of the surveyed hospitals' property and order are disturbed or damaged by patients, their family members or "professional mobs" (职业医闹).[3] Whereas many violent incidents occur because discontented patients abruptly lose control of their emotions, a significant proportion of violent incidents are attributable to patients' deliberate strategies for claiming damages from hospitals by coercive measures.[4] Protest and violence are routinely used as "a common tool for patients and their family members seeking compensation from hospitals.[5] The plausible explanation of why patients resort to violence in order to claim compensation is that they do not trust the legal system that resolves medical disputes.[6] This "lack of a credible system" rather than frivolous litigation or unavailability of malpractice insurance becomes the real "malpractice crisis" in China.[7]

Much legislative endeavor has been made in order to build a credible malpractice system in China. The medical malpractice liability system was formally established in China in the second half of the 1980s,[8] and has been drastically reformed twice since then.[9]

Survey in China and Medical Dispute Solution Overseas], 11 ZHONGGUO YIYUAN (中国医院) [CHINESE HOSPITAL] 2 (2007). Jia Xiaoli (贾晓莉) et al., *2003 Nian - 2012 Nian Quanguo Yiyuan Changsuo Baoli Shangyi Qingkuang Diaocha Yanjiu* (2003年-2012年全国医院场所暴力伤医情况调查研究) [*Investigation on Hospital Violence during 2003 to 2012 in China*], 18 ZHONGGUO YIYUAN (中国医院) [CHINESE HOSPITAL] 1 (2014).

[3] "Professional mobs" are hired by a victimized patient or her family members to help carry out violent protest in order to force hospitals to pay compensation through settlement as quickly as possible. They often resort to coercive measures such as assault and battery, false imprisonment and vandalism. Less violent examples include burning money of the nether world, setting up a mourning hall, laying funeral wreaths, displaying the dead body of the diseased patient, mobbing, picking a quarrel and making trouble in the medical institution concerned.

[4] Xu Xin (徐昕) & Lu Rongrong (卢荣荣), *Baoli yu Bu Xinren: Zhuanxing Zhongguo de Yiyao Baoli Yanjiu: 2000~2006* (暴力与不信任——转型中国的医疗暴力研究：2000~2006) [*Violence and Mistrust: Research on Violence in Medical Treatment in Transforming China (2000~2006)*], 2008 FAZHI YU SHEHUI FAZHAN (法制与社会发展) [LEGAL & SOCIAL DEVELOPMENT] 82-101 (2008).

[5] Benjamin L. Liebman, *Malpractice Mobs: Medical Dispute Resolution in China*, 113 COLUM. L. REV. 181 (2013).

[6] Xu & Lu, *supra* note 4.

[7] Dean M. Harris & Chien-Chang Wu, Medical Malpractice in the People's Republic of China: The 2002 Regulation on the Handling of Medical Accidents, 33(3) J. L. MED. & ETHICS 456 (2005).

[8] Minfa Tongze (民法通则) [General Principles of the Civil Law] (promulgated by the Nat'l People's Cong., Apr. 12, 1986, effective Jan. 1, 1987, amended Aug. 27, 2009) art. 106(2) (Chinalawinfo) [hereinafter GPCL] (providing the general tort clause). Yiliao Shigu Chuli Banfa (医疗事故处理办法) [Measures for the Handling of Medical Accidents] (promulgated by the St. Council, Jun. 29, 1987, effective Jun. 29, 1987, annulled Sep. 1, 2002) (Chinalawinfo) [hereinafter MHMA] (the special administrative regulation applicable to medical malpractice).

[9] The first significant reform was initiated by amending the MHMA. Yiliao Shigu Chuli Tiaoli (医疗事故处理条例) [Regulation on the Handling of Medical Accidents] (promulgated by the St. Council, Apr. 4, 2002, effective Sep. 1, 2002) (Chinalawinfo) [hereinafter RHMA] (replacing the original MHMA in 2002). Qinquan Zeren Fa (侵权责任法) [Tort Liability Law] (promulgated by the Standing Comm. Nat'l People's Cong., Dec. 26, 2009, effective Jul. 1, 2010) (Chinalawinfo) [hereinafter TLL]) Chap. 7

Voluminous literature regarding the Chinese malpractice liability reforms is currently available in English.[10] In general, most scholarly discussions were centered on three main reforms: the criteria for liability, the expert witness system (鉴定制度) and the measure of compensation. First, the MHMA and the RHMA imposed some restrictions on the standard of care,[11] causation,[12] and compensatory damage[13] – all of which have been eliminated altogether.[14] The current standard of care required of physicians is defined as the "obligations of diagnosis and treatment up to the standard at the time of the diagnosis and treatment."[15] Second, the old expert witness

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(titled "Liability for Iatrogenic Injuries", reforming the current regulation thoroughly for the second time by repealing relevant malpractice liability rules in the RHMA).

[10] *See e.g.* Harris & Wu, *supra* note 7 (discussing the pros and cons of the MHMA and the RHMA). Ren Rongming & Wang Mantian, *On the Legal System of Medical Malpractice Management in China and Its Impact on Medical Ethics*, 12(3) INT'L J. THE COMPUTER, THE INTERNET AND MGMT. 73-80 (2004) (discussing the problems of the RHMA and its impact on medical ethical principles). Chao Xi & Lixin Yang, *Medical liability laws in China: The tale of two regimes*, 19 TORT L. REV. 65 (2011) (discussing the bifurcated medical negligence system in China for the period 2002-2010 and the legislative reform of medical liability in 2010). Zhu Wang & Ken Oliphant, *Yangge Dance: The Rhythm of Liability for Medical Malpractice in the People's Republic of China*, 87(1) CHI.-KENT L. REV. 21 (2011) (summarizing the history of medical liability in China from 1949 onwards and evaluating main provisions of the MHMA, the RHMA and the currently applicable TLL). DING CHUNYAN, MEDICAL NEGLIGENCE LAW IN TRANSITIONAL CHINA (Intersentia 2012) (discussing and evaluating the old and the current medical negligence system in China). Jordan Kearney, *Why China's 2010 Medical Malpractice Reform Fails to Reform Medical Malpractice*, 26 EMORY INT'L L. REV. 1039 (2012) (opining the new TLL would fail to achieve its goals of efficient deterrence and fair compensation). Min Zhao & Peng Tao, *Current Status and Legal Treatments of Medical Disputes in China*, *in* LEGAL AND FORENSIC MEDICINE (R. G. Beran ed., 2013) (discussing the current status and legal treatment of medical disputes in China).

[11] Yiliao Shigu Chuli Tiaoli (医疗事故处理条例) [Regulation on the Handling of Medical Accidents] (promulgated by the St. Council, Apr. 4, 2002, effective Sep. 1, 2002) [hereinafter RHMA] art.2 (Chinalawinfo) (confining medical negligence to a breach of "laws, regulations, ministerial rules concerning medical treatment and health or the standards or conventions of medical treatment and nursing.").

[12] Yiliao Shigu Chuli Banfa (医疗事故处理办法) [Measures for the Handling of Medical Accidents] (promulgated by the St. Council, Jun. 29, 1987, effective Jun. 29, 1987, annulled Sep. 1, 2002) [hereinafter MHMA] art. 2 (Chinalawinfo) (providing that iatrogenic injuries must be "directly caused" by medical negligence, which indicates an "immediate cause (直接原因)" instead of an "remote cause (间接原因); that is to say, an intervening factor such as the patient's underlying medical condition would break the causal link between medical negligence and the final injury.).

[13] *Id.*, (restricting compensable iatrogenic injuries to "death, disability or tissue-organ injury leading to dysfunction."). RHMA art. 4 loosened the foregoing restriction; however, it still required that compensable iatrogenic injuries must be "obvious or tangible (明显的)." Hence, less "obvious" injuries such as those that would take years to discover, lost chances of survival or living a longer life, or infringement on the right to self-determination were not compensable according to the RHMA.

[14] Qinquan Zeren Fa (侵权责任法) [Tort Liability Law] (promulgated by the Standing Comm. Nat'l People's Cong., Dec. 26, 2009, effective Jul. 1, 2010) (Chinalawinfo) [hereinafter TLL] art. 54 (simply providing that a defendant hospital shall be held liable for any harm a patient sustains during diagnosis and treatment due to fault on the part of the defendant hospital or any of its medical staff, as the current applicable general clause for medical malpractice liability). *See e.g.* Xi & Yang, *supra* note 10; Wang & Oliphant, *supra* note 10; DING, *supra* note 10, at 55-94 (pointing out that even before the implementation of the TLL in 2010, it was possible for courts to apply the GPCL and its judicial interpretations to medical malpractice cases that, according to expert opinions, were not regarded as "medical accidents.").

[15] Qinquan Zeren Fa (侵权责任法) [Tort Liability Law] (promulgated by the Standing Comm. Nat'l People's Cong., Dec. 26, 2009, effective Jul. 1, 2010) [hereinafter TLL]) art. 57 (Chinalawinfo).

system created by the MHMA was criticized for "protectionism, monopoly and lack of transparency,"[16] which has been replaced by a new expert witness system based on the RHMA.[17] In practice, the RHMA-based system, which mainly relies on doctors practicing clinical medicine, intensely competes with the alternative medico-legal judicial authentication system under which forensic physicians produce expert evidence.[18] Available empirical evidence shows that expert testimony is critical to the resolution of medical disputes and expert witnesses give the vast majority of proof of medical liability.[19] This "battle of experts" between clinical doctors and forensic physicians greatly increases legal uncertainty. Unfortunately, the TLL does not touch on this debatable issue. Third, the limitations imposed on the measure of compensation by the MHMA[20] and the RHMA[21] have been entirely removed. Currently, the measure of compensation for iatrogenic injuries applies the same rules - art. 16 TLL for

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[16] Harris & Wu, *supra* note 7; *see also* Wang & Oliphant, *supra* note 10. DING, *supra* note 10, at 153-61 (stating that expert witnesses were chosen from physicians practicing clinical medicine, and were fixed members of Technical Authentication Commissions, which were affiliated with local public health authorities. These same authorities are also in charge of the regulation of medical profession. Many patients had a deep distrust of the impartiality of expert witnesses because the authorities might affect expert testimony in order to protect public hospitals.).

[17] *See* Wang & Oliphant, *supra* note 10. DING, *supra* note 10, at 153-59. In order to enhance credibility, the new system shifted the responsibility of organizing expert witnesses from the Technical Authentication Commission to various medical associations. However, this new system attracted criticism as well, since medical associations in China are semi-governmental organizations and still subject to regulation by public health authorities.

[18] *See* Guanyu Canzhao "Yiliao Shigu Chuli Tiaoli" Shenli Yiliao Jiufen Minshi Anjian de Tongzhi (关于参照《医疗事故处理条例》审理医疗纠纷民事案件的通知) [Notice on Trying Civil Cases on Medical Disputes by Referring to the "Regulation on Handling Medical Malpractices"] (promulgated by the Sup. People's Ct., Jan. 6, 2003, effective Jan. 6, 2003, annulled Apr. 8, 2013) art. 2 (Chinalawinfo) (stating that for the period 2003-2010, the RHMA-based expert witness system shall apply to disputes over "medical accidents," whereas the medico-legal judicial authentication system to disputes over medical compensation resulting from "reasons other than medical accidents,"). *See* DING, *supra* note 10, at 55-94. (indicating that in practice, however, it was often difficult to make a clear distinction between "medical accidents" and "ordinary medical negligence.").

[19] Wang Cheng (王成), *Yiliao Qinquan Xingwei Falü Guizhi de Shizheng Fenxi* (医疗侵权行为法律规制的实证分析) [*An Empirical Analysis of Medical Tort Law*], 2010 ZHONGGUO FAXUE (中国法学) [CHINA LEGAL SCIENCE] 113 (2010).

[20] Yiliao Shigu Chuli Banfa (医疗事故处理办法) [Measures for the Handling of Medical Accidents] (promulgated by the St. Council, Jun. 29, 1987, effective Jun. 29, 1987, annulled Sep. 1, 2002) (Chinalawinfo) [hereinafter MHMA], art. 18(1) (providing plaintiff-patients with "a lump sum of economic compensation (一次性经济补偿)", thus excluding compensation for non-pecuniary losses). In practice, this "lump sum" were usually very limited. *See* Tianjin Shi Yiliao Shigu Chuli Banfa Shishi Xize (天津市医疗事故处理办法实施细则) [Detailed Rules for the Implementation of the Measures for the Handling of Medical Accidents] (promulgated by the Tianjin Muni. Gov't, Nov. 15, 1988, effective Nov. 15, 1988, annulled Jul. 1, 2004) (Chinalawinfo) (stating that the lump sum in Tianjin ranges from RMB 2000 *yuan* to 5000 *yuan*).

[21] The RHMA repealed the MHMA's "a lump sum of economic compensation." Instead, RHMA art. 50 allowed for compensation for both pecuniary losses and non-pecuniary losses. However, the measure of compensation for medical accident injury was still limited in comparison to that of compensation for other types of harm where the GPCL and its judicial interpretations were applicable.

pecuniary losses and art. 22 TLL for non-pecuniary losses - as that of compensation for other types of personal injuries does.

No matter how the malpractice system varies, the proof of liability is the starting point and critical to a successful claim. All requirements of malpractice liability – fault, causation and damage – must be established before the plaintiff-patient can obtain any compensation. As far as the requirements are concerned, although the TLL has evidently defined the standard of care (art. 57 TLL) and the scope of compensatory damage (art. 16, art. 22 TLL), it keeps causation issues unaddressed; so did the prior legislation.[22]

However, proof of causation is particularly difficult in medical malpractice cases. At least two factors can contribute to evidential uncertainty and dispute over causation ("causal uncertainty"). First, there is evident informational asymmetry between medical professionals and patients (and judges). Compared to physicians who are experts in medical science and who actually perform treatment, patients as medical laymen normally know little about pathology and only have an intuitive sense of what happens during treatment. The information concerning causation may be available to defendant-hospitals, but it may not be available to patients or judges for various reasons.[23] Sometimes, patients "may have been under anesthetic and unable to observe what was done to him."[24] Sometimes, the most important type of evidential material – medical records – are forged or destroyed by the defendant or simply missing. Neither patients nor judges are able to establish causation in the absence of crucial evidentiary documents. Sometimes, it is not difficult to prove that the injury is caused by at least one but not all of the doctors' or hospitals' faults, but it is factually indeterminate as to which doctor or hospital is the real tortfeasor.

