Research Article

Miguel (Masaru) Kitamura and Koki Arai*

Impact of Shorter Trial Periods in Medical Litigation

Abstract: This study examined the reasons for the decline in the plaintiff win rate in medical lawsuits in Japan since 1999. The results suggest that the decline in the plaintiff win rate is likely due to the overall shortening of trial periods. In particular, if the trial period is shortened by one month, the plaintiff win rate decreases by 1.63%. After indicating the correlation between a decrease in plaintiffs' winning rate and a shortened trial period, this study examines the causal relationship from five perspectives and the substantive factors.

Keywords: Japan, medical lawsuits, plaintiff win rate, trial duration

1 Introduction

This study explores the possibility that a decline in the plaintiff win rate observed in recent years is caused by a shortening of the trial period. Most medical lawsuits[1] are civil lawsuits that require medical knowledge and judgment, such as lawsuits challenging medical diagnoses and treatments; thus, they are treated as so-called specialized lawsuits requiring specialized knowledge during hearings and trials. In recent years in Japan, the average trial period for medical lawsuits has shortened remarkably (Supreme Court of Japan 2021a). However, the percentage of medical lawsuit plaintiffs winning cases (on the grounds that all or part of the claims are

---

1 The Supreme Court defines a "medical dispute case" as "a civil litigation case or a civil mediation case requires specialized knowledge and experience in medicine or medical treatment in order to organize the issues or evidence or to conduct a trial" (Supreme Court Rule No. 5, Article 2, Item 1 of the Rules of the Committee on Medical-Related Litigation).

*Corresponding author: Koki Arai, Professor of Economics, Faculty of Business Studies, Kyoritsu Women's University, Tokyo, Japan, E-mail: koki.arai@nifty.ne.jp. https://orcid.org/0000-0002-6907-4046
Miguel (Masaru) Kitamura, Attorney, Kitamura Law Office, Tokyo, Japan

justified) also displayed a marked downward trend (see Figure 2. Supreme Court of Japan 2021b). This study examines the causal relationship between the two phenomena and then considers the background, reasons, and effects of both.

Various case theories exist on the requirements and burdens of proof in medical litigation, such as the level of medical care and reasonable expectations. The burden of proof for plaintiffs in medical lawsuits is considered to be heavier than in other lawsuits because medical care is a typical case of uneven distribution of information. Therefore, if the trial period is shortened, the plaintiff's win rate might decrease relative to other lawsuits. Meanwhile, because the plaintiff win rate is determined by the judgment of the entity, the facts or judgment rules that formed the basis of a trial might have changed during the period covered by the study. This paper examines the aging of the population, the dissemination of medical guidelines, and their importance as a norm for judicial decisions as the factors that contribute to such changes, especially from the perspective of health economics. The Supreme Court has promoted measures such as appointing expert witnesses in medical lawsuits; however, these measures are not considered in this study because they are assumed to be neutral to the outcome of lawsuits.[2]

Although the number of observations in this study is not large, the multifaceted examination has led to solid results regarding causality, which is important when considering the factors that are relevant to medical litigation. The causal relationships found show that the pressure from rushing to an outcome significantly affects the outcome, whereas judges are committed to a fair and proper trial and process speed.

The relationship between the duration of medical lawsuits and the plaintiff win rate discussed here represents an analysis of the data from Japan. Although a particular judicial system in a particular country appears to be the target (Bosio et al. 2022), the causal inference based on the data under consideration here is examined to avoid dependence on a particular system or country. Therefore, as a framework for analyzing the relationship of judicial procedures to the actual status of the litigation, the conclusions obtained will have a wide range of implications beyond the analysis of specific countries.

Section 2 reviews the policy initiatives and existing theoretical and empirical studies and points out that the fluctuation in the plaintiff win rate and its causes have not been examined in the past. Section 3 describes the system and data and analyzes the statistical factors that might have contributed to a decline in the plaintiff win rate based on a simple model. Section 4 examines the causal relationships, and Section 5 describes the substantive factors. Section 6 presents the conclusions and suggestions for future research.

---

2 About the Medical Litigation Committee, see https://www.courts.go.jp/saikosai/iinkai/izikankei/index.html.

2 Previous Research

Research on improving the management of medical lawsuits in Japan has been conducted in the field of judicial research, and recommendations for improvements have been made (Supreme Court of Japan 2001). The relevant concerns include 1) improving litigation management (arrangement of issues, intensive examination of evidence, appropriate expert testimony, and prompt judgment); 2) improving the institutional infrastructure for expert testimony procedures; and 3) methods to introduce expert knowledge. Subsequently, the Supreme Court exchanged opinions with medical professionals and decided to establish a neutral committee and mechanism to recommend candidates as expert witnesses. Thus, the Committee on Medical Litigation was established. Several important issues have been discussed as part of the committee's duties (Maeda 2016). Regarding medical lawsuits, several developments have occurred, including the following. 1) Alternative dispute resolution systems have been established in various regions, mainly by bar associations. 2) The Japan Medical Safety Research Organization was established in 2010. 3) The National Center for Medical Accident Investigation and Support was established nationwide in 2014, which makes recommendations to prevent the recurrence of similar medical accidents. 4) Principles of medical ethics for advanced medical treatments have emerged (Shurtz 2014). The main focus is on research to support the practical efforts to shorten the trial period.

Substantial research on medical lawsuits from the perspective of law and economics has been conducted on the legal and economic incentives of medical malpractice law (Ethan and Lieber 2014), changes in doctors' residences under medical malpractice law (Lakdawalla and Seabury 2012), the cost effectiveness of medical malpractice liability and social welfare, and the relationship between medical malpractice claims and the roots of negligence (Wright 2011). However, few studies examined the duration of trials and the content and outcomes of lawsuits.

Regarding the time required for civil trials in Japan, some researchers pointed out providing information on actual civil trials to the general public is important (Mori 2020), and the courts held a study group on verifying the expediting of trials (Supreme Court of Japan 2021c).

These studies focused on the traditional interpretation theory of substantive law, clarifying the norms applied by judges given the contents of the judgments and examining their effects. However, to say that no studies moved away from such normative arguments to analytically examine the rate of plaintiff-favoring judgments handed down by judges and their objective factors is fair. From

the perspective of law and economics, because litigation is a social process in which judges are major players, clarifying the objective factors that influence the decisions of judges as players is important.

This study focuses on recent trends in the court system regarding the determinants of litigation outcomes, particularly the effect of shortened trial periods in medical litigation on plaintiffs' win rates. As an empirical study, it does not consider the trial process, which has not yet been illuminated, as a black box but clarifies its objective factors. In most previous studies, the norms applied by judges were clarified based on the content of the judgments, and their effects were examined. Apart from such discussions, no studies analytically examined the tendency of judgments themselves (plaintiff win rate) and their objective factors, and only a few studies discussed the factors behind the decline in the plaintiff win rate (Oshima 2018). This study, as such an empirical study, attempts to elucidate the previously unstudied objective factors of the trial process.

To investigate the cause of the declining plaintiff win rate, this study assumes that (i) procedural factors, specifically the shortening of trial periods because of the speeding up of trials since 1999,[3] and (ii) advances in medical technology are substantive factors (reflected in population aging and the dissemination of "medical treatment guidelines") that lower the plaintiff win rate.

3 Institutions, Data, and Models

3.1 Institutions and Definitions

Japan's health indicators, such as life expectancy, are among the highest in the world. In contrast, the ratio of 2008 medical expenses to gross domestic product was 8.5%, ranking 20th among the Organization for Economic Cooperation and Development countries and representing only approximately half of the medical expenses in the United States. Medical expenses are controlled by uniform medical fees throughout the country, and the overall revision rate is set first, followed by item-specific revisions. The structural and process aspects of the quality of medical care are viewed as inadequate, which is primarily the result of the historical development of doctors and hospitals in Japan and not of the policy of controlling medical costs. In contrast, outcomes such as surgical mortality are comparable with those of other developed countries (Organisation for Economic Co-operation and Development 2011). In Japan, the basic medical policy has been to take a

---

3 See Supreme Court, "Judicial System Reform: Thinking about the Judicial System in the 21st Century," available at https://www.courts.go.jp/about/sihou/kaikaku_sihou_21/index.html.

laissez–faire approach to the system of medical service provision while strictly controlling payment conditions. As a result, the governance of professional groups, such as doctors and hospitals, has been weak, and accountability has not been sufficiently fulfilled (Hashimoto et al. 2011).

To the best of our knowledge, not many studies positioned and analyzed medical litigation in Japan within the litigation system. Medical malpractice claims and dispute resolution systems have been examined in Western societies for their impact on the quality of medical care and efficient compensation for injured patients. However, little is known about the medical malpractice environment in Japan because medical information is closely guarded. An examination of Japan's malpractice system and the frequency of claims over the past 30 years since the 1970s shows that annual professional liability insurance premiums for physicians are relatively low, and the frequency of insurance claims in Japan is lower than that reported in the United States, the United Kingdom, and Germany (Nakajima et al. 2001). A study points out the impact of national health insurance on medical malpractice claim litigation in Japan (Ramseyer 2010). In terms of assessing the number of civil lawsuits in recent years, little discussion exists on the medical litigation system, although some argue that it is increasing (Leflar 2021). With this situation in mind, this study analyzes the mechanisms that work in medical litigation within the overall litigation system. In this study, medical lawsuits are those in which the patient—the plaintiff—sues the medical institution as the defendant for default or tort liability for the medical care received. Therefore, product liability lawsuits regarding medicines are beyond the scope of this study. Moreover, lawsuits in which national policy is in dispute, such as class action lawsuits concerning hepatitis B caused by vaccinations and product liability lawsuits concerning medicines, are not considered. The Supreme Court statistics subsequently cited are for "medical lawsuits," which likewise do not seem to include hepatitis B lawsuits.[4] Although the approach to take regarding product liability lawsuits is unclear, we discuss them on the assumption that the definitions of this study and that of the Supreme Court are consistent. Even if they are included, this discussion of the uneven distribution of information and the burden on plaintiffs still applies. The plaintiff win rate is the ratio of the number of approved cases (including partial approval) to the total number of judgments. Adversarial lawsuit litigation means that the party on the defendant's side made an argument on the date of the oral argument.

---

4 Hepatitis B lawsuits were being filed by more than 10,000 people each year around 2015 (20th Council for Promotion of Hepatitis Measures Reference 6, https://www.mhlw.go.jp/file/05-Shingikai-10905750-Kenkoukyoku-Kanentaisakusuishinshitsu/0000183739.pdf), but they do not appear to be included in the Supreme Court's medical-related lawsuits.