Second, it is not infrequent in some medical cases that even medical experts are unsure whether or to what extent an injury was caused by the negligent treatment. There are hard cases where there is "scientific uncertainty concerning the causal relationship" between a faulty treatment and an iatrogenic injury.[25] Even equipped with the most advanced medical knowledge and the state-of-the-art technology, expert witnesses often find it difficult to prove causation with certainty in cases where non-tortious factors are involved. Besides faulty treatments, injuries suffered by patients may result from

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[22] MHMA art. 2 was an exception, which confined causation to "immediate causation." However, it did not define causation in itself.

[23] LARA KHOURY, UNCERTAIN CAUSATION IN MEDICAL LIABILITY 51 (Hart Publ.g 2006).

[24] MARC STAUCH, THE LAW OF MEDICAL NEGLIGENCE IN ENGLAND AND GERMANY: A COMPARATIVE ANALYSIS 61-62 (Hart Publ.g 2008).

[25] Robert Young et al., *Causality and Causation in Tort law*, 24 INT'L REV. L. & ECON. 507 (2004).

two non-tortious factors[26]: (1) the normal outcome of the patient's underlying or pre-existing medical condition,[27] and (2) therapeutic risks inherent in treatment beyond physicians' control.[28] It is indeterminate whether or which part of the final injury is attributable to the negligent treatment. In practice, a significant proportion of medical cases involve scientific uncertainty and are quite difficult cases to resolve.

Because of causal uncertainty, many patients, even with the help of expert witnesses, often find it virtually impossible to provide adequate evidence that can satisfy the traditional standard of proof. In short, causal uncertainty may make proof of causation highly problematic. In 2012, Professor Ken Oliphant examined and evaluated the TLL's approach to uncertain (alternative) causes.[29] According to some of Oliphant's Chinese colleagues, "as yet little attention has been paid to" the issue of causal uncertainty. After reading the text of the TLL, Oliphant argued that, "by providing a general solution only to the problem of 'alternative' or 'indeterminate' defendants and restricting itself to an all-or-nothing approach, the new Chinese Tort Liability Law lags behind cutting-edge developments at national level." However, a lack of a comprehensive set of rules concerning uncertain causes in the TLL does not necessarily mean that there are no medical cases involving causal uncertainty in practice. It is thus interesting to know how Chinese courts handle causal uncertainty issues in practice, and how these practical approaches can be justified.

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[26] See STAUCH, supra note 24, at 76. KHOURY, supra note 23, at 51-52. Yang Lixin (杨立新), Lun Yiliao Guoshi Peichang Zeren de Yuanyinli Guize (论医疗过失赔偿责任的原因力规则) [The Rule of Causal Potency Applying to Compensatory Liability for Medical Malpractice], 2008 FA SHANG YANJIU (法商研究) [STUDIES IN LAW & BUSINESS] 37 (2008). Wang Yu (王瑜), Yiliao Sunhai zhong Yinguo Guanxi Bu Quedingxing de Chuli (医疗损害中因果关系不确定性的处理) [Solutions to the Problem of Unvertainty of Causality in Medical Malpractice] (Apr. 14, 2014) (unpublished master thesis, Huadong Zhengfa Daxue (华东政法大学) [East China University]) (on file with CNKI).

[27] Patients are already in a poor condition before they go to hospital. Even in the absence of any medical intervention, patients' state of health may still deteriorate as the normal outcome of these underlying or pre-existing conditions. Pre-existing conditions are obvious ones which immediately impel patients to see a doctor. Underlying conditions may or may not be hidden by something more obvious, and may or may not be present with another medical condition. Underlying conditions often contribute to another symptom or disease. *See* Ellen Schnakenberg, *What Is the Meaning of Underlying Medical Condition?*, THE ANSWERS, http://www.answers.com/Q/What_is_the_meaning_of_underlying_medical _condition (last visited Dec. 9, 2015) (listing examples of underlying conditions, like obesity, compromised immune system, diabetes, malabsorption).

[28] Modern medical interventions are intrusive and highly risky. Physicians usually do not guarantee that treatment will be successful. Therapeutic risks are an integral part of medical interventions and cannot be avoided with certainty even if all medical procedures are well performed. When properly informed of therapeutic risks and patients give consent to medical treatment, the realization of therapeutic risks cannot be regarded as the health care provider's fault.

[29] Ken Oliphant, *Uncertain Causes: The Chinese Tort Liability Law in Comparative Perspective*, *in* TOWARDS A CHINESE CIVIL CODE: COMPARATIVE AND HISTORICAL PERSPECTIVES 395–408 (Lei Chen & C. H. (Remco) van Rhee eds., 2012).

Before answering these questions directly, it is necessary to find out how causation is commonly defined in tort law and what proof rules apply to civil dispute cases in China (Section Ⅱ). Section Ⅲ attempts to categorize medical cases involving causal uncertainty in order to facilitate further discussions and evaluations. Then, attention is paid to how Chinese legislation and courts handle causal uncertainty issues in medical malpractice cases and how the courts' approaches can be legally justified (Section Ⅳ). Thereafter, the proportional approaches to causal uncertainty issues are evaluated from the perspective of law and economics (Section Ⅴ). The final section concludes that it is the TLL rather than the judicial practice in the field of medical malpractice in China that lags behind the latest development in other countries.

Ⅱ. Causation and Proof Rules

A. Defining Causation in Chinese Tort Law

Despite the fact that causation plays an essential role in tort law, none of the provisions in the new TLL or the prior legislation (MHMA, RHMA and GPCL) or any judicial interpretation[30] has ever defined this term. As a matter of fact, the theory of causation has mainly been developed by tort scholars and courts in China. During the last two decades of the 20th century, the dominant doctrine about causation in tort law was the so-called "necessity theory (必然因果关系说)."[31] According to this theory, causation only exists where there is "an inner, intrinsic and inevitable link (内在的、本质的、必然的联系)" between the injurious act and damage.[32] Put another way, there must be a movement from the injurious act to damage which indicates a trend that is inevitable and absolutely certain according to objective natural law.[33] This approach was claimed to be based on dialectical materialism and influenced by the then Soviet law.[34] It is also similar to Kant's view that D necessarily follows from A or

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[30] Guanyu Jiaqiang Falü Jieshi Gongzuo de Jueyi (关于加强法律解释工作的决议) [Resolution Providing an Improved Interpretation of the Law] (promulgated by the Standing Comm. Nat'l People's Cong., Jun. 10, 1981, effective Jun. 10, 1981) (Chinalawinfo) art. 2 (providing that the Supreme People's Court is empowered by Constitution to enact judicial interpretations concerning the application of law, which can be directly cited in decisions).

[31] The word "necessity" here only refers to a situation that is inevitable, which should not be confused with the legal defense of "necessity" (紧急避险).

[32] Zhao Kexiang (赵克祥), *Qinquan Fa Shang Yinguo Guanxi Gainian Bianxi - Yi Zhexue Shijiao Wei Chufadian* (侵权法上因果关系概念辨析——以哲学视角为出发点) [*The Compensation of the Concepts of Causation in Philosophy and Tort - From the Perspective of Philosophy*], 5 Kunming Ligong Daxue Xuebao (Shehui Kexue Ban) (昆明理工大学学报(社会科学版)) [J. Kunming U. Sci. & Tech. (Soc. Sci.)] 32, 32–37 (2008).

[33] Jiang Meiying (强美英), Yiliao Sunhai Peichang Zeren Fendan Yanjiu (医疗损害赔偿责任分担研究) [On Sharing Liability for Compensation for Medical Injury] 223 (2010).

[34] Zhao, *supra* note 32.

Hume's view that in every instance D always follows A, if A is said to be the cause of D.[35]

However, in modern tort cases, especially those involving industrial and medical accidents, it is extremely difficult for victims to prove that D necessarily follows from A. For instance, many treatment outcomes are random rather than predetermined and statistical regularity such as the cure rate is based on probabilities.[36] Therefore, the necessity theory considerably limits both the possibility of establishing tort liability and the scope of compensation, being extremely disadvantageous to the protection of the patient's interests.

The stringent requirement of the necessity theory has been challenged and subsequently relaxed. Since the 1990's, the necessity theory had been widely criticized by the academia. The first scholar who challenged the orthodox necessity theory was Professor Liang Huixing in 1989. In his commentary on *Zhang & Zhang v. Zhang*,[37] which was published on the Supreme People's Gazette in 1989, Liang criticized the necessity theory on the grounds that to establish the "inner, intrinsic and inevitable link" between objective things is beyond the capacity of most judges. Liang continued to argue that what judges can do is to decide cases mainly in accordance with "the common norms of social life, the concepts of equity and justice, *boni mores* and normal human feelings." After the criticism, Liang advocated the use of the adequacy theory, which was also implicitly employed in *Zhang & Zhang v. Zhang*. In that case, the victim Mr. Zhang had his left inner ankle wounded due to an accident on a construction site. The hospital appropriately treated him but failed to save his life. Mr. Zhang later died of septicopyemia, septic shock and multiple organ failure, which was not due to any fault on the part of the hospital. Had the court adhered to the necessity theory, the defendant-employer would not have been held liable because death does not necessarily follow a leg wound. On the contrary, the court nonetheless confirmed that the victim's death could only have been attributed to the industrial injury. Although the court had not expressly mentioned the theory on which the causation was established, Liang argued that the decision could only be explained on the basis of the "adequacy theory (相当因果关系说)" rather than the necessity theory. According to Liang, causation can be established if, based on

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[35] Young et al., *supra* note 25.

[36] Zhao, *supra* note 32.

[37] Liang Huixing (梁慧星), *Guzhu Chengbao Changfang Chaichu Gongcheng Weizhang Shigong Zhi Gugong Shoushang Ganran Siwang An Pingshi* (雇主承包厂房拆除工程违章施工致雇工受伤感染死亡案评释) [*A Critical Commentary on the Case Zhang Lianqi & Zhang Guoli v. Zhang Xuezhen*],4 FAXUE YANJIU (法学研究) [CHINESE J. L.] 45, 45–52 (1989); Zhang Lianqi, Zhang Guoli Su Zhang Xuezhen Sunhai Peichang Jiufen An (张连起、张国莉诉张学珍损害赔偿纠纷案) [Lianqi Zhang & Guoli Zhang v. Xuezhen Zhang], ZUIGAO RENMIN FAYUAN GONGBAO (最高人民法院公报) [SUP. PEOPLE'S CT. GAZ.], Jan. 1, 1989, (Tianjin Tanggu Dist. People's Ct. 1989) [hereinafter Zhang & Zhang v. Zhang].

currently available knowledge and experience, an ordinary person agrees that there may be the same harm under the same circumstance.

Liang's commentary on *Zhang & Zhang v. Zhang* marked a turning point in Chinese causation theories in tort law. Although *Zhang & Zhang v. Zhang* was not adjudicated by the Supreme People's Court,[38] the publication of the case on its official gazette clearly indicated the Supreme Court's preference for the adequacy theory. Later, more and more scholars proposed to introduce the adequacy theory from German law into Chinese tort law.[39] Currently, it seems that the adequacy theory tends to play a more important role in tort decisions.[40]

Although neither the statutes (TLL, GPCL, MHMA or RHMA) nor any judicial interpretation has ever provided for the definition of causation or the adequacy theory, some clues can be discovered at the local-level judicial practice. For instance, two provincial high courts expressly define the adequacy theory by issuing judicial guides[41] within their own jurisdictions. In 2005, the Shanghai High People's Court enacted the Guide to the Trial of Medical Malpractice Cases (2005).[42] Art. 13 of the Shanghai Guide provides that the determination of causation shall be based on the adequacy theory – "an adequate causation exists between a negligent treatment and an injury if the treatment is the *conditio sine qua non* of the injury and if

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[38] The Chinese court system in the mainland consists of local courts, special courts and the Supreme People's Court, with all the first two subject to the supervision of the latter. There are 32 provincial jurisdictions, each of which has a three-level court system: district people's courts at the grassroots-level, intermediate people's courts at the municipal level and high people's courts at the provincial level. Normally, most civil cases of the first instance are tried before district courts and those of the second instance before intermediate courts. The second instance is the final instance. Therefore, the vast majority of civil cases will not reach the Supreme Court. Nevertheless, the Supreme Court has the power to overrule or retry any erroneous local adjudications if the Supreme Court deems it necessary. The Supreme Court also regularly select exemplary local decisions and publish them in order for all local courts nationwide to follow. *See* China's Judiciary, http://www.china.org.cn/english/Judiciary/31280.htm (last visited Nov. 19, 2015) (containing more detailed information about China's court system). *See* Jinting Deng, *The Guiding Case System in Mainland China*, 10 FRONTIERS L. IN CHINA 1 (2015) (containing details for the recently established Chinese Guiding Case System).

[39] *See e.g.* Zhu Yan (朱岩), *Dangdai Deguo Qinquan Fa Shang Yinguo Guanxi Lilun he Shiwu Zhong de Zhuyao Wenti* (当代德国侵权法上因果关系理论和实务中的主要问题) [*Main Theoretical and Practical Issues concerning Causation in Modern German Tort Law*], 6 FAXUE JIA (法学家) [THE JURISTS] 145, 145–152 (2004). YANG LIXIN (杨立新), QINQUAN ZEREN FA (侵权责任法) [TORT LAW] 98 (2010). CHENG XIAO (程啸), QINQUAN ZEREN FA (侵权责任法) [TORTIOUS LIABILITY LAW] 181 (2011). WANG LIMING (王利明), QINQUAN ZEREN FA YANJIU (SHANG) (侵权责任法研究(上)) [THE RESEARCH ON TORT LIABILITY LAW (BOOK 1)] 375 (2011).

[40] CHENG XIAO (程啸), *supra* note 39, at 182.

[41] Local judicial guides issued by high or intermediate courts are not judicial interpretations. They are by no means applicable rules and cannot be directly cited in decisions. In practice, nevertheless, these local guides are highly influential in local judges' application of law in the sense that cases of the first instance may be overruled by appellate courts if trial judges do not strictly follow relevant guides issued by the appellate courts. In other words, local judicial guides represent opinions of appellate courts.

[42] Yiliao Guoshi Peichang Jiufen Anjian Banli Zhinan (医疗过失赔偿纠纷案件办案指南) [Guide to the Trial of Medical Malpractice Cases] (promulgated by Shanghai High People's Ct., Sept. 20, 2005, effective Sept. 20, 2005) (Chinalawinfo), [hereinafter Shanghai Guide].

the treatment substantially increases the objective probability of the occurrence of the injury." Likewise, the Jiangsu High People's Court issued the Guide to the Trial of Tort Compensation Cases (2011),[43] art. 5 para. 1 of which provides for the definition of the adequacy theory as follows:

> The causation between an action and an injury would be established, if the injury would have not occurred but for the action, and it is reasonably likely that the presence of the action would have resulted in the injury; the causation would not be established, if although the injury would have not occurred but for the action, the injury would have normally not occurred even in the presence of the action.

Combining the foregoing two guides, it is evident that the adequacy theory bases causation on two essential tests: (1) the "but for" or "*conditio sine qua non*" test, and (2) the "adequacy" – an increased objective probability or reasonable likelihood. This two-step approach is extremely similar to that of German tort law.[44] Currently, however, there is no evidence that a third step – policy considerations such as those associated with the protective purpose of the violated rule – has been or will be adopted by Chinese courts. Interestingly, many Chinese courts also refer to the first step as "causation in fact (事实上的因果关系)" and the second one as "causation in law (法律上的因果关系)". It should be noted, however, that the Chinese version of causation in law is different from its counterpart – "remoteness", "legal cause" or "proximate cause" in the common law.[45] Whereas the test for the former is the probability-based "adequacy," the leading test for the latter is foreseeability.[46]

B. Proof Rules Applying to Civil Cases

1. The Burden of Proof

Two key components of proof rules are the burden of proof and the standard of proof. While the former allocates the risk of losing on an issue in cases of doubt to either the plaintiff or the defendant, the latter prescribes the degree of certainty with which disputed facts must be established in order to be accepted as proved. In China, rules of evidence applying to civil cases were formerly set up in 2001 when

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[43] Qinquan Sunhai Peichang Anjian Shenli Zhinan (侵权损害赔偿案件审理指南) [Trial Guide to the Trial of Tort Compensation Cases] (promulgated by 1st Civil Trial Chamber Jiangsu High People's Ct., 2011, effective 2011) (Chinalawinfo) [hereinafter Jiangsu Guide].

[44] Ulrich Magnus, *Causation in German Tort Law*, *in* 4 UNIFICATION OF TORT LAW: CAUSATION (PRINCIPLES OF EUROPEAN TORT LAW) 64–65 (J. Spier ed., 2000).

[45] W. V. Horton Rogers, *Causation under English Law*, *in* 4 UNIFICATION OF TORT LAW: CAUSATION (PRINCIPLES OF EUROPEAN TORT LAW) 40 (J. Spier ed., 2000).

[46] *Id*.

the Supreme People's Court enacted the Provisions on Evidence in Civil Procedures (2001).[47]

The burden of proof in civil cases rests on the plaintiff as a matter of principle unless otherwise provided by the law.[48] In medical malpractice cases, the issue of the burden of proof is complex and controversial. For the period of 1986-2001, there was no special provision relating to the burden of proof in either the MHMA or the GPCL and the general principle applied to medical cases.

The general allocation of the burden of proof was dramatically reversed for medical malpractice liability in the following decade (2001-2010). As of 2001, the defendant-hospital began to bear the burden of proving the absence of both fault and causation while the plaintiff-patient only had to prove that he had suffered iatrogenic injuries from the defendant-hospital.[49]

This quasi total reversal of the burden of proof was basically abandoned by the new TLL. The reversal rule was fiercely criticized for three reasons. First, it would encourage frivolous actions. Patients would be more willing to file malpractice claims if they bore little burden of proof.[50] Second, it would induce providers to practice defensive medicine. Providers would take excessive precautions in response to the increased risk of losing a malpractice lawsuit due to failure to disprove causation and fault.[51] Third, it violates the principle of "equality of arms."[52] There should be a fair allocation of the risk of losing a lawsuit between the plaintiff and the defendant. The reversal rule imposes too much risk on the defendant, which is unfair.

As a result, in 2010, the reversal rule was reversed by art. 54 TLL back to the original state. For the time being, it is normally the plaintiff-patient that has to prove the presence of harm, negligence and

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[47] Guanyu Minshi Susong Zhengju de Ruogan Guiding (关于民事诉讼证据的若干规定) [Some Provisions on Evidence in Civil Procedures] (promulgated by the Sup. People's Ct., Dec. 21, 2001, effective Apr. 1, 2002) (Chinalawinfo).

[48] *Id.*, art.2.

[49] *Id.*, art. 4 para. 1(8).

[50] *See e.g.* Shao Yi (邵毅), *Yiliao Qinquan Susong zhong Yi-Guo Guanxi de Zhengming Zeren Fenpei Tanxi* (医疗侵权诉讼中因果关系的证明责任分配探析) [*Analysis of the Location of Burden of Proof in Medical Malpractice Lawsuits*], 2 HEILONGJIANG SHENG ZHENGFA GUANLI GANBU XUEYUAN XUEBAO (黑龙江省政法管理干部学院学报) [JOURNAL OF HEILONGJIANG ADMINISTRATIVE CADRE INSTITUTE OF POLITICS AND LAW] 104–106 (2013) (discussing the allocation of the burden of proof of causation in medical malpractice lawsuits).

[51] *Id.*

[52] Yang Lixin (杨立新), *Yiliao Sunhai Zeren de Yin-Guo Guanxi Zhengming ji Juzheng Zeren* (医疗损害责任的因果关系证明及举证责任) [*Proof of Causation and the Burden of Proof in Medical Malpractice Cases*], 1 FAXUE (法学) [LAW SCIENCE] 35–44 (2009) (opining proof relaxations rather than the reversal of the burden of proof should apply to medical malpractice cases); Shen Guanling (沈冠伶), *Wuqi Pingdeng Yuanze yu Yiliao Susong zhi Shiyong* (武器平等原则于医疗诉讼之适用) [*The Application of the Principle of Equality of Arms to Medical Malpractice Lawsuits*], 127 YUEDAN FAXUE ZAZHI (月旦法学杂志) [THE TAIWAN LAW REVIEW] 28-49 (2005) (discussing how to allocate the burden of proof in medical malpractice cases in light of the principle of equality of arms).

causation. However, while the TLL's approach may be welcomed by the medical profession, it may not be considered satisfactory by some patients and lawyers.[53]

2. The Standard of Proof

As far as the standard of proof is concerned, the Civil Procedure Law[54] has not specified what the actual standard is. According to dominant scholarly opinions in the 1990s, the same standard of "clear facts, unquestionable and sufficient evidence" (事实清楚，证据确实充分) applied to both criminal and civil proceedings.[55] The application of this very high standard to civil cases has been subject to fierce criticism. A general consensus among scholars has been reached that a less strict standard of proof should be applied to civil cases.[56] Consequently, the Supreme People's Court set the standard of proof for civil proceedings in art. 73 para. 1 PECP, which reads as follows:

> Where both parties concerned produces contradicting evidences to prove a same fact but neither has enough evidence to rebut the evidence of the other party, the People's court shall determine which evidence are *obviously* more forceful than the other evidence by taking the case into consideration, and shall affirm the evidence that are more forceful [italics added].

Although drafters of the PECP interpreted the "obviously-more-forceful" standard as the "high probability" (高度盖然性) standard, they did not clarify how high the probability should be.[57] Some scholars advocate that this probability should be "nine times out of

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[53] Wang & Oliphant, *supra* note 10 (opining that the TLL's approach to the allocation of the burden of proof of causation as "another step backwards on its way" to the protection of patients' rights and interests). *See* Ye Mingyi (叶名怡), *Yiliao Qinquan Zeren zhong Yin-Guo Guanxi de Rending* (医疗侵权责任中因果关系的认定) [*Determining Causation in Medical Malpractice Cases*], 1 ZHONGWAI FAXUE (中外法学) [PEKING UNIVSITY LAW JOURNAL] 136 (2012) (stating that due to informational and technological asymmetries, it is more difficult for patients than hospitals to discharge the burden of proof of causation.).

[54] Minshi Susomg Fa (民事诉讼法) [Civil Procedure Law] (promulgated by the Standing Comm. Nat'l People's Cong., Apr. 9, 1991, effective Apr. 9, 1991, amended Oct. 28, 2007, Aug. 31, 2012) (Chinalawinfo) [hereinafter CPL].

[55] Wang Shengyang (王圣扬), *Lun Susong Zhengming Biaozhun de Eryuan Zhi* (论诉讼证明标准的二元制) [*On A Binary System of the Standards of Proof*], 3 ZHONGGUO FAXUE (中国法学) [CHINA LEGAL SCIENCE] 136 (1999).

[56] Zhang Weiping (张卫平), *Zhengming Biaozhun Jiangou de Wutuobang* (证明标准建构的乌托邦) [*The Utopian Construction of the Standards of Proof*], 4 FAXUE YANJIU (法学研究) [CHINESE JOURNAL OF LAW] 60 (2003).

[57] Li Guoguang (李国光), Zuigao Renmin Fayuan *Guanyu Minshi Susong Zhengju de Ruogan Guiding* de Lijie yu Shiyong (最高人民法院《关于民事诉讼证据的若干规定》的理解与适用) [Understanding and Application of the Some Provisions of the Supreme People's Court on Evidence in Civil Procedures] (Zhongguo Fazhi Chubanshe (中国法制出版社) [China Legal Publg. House] 2002).

ten"[58] or at least 70%.[59] Therefore, similar to the common law, Chinese law adopts a probability-oriented rather than a subjective *intime conviction* (in France) or a "full judicial conviction" (in Germany) approach to the standard of proof in civil cases.[60] However, the high probability standard demands a higher probability than just being "more likely than not."

Be that as it may, due to a lack of clear definition of the "high probability," Chinese judges exercise their discretion to interpret the required degree of proof. A recent case study shows that many judges equate the "high probability" standard with the "preponderance of evidence" standard and some judges simply apply the "preponderance of evidence" standard directly without reference to the "high probability" standard.[61] Because there are dividing interpretations of the "high probability" standard, the application of the standard of proof in civil cases is not always unified or consistent in China.

III. CATEGORIZING MEDICAL CASES INVOLVING CAUSAL UNCERTAINTY

The categorization is modeled on the project of "Proportional Liability"[62] conducted under the auspices of the European Center of Tort and Insurance Law (ECTIL) together with the Institute for European Tort Law. The ECTIL project comprehensively compared and contrasted the proportional approach to causal uncertainty under

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[58] Li Hao (李浩), *Minshi Susong Zhengming Biaozhun de Zai Sikao* (民事诉讼证明标准的再思考) [*Rethinking of the Standard of Proof for Civil Proceedings*], 5 FA SHANG YANJIU (法商研究) [ZUEL LAW JOURNAL] 19 (1999).

[59] Wu Zeyong (吴泽勇), *Zhongguo Fa shang de Minshi Susong Zhengming Biaozhun* (中国法上的民事诉讼证明标准) [*The Standard of Proof for Civil Procedure in Chinese Law*], 7(1) QINGHUA FAXUE (清华法学) [TSINGHUA LAW JOURNAL] 73 (2013).

[60] Common law countries and civil law countries approach the standard of proof differently. In common law systems, whereas a very high standard – "beyond a reasonable doubt" – applies to criminal proceedings, a relatively low "more-likely-than-not" (at least 51%) standard, termed "preponderance of evidence" in the US and "balance of probabilities" in the UK, is used in civil cases. Unlike common law, it is commonly argued that there is no distinction between standards of proof applying to civil and criminal proceedings in continental Europe. In France, the subjective persuasion of a single judge – "*intime conviction*" – is required. In Germany, the standard is interpreted as a full judicial conviction in the form of a degree of certainty that silences doubt for practical purposes, even if it does not eliminate them entirely. *See generally* Keven M. Clermont & Emily Sherwin, *A Comparative View of Standards of Proof*, 50(2) AM. J. COMP. L. 243 (2002). Michele Taruffo, *Rethinking the Standards of Proof*, 51(3) AM. J. COMP. L. 659 (2003). Richard W. Wright, *Proving Causation: Probability versus Belief, in* PERSPECTIVES ON CAUSATION (Hart Publ'g 2011). Mark Schweizer, *The Civil Standard of Proof--What Is It, Actually?* (Max Planck Inst. for Research on Collective Goods, Working Paper No. 2013/12), *available at* https://www.econstor.eu/dspace/bitstream/10419/84989/1/756340594.pdf.

[61] Wu, *supra* note 59.

[62] Israel Gilead et al., *General Report – Causal Uncertainty and Proportional Liability: Analytical and Comparative Report, in* PROPORTIONAL LIABILITY: ANALYTICAL AND COMPARATIVE PERSPECTIVES 1 (Israel Gilead et al. eds., 2013).

tort law in 16 countries and in two model codes.[63] The below table borrows the same case categorization as the ECTLL project (three main categories and seven sub-categories).[64]

Of course, not all of the seven sub-categories are particularly relevant to medical malpractice cases. In order to find out which sub-categories are the most relevant ones in practice, an empirical analysis of hundreds of cases was conducted.[65] Of all the 280 cases closed with judgments, 247 reported how causation was established. The proportion of each sub-category relative to the 247 cases is presented in Table 1 as follows:

TABLE 1 DISTRIBUTION OF THE SUB-CATEGORIES

Sub-Categories (P=Plaintiff; D=Defendant)	Number	Ratio
A1 (alternative liability – indeterminate tortfeasors)	0	0
A2 (market-share liability – causally unrelated tortfeasors and victims)	0	0
A3 (pollution or drug cases – indeterminate victims)	0	0
A4 (The hard case)	95	38.46%
A5 (lost chances)	9	3.64%
B1 (all parts of P's harm were caused by liable Ds)	4	1.62%

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[63] *See* Eur. Ctr. of Tort and Ins. Law, Principles of European Tort Law - Text and Commentary (Eur. Group On Tort Law ed., (2005) [hereinafter PETL]; *see also* Study Group on a Eur. Civil Code Principles & Research Group on EC Private Law (Acquis Group), Definitions and Model Rules of European Private Law: Draft Common Frame of Reference (Christian von Bar et al. eds., Outline ed. 2009). [hereinafter DCFR].

[64] *Id. See also infra* Table 1. *See* Yang Yinhong (杨垠红), *Duoyin Buming Qinquan Zhong Bili Zeren zhi Shiyong* (多因不明侵权中比例责任之适用) [*Applying Proportional Liability to Tort Cases Involving Multiple Causes and Causal Uncertainty*], 31(4) ZHENGFA LUNTAN (政法论坛) [TRIBUNE OF POLITICAL SCIENCE & LAW] 155 (2013) (a brief introduction to these categories and their relevance to Chinese law).