A medical guideline is defined as "a document that evaluates the total body of evidence through a systematic review and presents recommendations that are considered optimal, taking into account the balance of benefits and harms, in order to support the decision-making of health care users and providers on important health-related issues" (Japan Health Care Evaluation Agency 2020). In addition, the aging rate is the percentage of the total population in Japan aged 65 years or older.

Medical litigation is characterized by the uneven distribution of information. For this reason, rules may be created in medical litigation to reduce the plaintiff's burden of proof. For example, a selective finding that the defendant was negligent may be permitted despite the absence of specific and concrete proof from the plaintiff. In medical litigation, however, strict presumption requirements have been applied in the context of the high duty of care imposed on medical actors, and this selective finding of negligence is permissible only when the application of the "prima facie presumption" by a highly probable empirical rule meets strict admissibility criteria this is the situation in Japanese case law.

In addition to this maldistribution of evidence, it has been pointed out that the lack of expert knowledge prolongs the time required for the resolution of issues and the length of expert testimony as factors in the prolongation of medical litigation. In response to the uneven distribution of evidence, a party inquiry system has been established. Furthermore, other measures have also been taken to improve support systems and networks for the appointment of appraisers (Supreme Court of Japan 2021c).

Under these circumstances, there is a need for a comprehensive understanding and analysis of the plaintiffs' prevailing rate and the duration of trials, and this discussion takes into consideration the uneven distribution of information and the burden placed on the plaintiffs.

3.2 Data

The data used in this study consist of the processing status of civil first-instance ordinary litigation cases and medical-related litigation cases in district courts, the average trial period, the number of completed cases by final classification, the plaintiff win rate, the ordinary trial duration, and the average trial period of cases in opposition to ordinary litigation. These figures are from the Court Data Book 2020 and the Report on the Verification of Speedy Trial. In these figures, civil first-instance ordinary litigation cases in district courts include medical-related litigation cases in these courts. The plaintiff win rate of medical-related litigation cases is based on cases in district and summary courts until 2004, and on cases in district courts since 2005.

The descriptive statistics of the data are provided in Table 1.

Table 1: Descriptive statistics.

	Medical lawsuit plaintiff win rate	Medical lawsuit average trial period	Civil overall plaintiff win rate	Civil overall average trial period	Adversarial lawsuits plaintiff win rate	Adversarial law-suits period	Civil overall number of cases
Mean	0.290	26.3	0.844	8.984	0.642	14.135	2,281,349
Median	0.254	25.1	0.848	8.7	0.625	12.9	2,255,536
Maximum	0.469	35.6	0.876	12.9	0.699	20.9	3,520,500
Minimum	0.17	22.6	0.8	6.5	0.606	9.9	1,432,324
Std. Dev.	0.0945	3.864	0.015	1.605	0.031	2.821	(623,656)
Observations	21	21	21	31	21	31	31

As shown in Table 1, the average medical lawsuit plaintiff win rate is 29.0%, the average medical lawsuit trial period is 26.3%, and the average civil overall trial win rate is 84.4%. The average civil overall trial period is 8.98 months, and the average civil overall number of cases is 2,281,349. The period of time mentioned here refers to the period of time from the date the case was received by the court to the date of termination, and is expressed in months. Also, the Observations mentioned here refer to the number of data used in this analysis, which is a sample size of 21 fiscal years of data.

3.3 Model

In this study, we assume that the decline in the plaintiff win rate is caused by the shortening of the trial period. We examine the validity and appropriateness of this assumption. For this purpose, we consider the following regression equation (1):

$$\text{PlaintiffWinRate}_y = \alpha_1 + \beta_1 \text{AverageTrialPeriod}_y + \epsilon_{1,y} \qquad (1)$$

where the subscript y represents the relevant year. The variable PlaintiffWinRate is the plaintiff win rate, and AverageTrialPeriod is the average trial period. α_1 and β_1 are the coefficients to be determined, and ε is the error term. Both the plaintiff win rate and the average trial duration are taken as natural logarithms.

We use this estimation formula to first observe the correlation between the decrease in the plaintiff win rate and the shortening of the trial period. In this study, we consider the statements of the American Statistical Association regarding statistical significance and p-values (Wasserstein and Lazar 2016) and use the probability that the research hypothesis is correct—rather than the p-value—to test the credibility of the coefficients. This approach shows an area of aggregation of the relationship between the reference point and the probability that the research hypothesis is correct (PHC) for statistical significance, and the test power analysis is believed to be verified more scientifically. The estimation results are presented in Table 2.

The results show that the duration of the hearing explains 43% of the variation in the plaintiff win rate and that the plaintiff win rate has a positive relationship with the duration of the hearing more than 95% of the time. The coefficient is 1.63, which means that if the trial period is shortened by one month, the plaintiff win rate decreases by 1.63%. Notably, the plaintiff win rate has been continuously declining since the 1999 reform of the judicial system that facilitated hearings (Figure 1). A continuous decline is expected because the duration of hearings is a policy variable. The fact that the plaintiff win rate, which is the result of the trial, shows the same continuous declining trend indicates the importance of the correlation.