[65] Part of the author's PhD project is to investigate how Chinese courts handle difficult medical malpractice cases in practice. For this purpose, the author collected and analyzed a total of 592 medical cases closed for the period 2002-2013 from the Gulou District People's Court in Nanjing, Jiangsu Province. In addition, the author also reviewed some cases closed after 2014 (data not complete) and interviewed some judges and an official of the expert witness organization. Gulou District is largely an urban area, with a dense population of more than six thousand by 2011 and an abundance of more than two hundred medical institutions, among which are twelve secondary or tertiary hospitals such as the Jiangsu Province Hospital, the Nanjing Drum Tower Hospital, the Nanjing Children's Hospital and the Zhongda Hospital of Southeast University. Among all the eleven districts of Nanjing, Gulou District has the largest number and scale of medical institutions and almost half of all medical malpractice cases in Nanjing are accepted and heard by the Gulou District Court. *See* GULOU QU TONGJI NIANJIAN 2012 (鼓楼区统计年鉴2012) [STATISTICAL YEARBOOK OF 2012 FOR GULOU DISTRICT] (Gulou Dist. Gov't (鼓楼区政府) eds., 2012). Qiu Lufeng (邱鹭风) & Yao Qiming (姚启明), Yihuan Jiufen Renmin Tiaojie Anli Jiexi (医患纠纷人民调解案例解析) [Analyses of Cases concerning Medical Dispute People's Mediation] (2012).

B2 (some parts of P's harm were caused by other factors)	134	54.25%
C (unrealized risks with potential for future harms)	0	0
Other cases not involving uncertainty over factual causation	94	38.06%

Category A concerns cases with uncertain causes of past harm where it is difficult to prove which causal factor is the factual cause of the harm. Category B relates to indeterminate parts of harm where factual causation is already established. Category C involves unrealized risks with potential for future harms.

This paper is confined to medical malpractice liability, which normally does not cover Sub-categories A2, A3 and Category C. Sub-categories A2 and A3 are concerned with iatrogenic injuries that may be attributable to defective pharmaceuticals rather than faulty treatment. In China, unrealized risks that may realize in the future are not compensable at the time of trial. If the risks actually realize some time after the decision, the plaintiff may file a separate lawsuit.[66] Hence, these (Sub-)categories are excluded from the analysis of this paper.

Not all of the 247 cases involve evidential uncertainty over causation in fact. In 38.06% (n=94) of the cases, the court simply stated that there were no injuries but for the medical negligence without giving any explanation. More often than not, this occurred in cases where a direct infringement was involved. Therefore, the causal connection between the faulty treatment and the injury is relatively strong. However, absence of causal uncertainty in fact does not necessarily mean that there is no dispute over causation in law. Actually, 36.17% (n=34) of the foregoing 94 cases are associated with multiple causal factors. As a result, there is an overlap (n=34) between these 94 cases and Category B (n=138).

Sub-categories A4[67] and A5[68] represent the most frequently encountered and controversial situations pertaining to causation in fact. Sub-category A4 and Sub-category A5 deal with the same class of cases where the probability of the factual causation is lower than the required standard of proof. Suppose the probability that D's mistreatment caused P's death was 20% or P's chance of avoiding

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[66] Guanyu Shenli Renshen Sunhai Peichang Anjian Shiyong Falü Ruogan Wenti de Jieshi (关于审理人身损害赔偿案件适用法律若干问题的解释) [Interpretation of Some Issues concerning the Application of Law for the Trial of Cases on Compensation for Personal Injury] (promulgated by the Sup. People's Ct., Dec. 4, 2003, effective May 1, 2004) art. 19 (Chinalawinfo).

[67] Gilead et al., *supra* note 62, at 14 ("P is born with severe brain damage. It is uncertain whether the damage was an inevitable outcome of her premature birth or caused due to the negligent treatment by Dr D, the obstetrician. It is established that the probability that D's mistreatment caused the damage is 20 % (or 90 %).").

[68] *Id*. ("Dr D negligently fails to diagnose P's cancer. As P's symptoms worsen, she consults another doctor who diagnoses her cancer, but because of its advanced stage, treatment is unsuccessful, and she dies. If Dr D had diagnosed the cancer when initially consulted, P would have had a 20 % (or 90 %) chance of successful life-saving treatment, which she lost.")

death by successful life-saving treatment was 20%. Sub-category A4 circumvents the traditional "all or nothing" approach by applying a proportional approach, under which the final damages are calculated by multiplying the total losses and the causal probability (20%). By contrast, Sub-category A5 adheres to the traditional standard of proof. Instead of adopting the probabilistic causation concept, Sub-category A5 treats the lost chance itself as a "standalone harm," although the value of the lost chance is also based on the product of the total losses and the lost chance (20%). Therefore, "lost chance" (A5) can be regarded as a special form of the "hard case" (A4).[69] While Austria,[70] the Netherlands,[71] England and Wales[72] and the draft PETL[73] favor the A4 approach, many other countries such as the USA[74] and

[69] *Id.*, at 39.

[70] *See* Bernhard A. Koch, *Causal Uncertainty and Proportional Liability in Austria*, *in* PROPORTIONAL LIABILITY: ANALYTICAL AND COMPARATIVE PERSPECTIVES 77, 77-97 (Israel Gilead et al. eds., 2013) (stating that Austrian courts prefer proportional liability to the "loss of a chance" theory while assuming that both the patient's pre-existing condition and the physician's faulty treatment are equally likely to cause the patient's final injury.).

[71] HR 31 maart 2006, RvdW 2006, 328 (Karamus/Nefalit) (Neth.) (where *Hoge Raad* rejected an all-or-nothing approach and embraced the proportional liability in cases where it is not possible to prove which of the various possible causative factors (tortious or non-tortious) caused the final damage.). *See* Oliphant, *supra* note 29; Michael G. Faure & Ton Hartlief, *The Netherlands*, *in* EUROPEAN TORT LAW 2006 (TORT AND INSURANCE LAW Y.B.) 338-60 (Helmut Koziol & Barbara C. Steininger ed., 2008). HR 24 december 2010, RvdW 2011, 35 (Fortis/Bourgonje) (Neth.); *see also* HR 14 december 2010, RcdW 2013, 37 (Nationale Nederlanden/Mother and son) (Neth.) (reaffirming and expanding this proportional liability approach). *See* Anne L.M. Keirse, *Going Dutch: How to Address Cases of Causal Uncertainty*, *in* PROPORTIONAL LIABILITY: ANALYTICAL AND COMPARATIVE PERSPECTIVES 227, 227-47 (Israel Gilead et al. eds., 2013).

[72] Barker v. Corus (UK) plc [2006] UKHL 20, [2006] 2 A.C. 572 (appeal taken from Eng.) (developed from Fairchild v. Glenhaven Funeral Services, [2002] UKHL 22, [2003] 1 A.C. 32 (appeal taken from Eng.) (a leading case in England and Wales where the House of Lords adopted a proportional-liability approach to causal uncertainty cases where either indeterminate defendants or risks in the victim's sphere are involved in 2006.). *See* Oliphant, *id*. (stating that this proportional-liability approach is only applicable when two requirements are satisfied: first, difficulty in the proof of causation must be caused by scientific uncertainty; second, the multiple risks must involve the same or at least a similar causative agency. It should be noted that the second "similarity" criterion has so far prevented the application of the Fairchild-Barker rule to clinical negligence cases.) *See* STAUCH, *supra* note 24, at 79-83 (in Gregg v. Scott, [2005] UKHL 2, (appeal taken from Eng.), the House of Lords rejected claims for "loss of chance" in clinical negligence cases in order to avoid "so radical a change in our law as to amount to a legislative act … would have enormous consequences for insurance companies and the National Health Service."). *See* MARK LUNNEY & KEN OLIPHANT, TORT LAW: TEXT AND MATERIALS 207-44 (5th ed. 2013) (a detailed discussion on causal uncertainty in English law).

[73] PETL art. 3:106, *supra* note 64 (Uncertain Causes Within the Victim's Sphere) ("The victim has to bear his loss to the extent corresponding to the likelihood that it may have been caused by an activity, occurrence or other circumstance within his own sphere.").

[74] *See* Michael D. Green, *Causal Uncertainty and Proportional Liability in the US*, *in* PROPORTIONAL LIABILITY: ANALYTICAL AND COMPARATIVE PERSPECTIVES (TORT AND INSURANCE LAW, VOL. 33) 343, 343-69 (Israel Gilead et al. eds., 2013) (stating that US courts basically retain an all-or-nothing approach to factual causation and damages instead of employing proportional liability. Nevertheless, in medical malpractice cases involving causal uncertainty, US courts normally apply the lost chance doctrine.). RESTATEMENT (THIRD) OF TORTS: PHYS. & EMOT. HARM § 26 (2010) (pointing out three requirements need to be satisfied before applying the lost chance doctrine to medical malpractice cases: "(1) a contractual relationship exists between patient and physician (or physician's employer), in which the

France[75] prefers the A5 approach, although the results are more or less the same.

Sub-category B2[76] covers the most frequently seen scenarios in relation to causation in law, where part of the victim's overall harm is caused by the victim's own fault (e.g. a patient's failure to follow her doctor's advice) or by a non-tortious factor (e.g. a patient's pre-existing or underlying conditions or therapeutic risks). The first scenario is concerned with the legal defense of "contributory negligence" in the common law or "contributory fault" (including both negligent and intentional conduct) in the continental legal systems, which is widely recognized.[77] The second scenario differs from the first one in that although a non-tortious factor is within the victim's own sphere, it normally cannot be regarded as the victim's own fault in a strictly legal sense. This scenario is much more controversial than

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raison d'être of the contract is that the physician will take every reasonable measure to obtain an optimal outcome for the patient; (2) reasonably good empirical evidence is often available about the general statistical probability of the lost opportunity; and (3) frequently the consequences of the physician's negligence will deprive the patient of a less-than-50-percent chance for recovery.").

[75] In France, loss of a chance (*perte d'une chance*) is a widely applied doctrine, which is a convenient way of bypassing the strict standard of proof. Since no definition is given by the French Civil Code, it is no problem to regard loss of a chance as a head of damage. Thus, the *Cour de cassation* even allows the possibility of compensation in cases where the likelihood of factual causation may be as low as 10%. The result comes very close to proportional liability. *See* Olivier Moréteau, *Causal Uncertainty and Proportional Liability in France*, *in* PROPORTIONAL LIABILITY: ANALYTICAL AND COMPARATIVE PERSPECTIVES (TORT AND INSURANCE LAW, VOL. 33) 141, 141-52 (Israel Gilead et al. eds., 2013). *See also* Ye, *supra* note 53.

[76] Gilead et al., *supra* note 62, at 16 ("Medical failure of Dr D to diagnose a cancer in his patient P results in an increased size of the tumor and therefore in greater harm, but the extent of this increase in size (and consequent magnitude of harm) due to D's fault cannot be identified and established by P.") (consisting of two scenarios: (1) P's own fault contributed to part of his injury; or (2) although P was not contributorily at fault, his own pre-existing or underlying conditions contributed to part of his injury.).

[77] *See* Gary T. Schwartz, *Contributory and Comparative Negligence: A Reappraisal*, 87(4) YALE L. J. 697 (1978) (stating that traditionally in the common law, "contributory negligence" was absolute in that the victim's own wrongfulness would exonerate the defendant from liability completely). Law Reform (Contributory Negligence) Act, 1945, 8 & 9 Geo. 6, c. 28, § 1, ch. 1 (Eng.) (amending that this absolute "contributory negligence" and the defendant's compensatory liability shall be mitigated "to such extent as the court thinks just and equitable having regard to the claimant's share in the responsibility for the damage."). The absolute "contributory negligence" defense has been superseded by comparative negligence in most states in the US as well. *See* Schwartz, *supra* note 77 (stating that under the comparative negligence rule, a plaintiff's own negligence shall proportionally reduce the damages recoverable from the defendant.). BLACK'S LAW DICTIONARY 1134 (9th ed. 2009). *See* WALTER GERVEN ET AL., TORT LAW: CASEBOOKS FOR THE COMMON LAW OF EUROPE (IUS COMMUNE CASEBOOKS FOR THE COMMON LAW OF EUROPE) 689-95 (2000) (explaining that in continental Europe, the victim whose own fault contributed to his damage cannot claim compensation for all his damage while in France, the *faute de la victim* rule is not provided by the *Code civil* but was developed by the case law of the *Cour de cassation*.). CEES VAN DAM, EUROPEAN TORT LAW 375 (Oxford Univ. Press 2d ed. 2013). BRGERLICHES GESETZBUCH [BGB] [CIVIL CODE], Aug. 18, 1896, § 254 (Ger.) (providing that in Germany, the *Mitverschulden* rule – the part of harm attributable to the faulty victim's own conduct shall be deducted from the scope of the defendant's compensatory liability.). BURGERLIJK WETBOEK [CIVIL CODE] art. 6:102, § 2 (Neth.) (providing that the defendant shall not be held liable for "circumstances attributable to the injured person himself."). *See also* DCFR art. 5:102(1), *supra* note 63. PETL art. 8:101,*supra* note 63.

the first one, and different legal systems approach this issue rather differently. Germany is somehow fairly conservative and denies the possibility of mitigating the defendant's liability in the event that part of the victim's harm was due to a non-tortious risk within his own sphere.[78] By contrast, the US[79] and many other European legal systems such as Austria,[80] the Netherlands,[81] France[82] and the draft PETL[83] have evolved to adopt a rule of proportional apportionment of damages between the faulty defendant and the plaintiff-patient whose pre-existing or underlying condition contributed to part of his harm.[84]

Actually, the second scenario of Sub-category B2 is often mixed with Sub-categories A4 and A5. The probability that a tort causes harm or a lost chance (often lower than 50%) suffices to establish factual causation in case of causal uncertainty; the same probability or chance then becomes the basis for determining causation in law – proportional apportionment of damages between the tort and non-tortious factors. Hence, causal uncertainty usually entails the combined determination of factual causation and legal causation together in medical malpractice cases.

Sub-category A1 and Sub-category B1 rarely occur in practice. However, their infrequency does not necessarily mean that they are unimportant. Legal solutions should be prepared for all potential categories of cases. Hence, these two sub-categories will not be excluded from the analysis. Sub-category A1 (alternative causation) occurs in the situation where it is certain that the harm must be caused

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[78] Ulrich Magnus, *Causal Uncertainty and Proportional Liability in Germany*, in PROPORTIONAL LIABILITY: ANALYTICAL AND COMPARATIVE PERSPECTIVES (TORT AND INSURANCE LAW VOLUME 33) 153, 153-69 (Israel Gilead et al. eds., 2013).

[79] RESTATEMENT (THIRD) OF TORTS: PHYS. & EMOT. HARM § 28 (2010) ("… [C]ausal apportionment of a plaintiff's harm may be required when a plaintiff had a preexisting symptomatic condition and the extent of enhanced injury is uncertain. Thus, a defendant whose tortious conduct aggravates a plaintiff's preexisting back problem and causes greater pain is liable only for the harm caused by the aggravation and not for any harm due to the original condition.").

[80] *See* Koch, *supra* note 70. The apportionment of damages applies if the likelihood risk within the victim's own sphere is comparable to torts.

[81] The *Hoge Raad* ruled that the employer's compensatory liability was reduced to the extent to which circumstances that can be attributed to the employee who has also contributed to his damage. *See* HR 31 maart 2006, RvdW 2006, 328 (Karamus/Nefalit) (Neth.). It seems that this decision is based on BURGERLIJK WETBOEK [CIVIL CODE] art. 6:102, § 2 (Neth.). *See* Oliphant, *supra* note 29. Faure & Hartlief, *supra* note 71. Keirse, *supra* note 71.

[82] *See* Moréteau, *supra* note 75. *See also* Ye, *supra* note 53 (stating that French courts apply the lost chance doctrine to cases where, to an unknown extent, the loss is in the victim's sphere (a pre-existing condition or a "natural" cause). The result of applying the lost chance doctrine is similar to that of a proportional liability approach.).

[83] PETL art. 3:106, *supra* note 63.

[84] *See* Gilead et al., *supra* note 62, at 49-50; Oliphant, *supra* note 10; *see also* Thomas Kadner Graziano, Loss of Chance in European Private Law: "All or Nothing" or Partial Liability in Cases of Uncertain Causation, 6 EUR. REV. PRIV. L. 1009 (2008) (noting that in England and Wales, the proportional apportionment rule does not apply to clinical negligence.).

by at least one (but not all) of many defendants, but it is virtually impossible to prove which one (or ones) is the real tortfeasor. The well-known "hunters case"[85] falls within this category. It is certain that one bullet of one hunter must have struck the victim, but it is difficult to prove which hunter is the actual tortfeasor. The difficulty lies more in producing sufficient evidence than in causation itself.[86] Under Sub-category B1,[87] it is already established in light of the standard of proof that all the parts of the injury were caused by all defendants, but none of them has caused all of the injury alone.

IV. ACTUAL SOLUTIONS AND LEGAL JUSTIFICATIONS

A. Category A Cases

1. Sub-category A1

Sub-category A1 involves alternative causation where which potential tortfeasor actually caused the injury is indeterminate. The new Chinese TLL provides a clear answer to this issue. Art. 10 TLL reads as follows:

> Where two or more persons engage in a conduct that endangers the personal or property safety of another person, if only the conduct of one or several of them causes harm to another person and the specific tortfeasor can be determined, the tortfeasor shall be liable; or if the specific tortfeasor cannot be determined, all of them shall be liable jointly and severally.

Oliphant maintained that the second clause of art. 10 TLL "establishes a liability in the case of uncertain causation involving alternative defendants" in China.[88] He continued to argue that this approach appears to be modeled on § 830(1) BGB[89] and looks similar to its counterpart in many other civil codes such as Article 6:99 of the

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[85] Gilead et al., *supra* note 62, at 12 ("Three hunters are independently hunting in a forest at the same time and each negligently and simultaneously fires at what she thinks is the prey. P is struck by one bullet and sues all three hunters but the evidence does not permit ascertaining which hunter fired the bullet that struck P.").

[86] WANG ZEJIAN (王泽鉴), QINQUAN XINGWEI (侵权行为) [TORTS] 189 (2009).

[87] Gilead et al., *supra* note 62, at 15 ("In the course of several months, P is involved in two separate automobile accidents, in each of which she suffers injury to the same part of her body. As a result of both accidents, P has suffered a permanent disability, but the extent of injury caused by the negligence of each of the two defendants (Ds) cannot be determined, even though it can be excluded that one of the accidents would have caused P's disability alone.").

[88] Oliphant, *supra* note 29.

[89] BRGERLICHES GESETZBUCH [BGB] [CIVIL CODE], Aug. 18, 1896, § 830(1) (Ger.) ("If more than one person has caused damage by a jointly committed tort, then each of them is responsible for the damage. The same applies if it cannot be established which of several persons involved caused the damage by his act.").

Dutch Civil Code,[90] and Art. VI.-4:103 of the DCFR.[91] The only difference is whether one of the defendants can escape liability by proving that his conduct was not the cause of the harm. According to the first clause of art. 10 TLL, one or more of the defendants can gain exoneration if and only if the true tortfeasor is determined.

This strict restriction on defendants' right to defense is claimed to be justified on the grounds of victim protection. Relative to the victim, potential injurers are assumed to be much easier to prove who is the actual tortfeasor. If defendants could obtain exoneration by proving his own innocence, it would be easier for all defendants to escape liability, leaving the victim uncompensated.[92]

Although art. 10 TLL may apply to general tort cases such as the "hunters case," its chances of being applied to medical malpractice cases are relatively low in practice. In China, all doctors are employed by medical institutions such as hospitals and clinics. Individual or freelance medical practice outside medical institutions is illegal. In malpractice lawsuits, medical institutions are the sole defendant.[93] When different physicians and nurses of the same medical institution err in performing the same procedure, only their employer-hospital will be sued. It will be unnecessary for the plaintiff to point out the actual individual wrongdoer.

Nevertheless, there is still one exceptional scenario where art. 10 TLL may apply, though no actual court decisions have been found yet. Upon approval of the medical institution where he works, however, a doctor may "go out for consultation (外出会诊)," i.e. to perform diagnosis and treatment within his practicing scope at another medical institution. In case an iatrogenic injury is caused by negligence on the part of the "visiting" doctor, it is the inviting medical institution that will be the sole defendant.[94] But if the doctor provides service at the inviting hospital without the permission of his employer-hospital, his practice is illegal and he may be held liable for his negligence based on art. 6 para. 1 TLL. Suppose it is uncertain whether the illegally

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[90] BURGERLIJK WETBOEK [CIVIL CODE] art. 6:99 (Neth.) ("Where the damage is caused by two or more events, for each of which another person is liable, and it is ascertained that the damage originates from at least one of these events, then each of these liable persons is joint and several liable for that damage, unless a liable person proves that this specific damage is not caused by the event for which he himself is liable.").

[91] DCFR art. VI.-4:103, *supra* note 63 ("Where legally relevant damage may have been caused by any one or more of a number of occurrences for which different persons are accountable and it is established that the damage was caused by one of these occurrences but not which one, each person who is accountable for any of the occurrences is rebuttably presumed to have caused that damage.").

[92] WANG SHENGMING (王胜明), ZHONGHUA RENMI GONGHEGUO QINQUAN ZEREN FA SHIYI (侵权责任法释义) [COMMENTARIES ON THE TORTIOUS LIABILITY LAW] 74 (2013).

[93] Qinquan Zeren Fa (侵权责任法) [Tort Liability Law] (promulgated by the Standing Comm. Nat'l People's Cong., Dec. 26, 2009, effective Jul. 1, 2010) art. 54 (Chinalawinfo).

[94] Yishi Waichu Huizhen Guanli Zanxing Guiding (医师外出会诊管理暂行规定) [Interim Provisions for the Administration of Doctors' Going Out for Consultation] (promulgated by the Ministry of Health, Dec. 16, 2004, effective Jul. 1, 2005) art. 2, art. 14 (Chinalawinfo).

practicing doctor or a nurse of the inviting hospital negligently dropped a piece of gauze inside the patient's chest during the same surgery. Then it is possible to hold the doctor and the inviting hospital liable *in solidum* in light of art. 10 TLL.

2. Sub-categories A4 and A5

Sub-categories A4 and A5 are essentially concerned with the same group of hard cases. They are difficult to handle because it is often impossible for the plaintiff to satisfy the traditional standard of proof in order for causation in fact to be established. They are hard cases also in the sense that no statute or judicial interpretation in China has ever provided a solution to these cases. Hence, it is necessary to find out their solutions in judicial practice empirically. Two main findings pertaining to uncertainty over factual causation based on the analysis of 246 medical malpractice cases from the Gulou District People's Court are summarized as follows:

> *The court was most likely to apply a "proportional liability" to many cases where there was causal uncertainty.* In almost 38% (n=95) of the 246 cases, the court identified that there was a certain degree of causality (even with a probability of less than 50%) between the negligence and the damage, such causality could not be excluded or there was indirect causality. The degree of causality would then be transferred into the degree of liability, against which the final awards are measured.

> *Confronted by causal uncertainty, the court also switched the causal link to other kinds of injuries in some cases.* If there were no tangible personal injuries, the court might establish that there were a causal connection between the negligence and the loss of expectations or chances of being cured, survival or longer life (3.6%; n=9), pure emotional distress (8%; n=21) or pure medical costs (2%; n=4).

Empirical evidence from the Gulou District People's Court demonstrates that the "high probability" standard of proof in China is almost totally circumvented by the court in malpractice lawsuits. On the one hand, it is found the court frequently adopts a "proportional liability" to many malpractice cases where there was causal uncertainty. In the court's opinion, a certain degree of causal link P* between medical malpractice and harm done – even when the P* is as low as 10% – suffices to establish causation. Then the court would normally calculate pecuniary damages based on the product of the P* and the amount of pecuniary losses suffered by plaintiff-patients.

On the other hand, in some cases of misdiagnosis or breach of the duty of information disclosure, if the P* is relatively low, the court

might also switch the causal link between malpractice and physical harm to the causal connection between malpractice and the loss of chances of recovery, survival or longer life, or the infliction of pure emotional distress.

There is other evidence showing that this relaxation, or more appropriately, "abandonment" of the "high probability" standard of proof in medical malpractice cases is not unique to the Gulou Court, but rather becomes a common practice nationwide.[95] In an interview, one judge explains the rationale behind this deviation as follows[96]:

> Sometimes, expert testimony on causation is highly ambiguous, using wording such as "there is a certain degree of causation" or "the possibility of the causal link cannot be excluded." We, as judges, often feel confused by this wording and then we decide to use our discretion to interpret the testimony. If the defendant grossly breaches the duty of medical care and this breach of duty may *sufficiently* lead to iatrogenic injuries, we will find that the causation is established. The word "*sufficiently*" implies a standard of proof relatively lower than the "high probability" standard. Otherwise it would be unfair on plaintiff-patients and their right to life and health could not be protected well [italics added].

It thus seems that the deviation is caused by both the ambiguity of expert testimony and by judges' natural partiality to the weaker party – patients.

Perhaps the most striking aspect of the Chinese approach to Sub-categories A4 and A5 is that Chinese courts are so flexible that they may apply either proportional liability or the lost chance doctrine to medical cases involving causal uncertainty at their discretion. By reading cases from the Gulou Court, two patterns can be detected. First, the court would apply proportional liability mostly likely to (direct infringement) cases where errors in treatment procedures are involved and expert witnesses provide a statistical causal probability or merely testify that the "causation cannot be eliminated (不排除因果关系)." Second, the court would apply the lost chance doctrine mostly likely to (indirect infringement) cases where misdiagnoses or failure to disclose critical medical information is concerned and expert witnesses normally disprove the existence of factual causation. In either of the foregoing two patterns, the plaintiff would be compensated for at least a small proportion of her full harm.

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[95] *See generally* Liu Xin (刘鑫), *Yiliao Suanhai Jishu Jianding Yanjiu* (医疗损害技术鉴定研究) [*On Medical Injury Technical Authentication*] (2014).

[96] Interview with Ms. A (anonymous), Assistant Judge, Nanjing Intermediate People's Court, Jiangsu Province, China (Jul. 17, 2014).

Three factors may help explain why the court chooses a two-pattern approach to medical malpractice cases. First, expert witnesses themselves systematically employ the proportional approach to factual and legal causation together. [97] The defendant's compensatory liability should be proportional to the "causal potency (原因力)" of the faulty treatment to the occurrence of the patient's final injury, which is ultimately based on the probability of the factual causation. [98] Therefore, if expert witnesses already provided the court with a statistical causal probability (although it might be lower than 50%), it would become very convenient for the court to apply proportional liability in light of equity and victim protection. [99] Second, in cases where expert witnesses disproved any causal connection, the court would find it difficult to estimate the statistical probability. [100] If the physical injury or death did occur, the court would roughly establish causation between malpractice and lost chances of survival or living a longer life. [101] If the risk did not materialize, the court would grant some compensation for non-pecuniary losses to the plaintiff. [102] Third, both proportional liability and the lost chance doctrine are theoretically compatible with the TLL. On the one hand, the TLL's silence on the definition of causation leaves it open to a broader and more flexible interpretation. Neither the traditional all-or-nothing approach nor proportional liability is evidently excluded by the TLL. On the other hand, art. 2 TLL defines the scope of protection so broadly as "civil rights and interests," which does not seem to exclude

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[97] In practice, expert witnesses usually make a rough estimate of the causal probability based on several levels: 100% (full liability 全部责任), 75% (primary liability 主要责任), 50% (equal liability 同等责任), 25% (secondary liability 次要责任), 10% (minor liability 轻微责任) and 0% (no liability 无责任). The factual and legal causation are not clearly distinguished and actually determined together. *Id.*, at 243-45.

[98] Interview with Jiang Tao (江涛), Office Dir., Office for Medical Authentication, Nanjing Medical Association, Jiangsu Province, China (Jul. 22, 2014).

[99] Interview with Li Zimu (李子木), Div. Chief Judge, Nanjing Gulou People's Court, Jiangsu Province, China (Jul. 14, 2014).