Table 2: Plaintiff win rates and trial period of medical litigation.

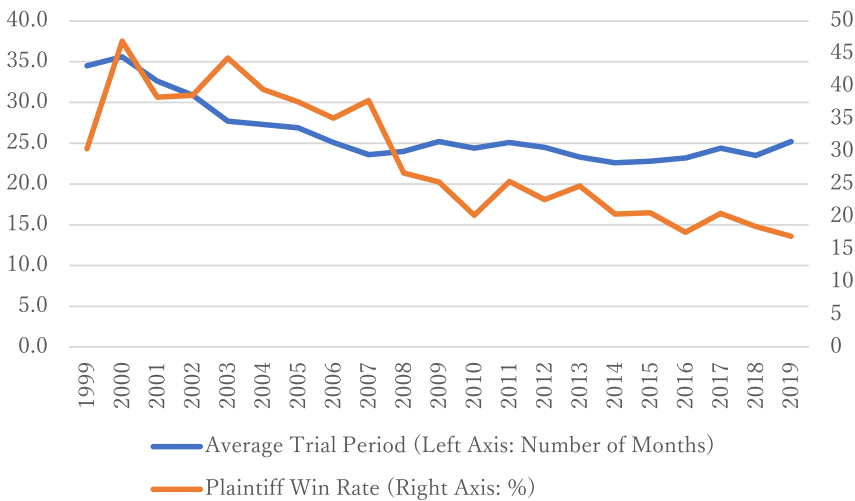| Dependent variable: Medical lawsuit plaintiff win rate				
Method: Least squares				
Sample (adjusted): 1999–2019				
Included observations: 21 after adjustments				
Variable	Coefficient	Std. Error	Upper 95%	Lower 95%
C	−1.991	1.324	0.762	−4.744
AverageTrialPeriod	1.627	0.406	2.471	0.784
R^2	0.459		Adjusted R^2	0.430

Figure 1: Average trial periods and plaintiff win rates.

In this regard, we examine causal relationships that go beyond the correlation. The objects of observation discussed here are trendy movements of the litigation currents. We cannot deny the possibility that cases exist that show the opposite situation among the objects of observation. For example, in some cases, the plaintiff won the case despite a short trial period; alternatively, the plaintiff lost the case despite a long trial period. However, a policy move has been pursued to shorten the trial period. As a result, the probability of a plaintiff winning a medical lawsuit is decreasing. This study attempts to show this decrease through various theories and data analysis.

As previously mentioned, medical lawsuits are a typical case of information asymmetry, and the burden of proof for the plaintiff's claim is relatively heavy.

Therefore, assuming a causal relationship that the shortened trial period led to a decrease in the acceptance rate is not unreasonable, that is, an increase in the number of plaintiffs' losses.

Moreover, this relationship is examined from the following five points.

First, we evaluate lawsuits other than medical lawsuits. We show that this correlation is small for lawsuits other than medical lawsuits. We also show that the correlation is present only in medical litigation, which indicates—in other words—whether or not the necessary condition is met. We see that the complementary set does not have the said correlation, and only the said set has the correlation.

Second, we verify that such correlations are found in lawsuits of similar complexity. This verification indicates whether—in other words—the sufficient condition is met for correlation to be found in similar types of cases other than medical litigation. This verification also shows that sets with similar properties show similar trends. In comparison, the controlled sets exhibit the same trend. These findings can be taken as an indication, that is, that the results occurred in the treatment but not the control group.

Third, the two-stage least-squares method shows that a correlation exists between the trial period and the plaintiff's win rate, even after controlling for the influence of other circumstances during the trial period. This controls for the effect of confounding variables and not the effect of reverse causality.

Fourth, we analyze the effect of settlements. The settlement rate in medical litigation has a significantly negative relationship with the plaintiff win rate. In contrast, the settlement rate has little explanatory power for civil litigation as a whole. In other words, efforts to shorten the duration of the litigation have increased the number of settlements. Moreover, the increase in settlements is mainly the result of the defendants' efforts. As a result, fewer cases exist in favor of the plaintiffs in the remaining portion, and the plaintiffs' win rate decreases—these data support this mechanism. Therefore, we verify that the increase in the settlement rate is correlated with the decrease in the plaintiff's win rate only for medical suits, which explains the mechanism that results in an increase in settlement, a shortening of the trial period, and the resulting decrease in the plaintiff win rate.

In addition, from a substantive point of view and supporting our reasoning from the reverse side, the fifth part attempts to show that variations in other confounding variables (aging of the population, diffusion of medical guidelines) are less related to variations in trial duration or plaintiff win rate. Doing so further attempts to show that the missing variables are not the ones affecting both variables.

4 Verification of Causality

In general, medical lawsuits are typical cases of information asymmetry, and the burden of proof on the plaintiff is considered relatively heavy. Therefore, assuming a causal relationship in which the shortened trial period leads to a decrease in the plaintiff win rate, that is, an increase in the number of cases lost by plaintiffs is not unreasonable. Theoretically, we consider that the plaintiff can win the case by reaching a certain threshold in the trial process by accumulating claims and proofs; $y = f(x)$, y: plaintiff's victory, x: plaintiff's litigation effort.