[100] *Id.*

[101] *See* Shan Yeping Su Nanjing Shi Di San Yiyuan (单业平诉南京市第三医院) [Shan Yeping v. Nanjing Third Hosp.], (on file with author) (Gulou Ct. Mar. 11, 2003) (China). Feng Zenglin & Xue Huanlan Su Nanjing Shi Gulou Yiyuan (冯增林、薛怀兰诉南京市鼓楼医院) [Feng Zenglin & Xue Huailan v. Nanjing Drum Tower Hosp.], (on file with author) (Gulou Ct. Dec. 14, 2006) (China); Zeng Guoying deng Su Nanjing Shi Gulou Yiyuan (曾国英等诉南京市鼓楼医院) [Zeng Guoying et al. v. Nanjing Drum Tower Hosp.], (on file with author) (Gulou Ct. Dec. 15, 2006) (China). Wang Wenqing deng Su Jiangsu Sheng Renmin Yiyuan (王文清诉江苏省人民医院) [Wang Wenqing et al. v. Jiangsu Province Hosp.], (on file with author) (Gulou Ct. Mar. 11, 2011) (China). Qi Jianzhong & Qi Enxuan Su Jiangsu Sheng Kouqiang Yiyuan (戚建中、戚恩瑄诉江苏省口腔医院) [Qi Jianzhong & Qi Enxuan v. Stomatological Hosp. Jiangsu Province], (on file with author) (Gulou Ct. Aug. 18, 2011) (China).

[102] *See* Yan Min Su Nanjing Shi Gulou Yiyuan (严敏诉南京市鼓楼医院) [Yan Min v. Nanjing Drum Tower Hosp.], (on file with author) (Gulou Ct. Jan. 20, 2003) (China). Zhu Yongkai v. Nanjing Shi Ertong Yiyuan & Nanjing Shi Hong izi Xueye Zhongxin (朱永凯诉南京市儿童医院、南京市红十字血液中心) [Zhu Yongkai v. Nanjing Children's Hosp. & Nanjing Red Cross Blood Ctr.], (on file with author) (Gulou Ct. Mar. 26, 2008) (China).

chances of survival and living a longer life as well.[103] Hence, lost chances of survival or living a longer life may well fall into the category of compensable damage.

B. Category B Cases

1. Sub-category B1

Sub-category B1 should be distinguished from cases involving multiple sufficient causes, where it has already been proven, without causal uncertainty, that each single defendant's conduct could lead to *all* of the injury alone, but the "but for" test fails to establish factual causation.[104] Under Sub-category B1, no single defendant's conduct could cause full harm independently. The right question B1 asks is how to apportion damages between multiple joint tortfeasors.

Regarding this question, Art. 12 TLL provides the clear answer: damages shall be apportioned according to each defendant's "seriousness of liability (责任大小);" when it is hard to determine the seriousness of liability, damages shall be evenly divided. According to the currently dominant scholarly opinion, the seriousness of liability is determined on the basis of both the degree of fault and causative potency. Causative potency is defined as the contribution of each cause to the occurrence or expansion of an injury. The seriousness of liability is primarily determined by comparing the degree of fault of each tortfeasor if they vary considerably in culpability. If it is difficult to compare the degree of fault or in cases where strict liability applies, the seriousness of liability will be mainly based on the comparison of the causative potency of each cause.[105]

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[103] Li, *supra* note 99.

[104] Here is an illustration: After being accidently wounded, P went to Hospital D_1 and Hospital D_2 successively. After treatment, P was infected with hepatitis C. It is already proven that both D_1 and D_2 provided substandard blood that had been infected with the virus of hepatitis C. *See e.g.* Hu Yongqiang Su Jingjiang Shi Renmin Yiyuan & Zhongguo Renmin Jiefang Jun Di 101 Yiyuan (胡永强诉靖江市人民医院、中国人民解放军第一〇一医院) [Hu Yongqiang v. Jingjiang County People's Hosp. & Chinese P LA No. 101 Hosp.] (Jingjiang Ct. 2014) (China) (Chinalawinfo). If the "but for" test applied, each of the two defendants could argue that all P's harm could nonetheless have occurred even without its faulty treatment. Then, neither D1's conduct nor D2's conduct would be established as the cause of P's harm. It is argued to be extremely unfair if each of the Ds would escape liability just because there were other potential tortfeasors, especially when P were not contributorily negligent. Hence, TLL art.11 provides that all defendants shall be held liable *in solidum*.

[105] Yang Lixin (杨立新) & Liang Qing (梁清), *Yuanyinli de Yinguo Guanxi Lilun Jichu Jiqi Juti Yingyong* (原因力的因果关系理论基础及其具体应用) [*Theoretical Bases for and Application of the Causation Theory of Causative Potency*], 6 FAXUE JIA (法学家) [THE JURIST] 101 (2006); Yang Lixin (杨立新) & Liang Qing (梁清), *Keguan yu Zhuguan de Bianzou: Yuanyinli yu Guocuo* (客观与主观的变奏:原因力与过错) [*The Interaction between Objectivity and Subjectivity: Causative Potency and Fault*], 2 HENAN SHENG ZHENGFA GUANLI GANBU XUEYUAN XUEBAO (河南省政法管理干部学院学报) [JOURNAL OF HENAN ADMININSTRATIVE INSTITUTION POLITICS & LAW] 8 (2009). Wang, *supra* note 86.

2. Sub-category B2

Under the first scenario of Sub-category B2, the plaintiff-patient's own fault also contributed to part of her harm. Art. 26 TLL provides that damages that the defendant has to pay *may* be mitigated if the victim is "also at fault as to the occurrence of harm," and art. 27 TLL gives total exoneration to the defendant if the harm is "caused intentionally by the victim." The mitigation of damages is also argued to be determined by comparing both the degree of fault and causative potency.[106]

Compared to the foregoing scenario, the second scenario of Sub-category B2, where a non-tortious risk within the patient's own sphere (a pre-existing or underlying condition) is involved, is more complicated and controversial. The new TLL does not provide for any clear rules concerning how to deal with such non-tortious factors.

It ought to be pointed out, however, that the legal basis for handling non-tortious factors in medical malpractice cases once existed. For the period 2002-2010, art. 49 para. 1 RHMA provided such a basis, which reads as follows:

The following elements shall be taken into consideration in the determination of the specific sum of compensation for a medical accident:

> (1) The grade of the medical accident;

> (2) The degree of liability (责任程度) of the negligent medical act in the consequences of the injury caused by the medical accident;

> (3) The relationship between the injury caused by the medical accident and the state of the original illness.

Sub-para. (2) and sub-para. (3) together provide a basis for apportioning damages between the negligent health care provider and the patient whose pre-existing or underlying medical condition also contributes to the occurrence or expansion of the final injury. It is also evident that the patient's pre-existing or underlying condition cannot be regarded as contributory negligence on the part of the patient. Hence, the relationship between the negligent treatment and the underlying condition can only be understood by comparing the influence of the two causative factors. In practice, the degree of liability is first determined by expert witnesses, and ultimately reviewed and confirmed by the court.

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[106] *Id.*

The RHMA's approach to non-tortious factors was argued to be applicable to other tort cases by analogy.[107] In practice, before 2014, this approach was *de facto* widely adopted in the trial of traffic accident cases. The publication of Guiding Case No. 24[108] by the Supreme People's Court, however, marked a turning point in the application of art. 49 para. 1 RHMA to other tort cases by analogy. In *Rong v. Wang & Yongcheng Insurance Company*, the appellate court clarified that the *ratio decidendi* is that "if the victim of a traffic accident was not at fault, the influence of his vulnerabilities or predispositions on his final harm does not fall within any ground of justification that can mitigate the tortfeasor's compensatory liability." Accordingly, the appellate court held the defendant fully liable for all harm suffered by the victim. This is similar to the eggshell skull rule ("a tortfeasor takes his victim as he finds him") in the common law.[109] The Guiding Cases are highly authoritative, because the selected cases' selection and publication clearly indicates that the Supreme People's Court shares the same opinion as the appellate court. As a matter of fact, many local courts tend to refuse to adopt the RHMA's approach in traffic accident cases.[110] Therefore, the RHMA's approach is no longer applicable to traffic accident cases.

Theoretically, Chapter 7 TLL has replaced the RHMA as far as medical malpractice liability is concerned. Since the TLL does not provide for any provision that is equivalent to art. 49 RHMA, it is fairly questionable whether it is still justifiable to continue to apply art. 49 RHMA to medical malpractice cases. For the time being, there is evidence showing that some local courts have been attempting to apply Guiding Case No. 24 to medical malpractice cases by analogy.[111] However, in medical malpractice cases, this new

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[107] Zhang Xinbao (张新宝) & Ming Jun (明俊), *Qinquanfa Shang de Yuanyinli Lilun Yanjiu* (侵权法上的原因力理论研究) [*Causative Potency Theory in Tort Law*], 2 ZHONGGUO FAXUE (中国法学) [CHINA LEGAL SCIENCE] 92 (2005).

[108] Rong Baoying Su Wang Yang, Yongcheng Caichan Baoxian Gufen Youxian Gongsi Jiangyin Zhigongsi (荣宝英诉王阳、永诚财产保险股份有限公司江阴支公司) [Rong Baoying v. Wang Yang & Yongcheng Property Ins. Ltd., Jiangyin Branch] (Wuxi Binhu Dist. People's Ct. Feb. 8, 2013) (Chinalawinfo).

[109] The defendant has to be responsible for all of the adverse outcomes of the victim's own vulnerabilities or predispositions such as an eggshell skull or a weak heart. *See* VAN DAM, *supra* note 77, at 344.

[110] *See e.g.,* Yin Baohai, Li Lanxiu Su Xue Jiaxin, Zhongguo Renmin Caichan Baoxian Gufen Youxian Gongsi Zhijiang Zhigongsi (尹保海、李兰修诉薛家新、中国人民财产保险股份有限公司枝江支公司) [Yin Baohai & Li Lanxiu v. Xue Jiaxin & PICC P&C Ltd., Zhijiang Branch] (Hebei Sheng Zhijiang People's Ct. Nov. 17, 2013). Sun Qinghao Deng Su Ansheng Tianping Caichan Baoxian Gufen Youxian Gongsi Jinan Zhongxin Zhigongsi (孙钦浩等诉安盛天平财产保险股份有限公司济南中心支公司) [Sun Qinghao et al. v. Ansheng Tianping Property Ins. Ltd, Jinan Cent. Branch] (Jinan Interm. People's Ct. Mar. 5, 2015) (Chinalawinfo).

[111] Zuigao Renmin Fayuan Zhidaoxing Anli Sifa Yingyong Niandu Baogao 2015 (最高人民法院指导性案例司法应用年度报告2015) [Annual Report on the Judicial Application of Guiding Cases of the Supreme People's Court 2015], CHINALAWINFO (Dec. 22, 2015), http://www.chinalawinfo.com/Notices/NoticeFulltext.aspx?listType=2&NoticeId=1383 (reporting that of all the 105 cases that cited

approach remains the exception rather than the rule. In practice, the RHMA's approach still endures with respect tomedical malpractice litigation. Again, the TLL's silence on this issue also allows for a flexible interpretation of causation under the law, taking into account varying policy considerations.

In an interview, one judge explains why applying Guiding Case No. 24 to medical cases involving non-tortious factors is undesirable.[112] Unlike drivers and pedestrians who are strangers to each other before the accident, patients at large receive benefits from medical care under a contractual relationship with health care providers. Therefore, it may be an unfair burden on health care providers to make them pay for the portion of the injury that is caused by risks within the patient's own sphere.[113]

C. Summary: Proportional Liability Becoming Popular

All the foregoing solutions to medical malpractice cases involving causal uncertainty share the same characteristic – they are associated with "proportional liability" in one way or another. According to the ECTIL project, proportional liability is broadly defined as follows:

> Proportional liability is tort liability imposed on D for harm suffered by P, for part of it, or for harm that P may suffer, according to the causal probability that D's tortious conduct may have caused the harm or caused part of it or may cause harm in the future.[114]

The causal probability in Category A1 is lower than the required standard of proof. According to the traditional "all-or-nothing" approach, plaintiff-patients will obtain no compensation at all in cases of uncertainty over factual causation. The TLL apportions damages among all defendants by holding them liable *in solidum* in Sub-category A1 cases. In view of fairness and victim protection, the court circumvents the traditional standard of proof and grants damages in light of the causal probability or lost chances in Sub-categories A4 and A5 cases.

Under Category B, the causal probability normally exceeds the traditional standard of proof while which part of injury is attributable to the defendant's conduct is unknown. The TLL apportions damages among multiple joint tortfeasors by virtue of joint and several liability in Sub-category B1 cases. In cases where part of the patient's injury

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Guiding Case No. 24, the vast majority were traffic accident cases while only three were medical malpractice cases).

[112] Interview with Dai Qingkang (戴庆康), Assoc. Professor, Se. U. L. Sch. & Assistant to the President, Xuzhou Intermediate People's Court, Nanjing & Xuzhou, China (Jan. 3, 2015).

[113] *Id.*

[114] Gilead et al., *supra* note 62, at 2.

was due to her own negligence, the TLL also apportions damages between the defendant and the plaintiff. In consideration of fairness and the protection of public health undertaking, the court deducts from the scope of the defendant's compensatory liability cost related to the part of injury due to the risk taken within the patient's own sphere.

V. ECONOMIC JUSTIFICATIONS FOR PROPORTIONAL LIABILITY

A. The Law and Economics Approach to Tort Law

1. Why Law and Economics?

Before we delve into the details of the economic analysis of tort law, perhaps the first question needs to be answered is "why should we be bothered about law and economics." The simple answer is that besides "justice" and "fairness," efficiency is also integral to society. Efficiency is a legitimate goal that has been recognized and treasured in China throughout the post-Mao era (after 1978). The relationship between efficiency and fairness is not only an economic and political issue, but also one of social development. Since the adoption of the reform and opening-up policy in 1978, the Communist Party and the Government of China have undergone a continual process of exploration into understanding the relation between efficiency and fairness, from "treating efficiency and fairness equally" to "giving priority to efficiency over fairness" and then to "properly balancing the relation between efficiency and fairness both in primary distribution and redistribution, and giving more consideration to fairness in redistribution."[115]

The pursuit of efficiency should be reflected in legislation. Based on the fundamental assumption that people are *rational maximizers* of their ends in life, economics offers a powerful tool to conduct cost-benefit analysis which is aimed at enhancing efficiency.[116] In welfare economics, the basic notion of efficiency is *Pareto efficiency*, meaning a situation where "it is impossible to change it so as to make at least one person better off … without making another person worse off."[117] Dissatisfied with Pareto efficiency, contemporary economists relaxed the stringent requirement of Pareto efficiency and developed the notion of *Kaldor-Hicks efficiency* (or a *potential Pareto improvement*), which "allows changes in which there are both gainers and losers but requires that the gainers gain more than the losers

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[115] Li Hui (李辉) & Zhang Junwei (张军伟), *Gaige Kaifang Yilai XiaoLü yu Gongping Guanxi Tifa de Yanjin yu Sikao* (改革开放以来效率与公平关系提法的演进与思考) [*The Relation Between Efficiency and Fairness After China Launched Its Reform and Opening-Up Policy*], 4 CHUANCHENG (传承) [INHERITANCE & INNOVATION] 72 (2013).

[116] RICHARD A. POSNER, Economic Analysis of Law 4-5 (8th ed., Aspen Publishers 2010).

[117] ROBERT COOTER & THOMAS ULEN, LAW & ECONOMICS 14 (6th ed. 2011).

lose."[118] The legal system also assumes that individual actors are rational, which can be evidenced by many legal principles or standards such as "freedom of contract"[119] and the "reasonable person" standard.[120]Another essential assumption is that rational maximizers respond to *incentives* – "that if a person's surroundings change in such a way that he could increase his satisfaction by altering his behavior, he will do so."[121] Incentives are provided by prices in the market and by *sanctions* in the legal system. To economists, "sanctions look like prices, and presumably, people respond to these sanctions much as they respond to prices."[122] Specifically, tort sanctions can be viewed as "prices" that induce potential tortfeasors to take appropriate precautions in order to avoid being held liable for harm done. This deterrence function of tort law is also stressed by art. 1 TLL, which reads "this law has been formulated for the purposes of … preventing … tortious acts." Hence, the intersection of the basic assumptions of economics and law provides the strong case for using economic methods to analyze legal problems. Based on "mathematically precise theories (price theory and game theory)"[123] and "empirically sound methods (statistics and econometrics)," economics is perfectly fit for analyzing how people respond to "implicit prices" of legal sanctions.[124]

2. The Basic Model of Tort Liability

The classic accident models of tort law attempts to explain how to minimize Calabresi's primary accident costs.[125] Calabresi took it "as axiomatic that the principal function of accident law is to reduce the sum of the costs of accidents and the costs of avoiding accidents."[126] Later, Brown developed a unified economic model of liability which

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[118] *Id*. at 42.

[119] Freedom of contract is the doctrine "that people have the right to enter into binding private agreements with others … that people are able to fashion their relations by private agreements." BLACK'S LAW DICTIONARY (10th ed. 2014). Therefore, the underlying assumption of freedom of contract is that people are rational so that they are able to pursue their interests through contracts.

[120] A "reasonable man" is a "hypothetical person … who exercises the degree of attention, knowledge, intelligence, and judgment … The reasonable man acts sensibly, does things without serious delay, and takes proper but not excessive precaution." *Id*. It follows that a reasonable man in law is almost identical a rational man in economics.

[121] POSNER, *supra* note 116, at 5.

[122] COOTER & ULEN, *supra* note 117, at 3.

[123] Readers who have not been trained in economists or mathematics should not be intimidated by the application of mathematics to legal analyses. As we will see in the following sections, only a basic high school level mathematical knowledge is employed to demonstrate critical propositions. Higher and Further Mathematics such as Calculus is carefully avoided in this article.

[124] COOTER & ULEN, *supra* note 117, at 3.

[125] Michael Faure, *Economic Observations Concerning Optimal Prevention and Compensation of Damage Caused by Medical Malpractice, in* NO-FAULT COMPENSATION IN THE HEALTH CARE SECTOR 7-8 (Jos Dute et al. eds., 2004).

[126] GUIDO CALABRESI, THE COSTS OF ACCIDENTS: A LEGAL AND ECONOMIC ANALYSIS 24 (Yale Univ. Press 1970).

takes into account the care taking of the injurer and the victim simultaneously. [127] In contrast, Shavell made a clear distinction between unilateral accidents (where only the injurer can affect accident risk) and bilateral accidents (where both the injurer and the victim can contribute to the occurrence of an accident) and analyzes them separately.[128] Moreover, Shavell took into account two kinds of decisions that may affect accident risk – care levels and activity levels. Injurers and victims have to decide not only "the degree of care to exercise when engaging in an activity" (care levels) but also "whether, or how much, to engage in a particular activity" (activity levels).[129]

For the sake of simplicity, I will introduce the simplest model where the injurer and the victim did not know each other before the accident (accidents between strangers)[130] and only the injurer can affect the accident risk (unilateral accidents).[131] Also, it is further assumed that parties are risk neutral,[132] that there is a lack of

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[127] John Prather Brown, *Toward an Economic Theory of Liability*, 2 J. LEGAL STUD. 323 (1973).

[128] Steven Shavell, *Strict Liability versus Negligence*, 9 J. LEGAL STUD. 1 (1980). STEVEN SHAVELL, ECONOMIC ANALYSIS OF ACCIDENT LAW 4-46 (Harvard Univ. Press 1987).

[129] *Id*.

[130] Although there is a contractual relationship between health care providers and patients before any adverse event occurs, parties in practice are not allowed to either waive tort liability or change the content of tort liability by mutual agreements. Also, the prevalence of considerable information asymmetry between health care providers and patients often render regulating medical malpractice through contractual liability undesirable. *See e.g.,* Guido Calabresi, *The Problem of Malpractice: Trying to Round out the Circle*, 27 U. TORONTO L.J. 131 (1977). Jennifer Arlen, *Private Contractual Alternatives to Malpractice Liability*, *in* MEDICAL MALPRACTICE & U.S. HEALTH CARE SYSTEM 245 (William M. Sage & Rogan Kersh eds., 2006). Tom Baker & Timothy D. Lytton, *Allowing Patients to Waive the Right to Sue for Medical Malpractice: A Response to Thaler and Sunstein*, 104 NW. U. L. REV. 233 (2010).

[131] In the literature, medical errors are normally treated as unilateral accidents for it is assumed that only health care providers can affect medical malpractice risks. *See e.g.,* Steven Shavell, *Theoretical Issues in Medical Malpractice*, *in* THE ECONOMICS OF MEDICAL MALPRACTICE 35 (Simon Rottenberg ed., 1978). Steve Boccara, *Medical Malpractice*, *in* TORT LAW AND ECONOMICS 341 (Michael G. Faure ed., 2009). Ben C. J. van Velthoven & Peter W. van Wijck, *Medical Liability: Do Doctors Care?*, 33 RECHT DER WERKELIJKHEID [LAW OF REALITY] 28 (2012) (Neth.). Of course, there are some exceptions to this assumption. For example, if the patient did not take medication as her doctor advised and suffered an injury as a result, her own carelessness obviously contributed to her injury. However, these are relatively rare cases in practice relevant to medical errors committed by physicians. Hence, the unilateral-accident assumption is valid in most of the cases.

[132] *Risk-neutral* as well as *risk-averse* and *risk-loving* are the three categories of risk attitudes. However, before explaining risk attitudes, it is essential to introduce the notions of a *random variable* and the *expected value* in the first place. A random variable is "a numerical measurement of the outcome of a random phenomenon." *See* ALAN AGRESTI & CHRISTINE FRANKLIN, STATISTICS: THE ART AND SCIENCE OF LEARNING FROM DATA 265 (3d ed. 2012). For example, the harm of an accident is a random with two possible values: either H (if the accident does occur) or 0 (if no accident occurs). Suppose also that the probability of the accident is P, and thus the probability of no accident is (1-P). Then, the expected value of the harm of the accident (hereinafter the *expected accident harm*) is defined as the weighted average of the harm in the long run, i.e. P*H+(1-P)*0, which is simply P*H. *See* ALAN AGRESTI & CHRISTINE FRANKLIN, STATISTICS: THE ART AND SCIENCE OF LEARNING FROM DATA 269 (3d ed. 2012). Then, let us define risk-neutral by making reference to risk-averse and risk-loving. An individual is risk-averse if she prefers a certain harm M to a risky prospect of an uncertain harm M (expected value=P*H=M) with a high magnitude (H) and a low probability (P), where H will far exceed M if P is extremely low. In contrast, she is risk-loving if she prefers the risky prospect of an uncertain harm M

regulation and insurance, that injurers are solvent enough to pay full compensation, and that there are no litigation costs.[133] Moreover, because in practice medical malpractice liability is based on negligence, I will only focus on the model of the negligence rule.

As mentioned above, the first goal of tort law is to minimize primary accident costs (or total accident costs), which amount to the sum of the cost of care and the expected accident losses. The levels of activity are assumed to be constant. Then, the (expected) total accident costs can be mathematically presented as follows:

$$T(x) = C(x) + p(x)H \ (\textit{Expression } 1), \text{where}$$

"x" denotes the level of care – how much time and effort spent; "C(x)" the cost of care – monetary value of the time and effort spent – when the injurer chooses to take x units of care, which is an *increasing* function; "p(x)" the probability of the accident when the injurer chooses to take x units of care, which is a *decreasing* function because more care will reduce the probability of the accident; "H" the magnitude of harm; "p(x)H" the expected accident cost; and "T(x)" the (expected) total accident costs before any accident occurs. We can illustrate T(x) in Figure 1[134] as:


(expected value=P*H=M) to a certain harm M. A risk-neutral individual is indifferent between a risky prospect of an uncertain harm M and a certain harm. *See* JOHN BLACK ET AL., A DICTIONARY OF ECONOMICS 366-67 (4th ed. 2012). Therefore, the significance of the risk-neutral assumption is that it allows us to determine the prospect of accident costs in terms of expected values before any accident occurs.

[133] COOTER & ULEN, *supra* note 117, at 230. These assumptions, of course, may not be all valid in practice: Health care providers may be risk averse; the health care system may be heavily regulated by the state; a well-functioning medical malpractice insurance may have already been developed; individual physicians, especially those young, may not have enough personal assets to pay damages; and patients may be discouraged from filing malpractice claims because of prohibitive litigation costs. Nonetheless, the effects of relaxing these assumptions are thoroughly examined by economists as well. *See e.g.* Hansbernd Schäfer & Frank Müller-langer, *Strict Liability versus Negligence, in* 1 TORT LAW AND ECONOMICS (Michael Faure ed., 2009). For the purpose of discussing causal uncertainty, the relaxation of these assumptions does not seem to alter the conclusions. Hence, we will not address the relaxation of these assumptions in this article.

[134] COOTER & ULEN, *supra* note 117, at 200.

FIGURE 1 THE OPTIMAL LEVEL OF CARE
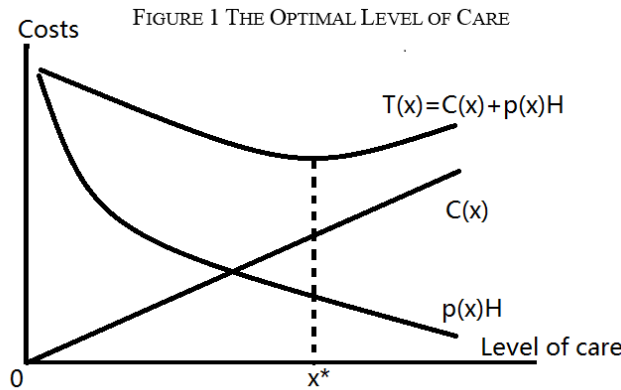
If the injurer takes little or no care, then the expected accident losses will be considerable; but if the injurer instead exercises too much care, then the costs of care will be prohibitive. Intuitively, the curve of T(x) is U-shaped, suggesting there is a minimum at the bottom of the U. [135] The level of care that corresponds to this minimum is denoted as x*. This x* is frequently referred to as the socially efficient level of precaution or the optimal level of care. [136] A level of care higher or lower than x* is socially undesirable. On the one hand, if the injurer took too little care (below x*), too many accidents would be caused and scarce social resources would be wasted. On the other hand, the highest level of care (well past x*) could surely prevent an accident from happening; however, more scarce resources would be spoiled, since taking one more unit of care will incur greater costs than the reduced expected accident costs. [137]

Under the model of the negligence rule, given that causation can be easily established in the absence of causal uncertainty, injurers will be held liable only when they fail to exercise due care ($\tilde{x}$). Under the assumption that the court correctly sets due care equal to the socially optimal level of care (=x*), [138] and also that the court sets the magnitude of compensatory liability (L) equal to the actual harm (H), then the total accident costs faced by a potential injurer is a piecewise function expressed as follows:

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[135] *Id.*

[136] *Id.*, at 201. SHAVELL *supra* note 128, at 34.

[137] Michael Faure, *supra* note 125, at 8.

[138] *Due care*, BLACK'S LAW DICTIONARY (10th ed. 2014) (stating that due care also termed reasonable care, ordinary care, adequate care or proper care, as a test for negligence, is "the degree of care that a prudent and competent person engaged in the same line of business or endeavor would exercise under similar circumstances."). The legal notion of due care is not necessarily identical with the economic notion of the optimal level of care x*. However, it would be social desirable if the court set due care equal to x* in order to economize on the total accident costs.

$$T(x) = \begin{cases} C(x) + p(x)L, if \ x < \tilde{x} \\ \qquad C(x), if \ x \geq \tilde{x} \end{cases},$$

$$where \ \tilde{x} = x^* \ and \ L = H \ (Expression \ 2).$$

Graphically, $T(x)$ can be expressed in Figure 2 as follows:

FIGURE 2 THE TOTAL ACCIDENT COSTS FACED BY INJURERS
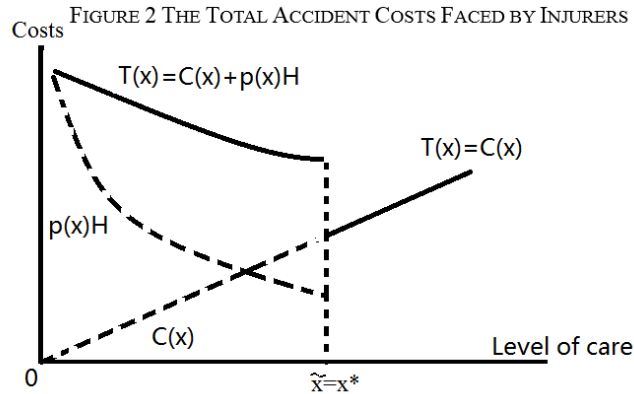
The solid line in Figure 2 suggests that the minimum of the total accident costs faced by the injurer occurs exactly where the injurer exercise due care, no more and no less! Consequently, the negligence rule is efficient, because it is able to induce potential injurer to exercise just the optimal level of care *ex ante*. Be that as it may, the negligence rule has its limitations when it comes to activity levels. Under negligence, injurers will not bear accident costs if they exercise due care. Hence, they will continually engage in their activity until they cannot obtain any extra utility,[139] which would not be socially desirable if their activity were so inherently risky that they might generate considerable negative externalities.[140] However, the medical service activities are unique in that although it generates some negative externalities, it creates considerable positive externalities at the same time.[141] Those negative externalities may be well set-off by the positive externalities. For this reason, I conclude that the

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[139] Shavell, *supra* note 128, at 22–25.