Here, the relationship is thought to be as follows, where the probability of the plaintiff winning the case increases with x's litigation effort.

$$\frac{\partial y}{\partial x} > 0.$$

The plaintiff's litigation effort is considered to be an increasing function of cost, effort, and time, as follows (time is used here as an example, t).

$$\frac{\partial x}{\partial t} > 0.$$

Extrinsic pressure exists to shorten the time such that as the value of t decreases, x decreases—and y decreases with it. We examine this relationship from the following four perspectives.

First, we show that the decrease in the plaintiff win rate and the shortening of the trial period are not related if the case is not a medical case. For this purpose, Table 3 shows the relationship between the plaintiff win rate and the trial period for the civil litigation domain as a whole using the same type of estimation formula. Here, the variable RateForPlaintiff represents the plaintiff win rate considering all civil lawsuits, and AverageTrialPeriod represents the average trial period considering all civil lawsuits.

Table 3: Overall plaintiff win rates and trial periods for civil litigation.

Dependent variable: Overall civil plaintiff win rate				
Method: Least squares				
Sample (adjusted): 1999–2019				
Included observations: 21 after adjustments				
Variable	Coefficient	Std. Error	Upper 95%	Lower 95%
C	−0.149	0.079	0.016	−0.314
Overall civil average trial period	−0.010	0.038	0.069	−0.089
R^2	0.003			

According to these results, the length of the trial and the plaintiff win rate for civil litigation as a whole are unlikely to be related. This finding is indicated by the fact that, given Table 3, we cannot reject the null hypothesis that the coefficient of the average trial period for the entire civil case is zero. In other words, this finding shows that the trial period of the entire civil lawsuit has nothing to do with the plaintiff's overall winning rate. Thus, such a relationship can be shown to not exist in nonmedical lawsuits, which is one of the factors that indicate that such a relationship exists only in medical litigation.

Second, we show that this phenomenon is not unique to medical litigation and that the same type of effect occurs for contested cases in which the defendant is present. To this end, using the same type of estimation equation, Table 4 shows the relationship between the plaintiff win rate and the trial period in adversarial civil litigation cases. We found a correlation between the shortening of the trial period in medical lawsuits and the plaintiff's win rate. Similarly, although the duration of nonmedical lawsuits was shorter, the plaintiff's win rate was not higher. Litigations in adversarial cases, which are of the same nature as medical suits but not as difficult as medical suits, were shorter in duration, and the plaintiff win rate was higher but not as high as in medical suits. Here, the variable RateForPlaintiff represents the plaintiff win rate in adversarial litigation in all civil litigation, and AverageTrialPeriod represents the average trial period in adversarial litigation in all civil litigation.

This result shows that the duration of the trial is positively related to the plaintiff's winning rate and explains approximately 20% of the plaintiff's winning rate in civil lawsuits in which the plaintiff contests the case at trial. In other words, a shorter trial period results in a lower probability that the plaintiff will win the case when the defendant contests it. Noteworthy is that this tendency is more pronounced in more difficult cases of the same type as medical suits, in which the plaintiff must contest the case at the trial. A similar relationship can be observed in

Table 4: Plaintiff win rates and trial periods in adversarial lawsuit litigation.

Dependent variable: Adversarial lawsuits plaintiff win rate				
Method: Least squares				
Sample (adjusted): 1999–2019				
Included observations: 21 after adjustments				
Variable	Coefficient	Std. Error	Upper 95%	Lower 95%
C	−1.083	0.287	−0.486	−1.680
Adversarial lawsuits period	0.254	0.114	0.490	0.017
R^2	0.207		Adjusted R^2	0.165

the same types of cases. This factor might be one that supports the assumption of causality mentioned at the beginning of this section.

Third, we consider the estimation by the two-stage least-squares method using the instrumental variables. This study shows that a reduction in the duration of medical trial litigation affects the medical plaintiff win rate. Developing a variable that only affects the duration of medical trial litigation but not the medical plaintiff win rate (only through the duration of litigation) is difficult. Here, we used the trial period of adversarial lawsuits in all civil lawsuits—considered related to the medical trial period but not the medical plaintiff win rate—as an operating variable and conducted an estimation using the two-stage least-squares method. However, using this operating variable as an exogenous variable for identification might be difficult and should be used only to observe the trend to determine whether it is consistent with the claim we are attempting to prove. In this structural estimation method, the predicted values of the endogenous variables are created by variables that have a small correlation with the error term and a large correlation with the explanatory variables, and the structure is estimated using the predicted values. The plaintiff's victory rate in medical lawsuits is not related to the duration of adversarial lawsuits in which the defendant appears in court during the entire civil lawsuits, but the duration of medical lawsuits is supposed to be related to the busyness of judges throughout the entire lawsuits, which actually has a small correlation with the error term but has the power to explain the explanatory variables (the correlation coefficient is shown in Table 5-2). The results are shown in Table 5.

This result shows that a positive trend exists between the duration of the trial and the plaintiff's victory rate in medical lawsuits, although the magnitude of the coefficient is smaller than that from OLS, even using the two-stage least-squares method. (The results are 10% significant in the one-tailed test in which the

Table 5: Structural estimation approach.

Dependent variable: Medical lawsuit plaintiff win rate				
Method: Two-stage least squares				
Sample (adjusted): 1999–2019				
Included observations: 21 after adjustments				
Instrument specification: Adversarial lawsuits period				
Constant added to instrument list				
Variable	Coefficient	Std. Error	Upper 95%	Lower 95%
C	−0.342	2.722	5.319	−6.004
Average trial period	1.122	0.835	2.858	−0.614

Table 5-2: Correlation coefficients for related variables.