[140] BLACK ET AL., *supra* note 132, at 158. (stating that Negative externalities are the damage caused to "other people or the environment … which does not have to be paid for by those carrying out the activity.")

[141] *Id.* (stating that positive externalities are "effects of an activity which are pleasant or profitable for other people who cannot be charged for them."). Normally, the health care market generates huge positive externalities to society in general, such as (a) providing healthier and more productive workers who create positive economic gains, (b) increasing medical knowledge and technological capacity of society, and (c) reducing the likelihood of contracting certain infectious diseases via e.g. vaccinations. *Externalities in the Health Care Market*, BOUNDLESS, https://www.boundless.com/economics/textbooks/boundless-economics-textbook/health-care-economics-35/introducing-health-care-economics-135/externalities-in-the-health-care-market-534-12631/ (last visited Apr. 10, 2016).

negligence rule is efficient for regulating medical malpractice even when activity levels are taken into account as well. In the next two sub-sections, I will examine the economic approach to causal uncertainty against this theoretical model.

B. The Law and Economics Approach to Uncertainty over Factual Causation

1. The Potential Inefficiency of the Threshold Approach

Because of imperfect evidentiary information, it is not rare that there is considerable uncertainty about whether or not the injury is iatrogenic, or to what extent the injury can be attributed to the health care provider's negligence or the patient's pre-existing conditions. There are two main approaches to the determination of causation: the threshold probability criterion and the proportional probability criterion.

Under the threshold probability criterion (the "all-or-nothing" principle), injurers will not be held liable for harm done unless the probability of the causation between their actions and the accidents exceeds a given threshold.[142] No matter how high the threshold is set, Shavell argued that two types of problems – either underdeterrence or overdeterrence – might nonetheless arise.[143] On the one hand, if the actual likelihood of causation were systematically below the threshold, then injurers would never be held liable for harm done.[144] This would lead to *underdeterrence* under negligence, since potential injurers would have no incentive to take care at all.[145] On the other hand, if the actual likelihood of causation were systematically above the threshold, then causation would always be easily established. Under negligence, there would be a potential danger of *overdeterrence*. This could be explained by two reasons. First, since causation could be easily established, it would be much easier to hold injurers liable under negligence. Second, due to considerable information asymmetry in the health care sector, courts may set due care either higher or lower than the socially optimal level of care. In order to avoid being held liable erroneously, potential injurers may react to the uncertainty over the standard of care by *overcomplying*.[146]

2. The Efficiency of the Proportional Approach

If information were perfect, i.e. the court set due care and applied the law correctly and injurers always complied with due care standard,

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[142] SHAVELL, *supra* note 128, at 115. Hans-Bernd Schäfer & Claus Ott, *Lehrbuch der ökonomischen Analyse des Zivilrechts* [*The Economic Analysis of Civil Law*], 209 MATTHEW BRAHAM TRANS., EDWARD ELGAR 2000 (2004) (Ger.).

[143] SHAVELL, *supra* note 128, at 115.

[144] *Id.*

[145] *Id.*

[146] Velthoven & Wijck, *supra* note 131, at 28–47 (2012).

then there would be no liability at all. However, quality uncertainty and information asymmetry are characteristics of the health care market.[147] Hence, courts may sometimes err in setting due care and assessing the true levels of care and medical professionals may often commit errors inadvertently.[148] In this sub-section, I will examine the impact of causal uncertainty on accident prevention, given that negligence is already established.

Under the proportional probability criterion, parties will always be held liable for harm done unless the probability of causation is almost zero; and the damages will amount to the victim's losses times the probability of causation.[149] Supposed, the victim's harm was either caused by the injurer's negligence with a probability of p(x), which is the dependent variable of the level of care x, or by a natural causative factor with a fixed probability of q, which is not affected by the level of care x. Suppose, also the cost of care is C(x) and the magnitude of liability is L. If there were no causal uncertainty, I would assume that L is equal to full harm (H). Hence, if injurers attempted to exercise care less than due care, the total accident costs faced by them in the absence of causal uncertainty are exactly described by the first part of Expression 2: $T(x) = C(x) + p(x)H$.[150] In case of causal uncertainty, total accident costs faced by the injurers would be as follows:

$$T(x) = C(x) + [p(x) + q]L \ (Expression \ 3).[151]$$

It is important to note that the probability of causation in case of causal uncertainty precisely denotes the *conditional probability*[152] that the injurer's negligence had caused the harm, given that the accident was already caused either by the injurer's negligence or by a natural factor. Hence, the probability of causation under causal uncertainty can be expressed as

$$p(x)/[p(x) + q] \ (Expression \ 4).[153]$$

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[147] Kenneth J. Arrow, *Uncertainty and the Welfare Economics of Medical Care*, 53 AM. ECON. REV. 941–73 (1963).

[148] SHAVELL, *supra* note 128, at 82.

[149] *Id.*, at 116; SCHÄFER & OTT, *supra* note 141, at 115.

[150] *See supra* Part V. Section A. 2.

[151] Because of the presence of natural causative factors such as pre-existing conditions, the probability that the accident will happen or that the injurer will be held liable is p(x)+q. Hence, the expected liability faced by the injurer is [p(x)+q]L.

[152] AGRESTI & FRANKLIN, *supra* note 132, at 231. (stating that in statistics, conditional probability is normally defined as follows: "For events A and B, the conditional probability of event A, given that event B has occurred, is $P(A \mid B) = (P(A \ and \ B)) / (P(B))$.").

[153] We can get this result by applying the formula of conditional probability in the prior note. Here, "A" denotes the event that harm was caused by the injurer's negligence, "B" the event that harm was caused either by the negligence or by the natural causative factor, and "A and B" the event that A and B occur at the same time. P(A) is equal to p(x), being the probability of event A. P(B) amounts to, being the probability of the union of event A and the event that harm was caused by the natural factor. P(A and B) equals exactly p(x), being the probability of the intersection of event A and event B. The reason why P(A

In case of causal uncertainty, if we adopted the proportional approach, we would set L not equal to H but identical with the product of the probability of causation ($p(x)/[p(x) + q]$) and harm H, which is shown as follows:

$$L = p(x) * H/[p(x) + q] \ (Expression \ 5).$$

By substituting L in Expression 5 for L in Expression 3, we will get precisely:

$$T(x) = C(x) + p(x)H \ (Expression \ 6).$$

It turns out Expression 6 is identical with Expression 1, which indicates that if the court set the magnitude of liability equal to the product of the (conditional) probability of causation and the full harm in case of causal uncertainty, the total accident costs faced by potential injurers are identical with those accident costs in cases where there is no causal uncertainty, and "injurers will behave as they would in the absence of uncertainty over causation."[154]

To summarize, it is maintained that proportional liability should be applied where there is considerable uncertainty over causation.[155] Since causal uncertainty is prevalent and significant in medical malpractice cases, it may be socially efficient to apply the proportional probability criterion.

C. The Law and Economics Approach to Unrestricted Scope of Liability

1. No Impact on the Efficient Level of Care

Ideally, the scope of injurers' liability for negligence should be restricted to accidents that they cause, because "it is only these accidents that determine optimal care."[156] Accordingly, health care providers should only be held liable for avoidable adverse events rather than accidents due to patients' own pre-existing conditions. Intriguingly, however, it can be demonstrated that unrestricted scope of liability – liability for both accidents due to negligence and natural factors – does not affect the level of care that parties would choose, because taking greater care will not reduce their liability for accidents that would occur in any case.[157] It should be noted that this situation is different from the one discussed in the prior sub-section: while the former is concerned with cases where there is no causal uncertainty – it is already established that both negligence and natural factors had contributed to the occurrence of the accident – but there is uncertainty

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and B) and P(A) are equal in size is that event A is a subset of event B. Therefore, the probability of causation under causal uncertainty is $P(A \mid B) = (P(A \ and \ B)) / (P(B)) = (p(x)) / ([p(x) + q])$.

[154] Shavell, *supra* note 128, at 82.

[155] *Id.*, *supra* note 128, at 82.

[156] *Id.*, *supra* note 128, at 107.

[157] *Id.*, at 107–08.

over the scope of liability, the latter address the question whether negligence or natural factors were the actual cause of the accident. We can use Expression 2 to represent the total accident costs faced by injurers if the scope of liability is restricted to accidents they cause. [158] Then, if injurers are also required by the court to be liable for accidents that are not caused by their negligence, they will have to bear an extra expected accident costs of q*M, where q is the fixed probability of accidents due to natural factors and M is harm due to those accidents. Consequently, the total accident costs faced by injurers will become:

$$T(x) = \begin{cases} C(x) + p(x)L + \boldsymbol{qM}, if\ x < \tilde{x} \\ \quad\quad C(x), if\ x \geq \tilde{x} \end{cases},$$

$$where\ \tilde{x} = x^*, L = H\ (Expression\ 7).$$

When comparing Expression 7 to Expression 2, we will note that the only impact of expanding the scope of liability by q*M is shifting the left part of the graph of the function T(x) upward by qM units, which is shown in Figure 3 as follows:

FIGURE 3 UNRESTRICTED SCOPE OF LIABILITY
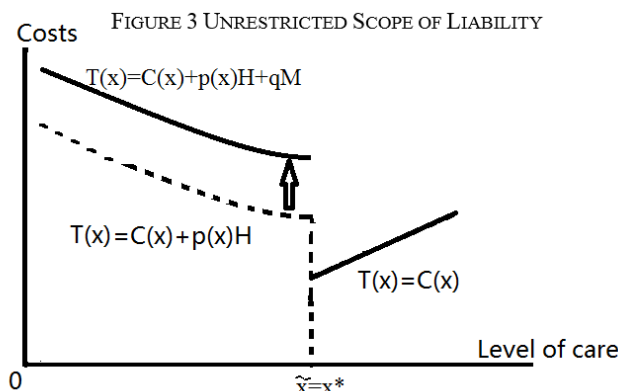
Evidently, after the upward shift by qM, the minimum of the new function represented by the solid lines is still obtained where the level of care is equal to x*. Therefore, unrestricted scope of liability does not alter the efficient level of care.

2. Impact on Activity Levels and Concerns about Administrative Costs

Nevertheless, restrictions on the scope of liability are still necessary. Although unrestricted scope of liability does not affect the optimal level of care, it may have implications for activity levels. In view of the fact that injurers will have to bear expected accident costs that are not caused by their activities, since it is fruitless for them to reduce their expected liability by taking greater care, they will respond

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[158] *See supra* Section V.A.2.

by reducing their activity levels until they quit the market altogether. Thus, there will be overdeterrence in terms of activity levels rather than care levels. As I addressed before, the health care market creates considerable positive externalities. Too many restrictions on the activity level of medical practice are socially undesirable. For this reason, the scope of liability should be restricted to adverse events that are caused by medical malpractice instead of patients' pre-existing conditions. In addition, the causal restriction of the scope of liability tends to decrease administrative costs, since fewer number of claims would be filed due to the dwindled compensatory damages that could be claimed in an individual case.[159] Therefore, it will be socially optimal if health care providers are only responsible for the part of the patient's injury that is not attributable to the risk within her own sphere. Put another way, the proportional apportionment of damages between medical malpractice torts and non-tortious pre-existing conditions is efficient.

VI. Conclusions

Causal uncertainty occurs very frequently in medical malpractice cases. Sometimes, it is difficult to establish factual causation because of low causal probability. Sometimes, it is challenging to determine which part of the patient's injury is actually caused by which defendant's faulty treatment.

Traditionally in China, a systematic approach to the difficulties of proving causation was to reverse the burden of proof. This approach was criticized as too stringent and grossly unfair to health care providers and was allegedly to have contributed to the prevalence of defensive medicine. The new TLL rejects this approach and places the burden of proof on plaintiff-patients in principle. Hence, for the time being in cases of causal uncertainty, plaintiffs may fail to satisfy the required "high probability" standard of proof.

The TLL has already provided for evident legal bases for the apportionment of damages in cases of alternative causation (Sub-category A1), multiple joint tortfeasors (Sub-category B1) and contributory negligence (1st scenario of Sub-category B2). However, neither the old legislation (GPCL, MHMA or RHMA) nor the TLL has ever stipulated clear rules that govern "hard cases" under Sub-categories A4 and A5. Moreover, the legal basis, which was once provided by the RHMA for apportioning damages between the faulty health care provider and the innocent patient whose pre-existing or underlying condition contributes to her own injury, is no longer applicable for now.

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[159] SHAVELL, *supra* note 128, at 108–09.

In spite of a lack of explicit legal bases, Chinese courts take an active role in employing new approaches to the problem of causal uncertainty. They regularly adopt a proportional approach to uncertainty over factual causation under Sub-category A4 and sometimes handle Sub-category A5 cases by virtue of the lost chance doctrine. As regards non-tortious factors under Sub-category B2, they make non-negligent plaintiff-patients bear by themselves the part of injury due to risks within their own sphere.

The courts' proportional approaches can be justified both from the legal and from the law and economics perspectives. As far as legal considerations are concerned, it is unfair that plaintiff-patients are denied compensation completely just because the causal probability is lower than the required standard of proof. By the same token, it is also unfair on defendant-hospitals to make them liable for all parts of the injury when non-tortious factors do matter. In view of optimal deterrence, economists have long demonstrated that the "all-or-nothing" approach and unrestricted scope of liability would lead to socially inefficient outcomes. Proportional liability is socially optimal, particularly in cases of considerable causal uncertainty and uncertainty over scope of liability.

With regard to what Oliphant commented on the TLL, he was correct as far as only the TLL is concerned. However, if we look behind "law on books" and search in to "law in action," we will find how active and flexible the role played by Chinese courts in applying legal rules is. Facing hard cases, Chinese courts systematically adopt proportional liability, with a view to better protecting patient's rights and interests. In this respect, it is the TLL rather than Chinese courts that lags behind cutting-edge development in other countries. However, it still remains to be seen how this judicial practice will develop in the future.