	Average trial period	Adversarial lawsuits period	Residual of eq. (1)
Average trial period	1		
Adversarial lawsuits period	0.547	1	
Residual of eq. (1)	−0.129	−1.46E-14	1

coefficient is positive.) Therefore, this result is consistent with the inference of causality. Although taking into account operational variables that are completely exogenous is difficult, it is considered an important factor in the causal inference that we are attempting to establish here because we have made certain structural estimates and found results that do not contradict previous estimates.

The fourth factor is the impact of the settlement rate. An increase in settlement rates in the final category leads to a shortening of the trial period, which might cause a decrease in the plaintiff win rate. Meanwhile, if the percentage of cases that end in settlement increases, the possibility exists that some cases with serious conflicts remain and end in judgment, which might lead to a prolongation of the trial period and an increase in the likelihood of plaintiffs winning those cases.

In the same type of estimation formula, the variable SettlementRate is used to represent the percentage of settlements in the final classification, and estimates are made of the medical lawsuit rate for plaintiffs and the medical lawsuit average trial period.

$$\text{PlaintiffWinRate}_y = \alpha_3 + \beta_3 \text{SettlementRate}_y + \epsilon_{3,y} \qquad (3)$$

$$d\big(\text{PlaintiffWinRate}_y\big) = \alpha_{3'} + \beta_{3'} d\big(\text{SettlementRate}_y\big) + \epsilon_{3',y} \qquad (3)'$$

The estimation results are shown in Table 6. Because we are taking differences here, we use actual values for the estimation rather than natural logarithms.

According to these results, the variation in the settlement rate explains approximately 30% of the variation in medical lawsuits and approximately 40% of the variation in the duration of medical lawsuits and, thus, might be a confounding factor. Therefore, we took the first-order differences of these variables and regressed their variations. The first-order difference (expressed in the form of $d(\cdot)$) indicates a weak relationship between the two. Therefore, the trend in the settlement rate of medical lawsuits has nothing to do with the plaintiff win rate or the time required for medical lawsuits.

The impact of encouraging settlements in medical lawsuits might be different between plaintiffs and defendants. Defendants might end up settling cases that are unfavorable to themselves. The degree of impact of the encouragement to settle

Table 6: Settlement rates and plaintiff win rates/average trial periods.

Variable	Coefficient	Std. Error	Upper 95%	Lower 95%	R^2
Dependent variable: Medical lawsuit plaintiff win rate					
C	112.858	27.349	169.745	55.971	
SettlementRate	−168.568	54.834	−54.512	−282.623	0.332
Dependent variable: Medical lawsuit average trial period					
C	64.727	10.364	86.285	43.169	
SettlementRate	−77.19	20.78	−33.968	−120.413	0.421
Dependent variable: d(Medical lawsuit plaintiff win rate)					
C	−0.788	1.345	2.01	−3.587	
d(SettlementRate)	27	51.878	134.906	−80.907	0.015
Dependent variable: d(Medical lawsuit average trial period)					
C	−0.458	0.317	0.201	−1.117	
d(SettlementRate)	−1.609	12.224	23.816	−27.035	0.001

Methods, sample durations, and observation numbers are omitted.

during the entire conduct of the litigation, or even before it, can be thought of as the same type of price elasticity of demand concept. If the ratio of a good's expenditure to income is small, the income elasticity of demand will tend to be low. For example, this means that the impact of demand for a 20% increase in the price of spinach is likely to be different between a person with an annual income of 30 million yen and a person with an annual income of 3 million yen. In general, the plaintiff and the defendant in a medical lawsuit are considered to be larger than the defendant; in other words, defendants are larger, more resilient to settlement, and more likely to choose settlement. In addition, a view exists that it is easier for the judge to make his or her own decision earlier because of the arrangement of issues and the intensive examination of evidence. When judges are encouraged to settle cases based on the notice of their own future decisions, defendants—larger entities—might be more likely to change their strategy based on such encouragement.[5] This situation can also be thought of in the same way as the case in which the income elasticity of demand is high, and the possibility exists that the defendant might be more likely to choose a settlement in an elastic manner in response to the approach. Therefore, in situations in which the evidence is in favor of the plaintiff, the tendency is to choose settlement and not reach a judgment.

Alternatively, judges who are pressed for time might tend to forcefully recommend settlements, and if the plaintiffs do not comply, they tend to lose their cases because of insufficient evidence. In other words, the possibility exists that

---

5 In Japan, there is no jury verdict but a judge's verdict.

the quality of trials is declining. The upward trend in the settlement rate and the downward trend in the plaintiff's win rate might indicate this possibility.

This examination also shows the possibility that these trends lead to an increase in the settlement rate and a decrease in the plaintiff win rate. This finding provides theoretical support that an increase in the settlement rate, which equals a decrease in the duration of the trial, leads to a decrease in the plaintiff's win rate, which is supported by the data.

In addition to this, we further examine the causal relationship between plaintiff win rates and trial length for different degrees of complexity of medical litigation. The data here do not directly measure the complexity of medical litigation. In fact, we use the trial durations as a proxy variable for complexity. Therefore, in order to remove the influence of years with particularly long trial durations and years with particularly high approval rates, and to highlight the characteristics of trial durations as an aggregate measure of complexity, it is possible to clarify the relationship between the degree of complexity and plaintiff win rates by looking at the relationship by rank. Although the degree of complexity of individual lawsuits is unique and difficult to compare, its relative position by year may be an appropriate proxy variable for the aggregate complexity of medical litigation when used in the analysis as an aggregate quantity. Specifically, the relative ranking among all observed years is determined and calculated using the regression equation in equation (1).

The results are shown in Table 7 below.

According to these results, the null hypothesis that the explanatory variables organized in terms of the degree of complexity of medical litigation do not have a relationship with the plaintiff win rate can be significantly rejected, and the probability of having a positive coefficient exceeds 95%. Thus, the results indicate that the more difficult the degree of complexity of medical litigation, the higher the plaintiff win rate, which supports the assertion made in this section.

Table 7: Ranking relationship between overall plaintiff win rates and trial periods for civil litigation.

Dependent variable: Overall civil plaintiff win rate ranking				
Method: Least squares				
Sample (adjusted): 1999–2019				
Included observations: 21 after adjustments				
Variable	Coefficient	Std. Error	Upper 95%	Lower 95%
C	3.631	2.093	8.012	−0.750
Overall civil average trial period ranking	0.679	0.168	1.031	0.326
R^2	0.679		Adjusted R^2	0.461

5 Substantive Factors

In addition to procedural factors, we discuss important substantive factors that might affect medical litigation decisions and examine whether these are confounding factors. If there are important confounding factors, the causal effect of the shortened trial period might only be apparent.

The factor that might be most important in this regard is the advancement of medical technology. In general, advances in medical technology are defined as developments that result in increased benefits and reduced risks arising from medical care as measured by various endpoints, such as the prolongation of life and improvements in health and quality of life (Haynes, Devereaux, and Guyatt 2002). When the risk of medical accidents that give rise to medical lawsuits has generally decreased because of improvements in medical technology, if the standard of judgment of the courts requires the realization of a level of care that corresponds to the results (or risk level) of medical treatment such as that in the past, the plaintiff win rate can be assumed to decrease in response to a decrease in the risk of medical accidents with improvements in medical technology. If the standard requires a level of care that corresponds to the results (or risk level) of medical treatment, as in the past, the plaintiff win rate can be assumed to decline in response to a decrease in the risk of medical accidents because of improvements in medical technology (Hurwitz 1999).

Related to this, as the standardization of medical information progresses, the number of cases in which medical practitioners provide medical care in compliance with the standard increases in relative terms. In this case, if the standard is also adopted as a norm in court, the plaintiff win rate decreases. In fact, as shown in Figure 2, the number of medical trials (first-instance judgments) that refers to clinical guidelines is increasing, and a trend in decreasing plaintiff win rates can be observed in the case database.

Accordingly, we estimate the impact of these factors on the plaintiff win rate using multiple regression analysis with the following equation:

$$d\big(\text{PlaintiffWinRate}_y\big) = \alpha_4 + \beta_{4,1} d\big(\text{NumberOfReferredGuidelines}_y\big)$$
$$+ \beta_{4,2} d\big(\text{AgingRate}_y\big) + \epsilon_{4,y} \tag{4}$$

In this equation, $d(\cdot)$ represents the first-order difference, NumberOfReferredGuidelines is the number of decisions that referred to medical guidelines in that year, and AgingRate is the aging rate in that year. Table 7 presents the estimation results.
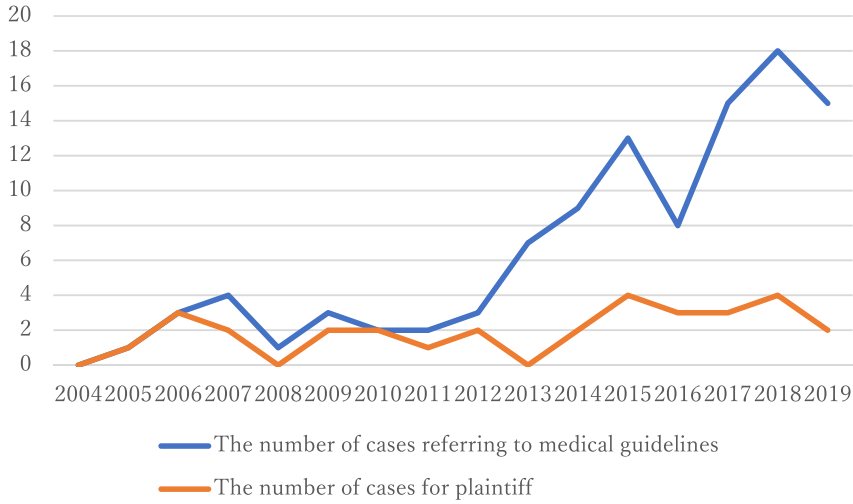
Figure 2: Number of medical lawsuit decisions referring to medical guidelines and cases for the plaintiff.

Because we are taking differences here, we are using actual values for estimation rather than natural logarithms (see Table 8).

According to these results, a weak relationship exists between the development of medical guidelines and the difference in the floor of the aging rate and the difference in the plaintiff win rate. At first glance, the development of medical guidelines and the aging rate appear related to the decline in the plaintiff win rate; however, in fact, the analysis finds that they are not confounding factors but, rather, simply have a certain trend movement that makes them appear related.

Table 8: Impact of medical guidelines and aging.

Variable	Coefficient	Std. Error	Upper 95%	Lower 95%
Dependent variable: d(PlaintiffWinRate)				
Method: Least squares				
Sample (adjusted): 2005–2019				
Included observations: 15 after adjustments				
C	−0.350	3.324	6.564	−7.263
d(NumberOfReferredGuidelines)	0.174	0.372	0.948	−0.600
d(AgingRate)	−2.311	5.550	9.233	−13.854
R^2	0.023			

6 Conclusion

This study examines the decline in the plaintiff win rate of medical lawsuits since 1999 in connection with the shortening of the trial period because of the judicial system reform promoted by the Supreme Court from that year in Japan. Since 1999, when the trial period was shortened, the average trial period of medical lawsuits decreased remarkably from 34.5 months in 1999 to 25.2 months in 2019. During the same period, the percentage of medical lawsuits in which the plaintiff's claim was admitted dropped from 30.4% to 17%. If a default on a medical contract is disputed in medical lawsuits, the burden on plaintiffs is not light because of the uneven distribution of information. Moreover, if the trial period is shortened, the plaintiff win rate might decrease compared with other types of lawsuits. Regarding medical lawsuits, judicial research has been conducted to improve the management of medical lawsuits, and recommendations for improvement have been made. However, none of these studies of policy, law and economics, and civil lawsuits focused on the impact of lawsuits on substantive decisions (plaintiff win rates). Thus, this study sheds light on a factor whose influence on the reality of litigation has not been previously analyzed.

The data used in this study are from the Court Data Book 2020 and the Report on the Verification of the Expediting of Trials. Regression analysis was conducted assuming that the decline in the plaintiff win rate was caused by the shortening of the trial period. The results show that the trial period explained 43% of the variation in the plaintiff win rate, and the plaintiff win rate had a significant positive relationship with the trial period. First, no relationship existed between the decrease in the plaintiff win rate and the shortening of the trial period if the case was not a medical lawsuit. Second, the same type of effect occurred for medical lawsuits and the same type of lawsuits. This finding can be taken as an indication, that is, that the results occurred in the treatment group but not in the control group. Third, a two-stage least-squares estimation using manipulated variables showed that the trial period of medical lawsuits had a significant positive relationship with the plaintiff win rate. Fourth, we examined the impact of the increase in the settlement rate. In medical lawsuits, obtaining some evidence at the issue settlement stage has become possible, and the number of settlements in which the defendant makes concessions at the issue settlement stage has increased, resulting in a shorter trial period. This result is likely to have contributed to a decrease in the plaintiffs' win rate.

Meanwhile, the improvement in medical technology and the standardization of medical care were examined as substantive confounders, for which the aging of the population was considered an indicator of the former and medical guidelines

an indicator of the latter. The results showed that the difference in the floor of the aging rate had little to do with the difference in the floor of the plaintiff win rate, which is consistent with intuitive predictions. However, surprisingly, the effect of medical guidelines on sentencing was not found. The main reason for this might be the insufficient quality of the case data but might also mean that new methods need to be developed for the statistical analysis of the impact of such substantive factors on sentencing.

Efforts to shorten the trial period are beneficial to reducing the time, economic, and mental burden on the parties involved; however, at the same time, ensuring fair and appropriate proceedings is essential. Given the changes in socioeconomic conditions both inside and outside Japan, meeting the public's demand for speedier trials is imperative. The practical significance of this study is that it clarifies the actual effect of shortening the trial period in medical litigation, which is a typical example of specialized litigation. The concern that the uneven distribution of information in medical lawsuits attributable to the structure of the provision of specialized medical services has caused a decline in the plaintiff win rate needs to be examined from the perspective of fairness and appropriateness. In addition, problems with medical guidelines have been pointed out, although this is not the main subject of this study. Whether the current trends, including the two trends (aging of the population and the spread of medical guidelines) under focus in this study, are merely distributional problems or whether they have a positive impact on social welfare must be examined.

The originality and contribution of this research is, first, that it is a pioneering study that clarifies how the content of substantive judgments is affected by the movement of rules and procedures. Second, this study poses a socially important question and highlights the need for further verification. Third, although a tentative conclusion was reached based on causal inference from aggregate data, further elaboration is needed, such as the detailed verification of missing variables. The limitations of this study are that it uses aggregate data from all over the country at any given time and examines their relationships and abstracts too much from the various factors to be considered in micro events, such as court cases. However, despite these limitations, this research presents an accurate method of analysis and issue extraction for understanding the trends in medical litigation and clarifying future issues.

Competing interests: We confirm that there are no financial or nonfinancial interests to declare in this study.

Ethics declaration: This paper does not involve a study of individual human participants. No approval from the Ethics Committee was required.

References

Bosio, E., S. Djankov, E.L. Glaeser, and A. Shleifer. 2022. "Public Procurement in Law and Practice." *American Economic Review* 112 (4): 1091–1117.

Ethan, M., and J. Lieber. 2014. "Medical Malpractice Reform, the Supply of Physicians, and Adverse Selection." *The Journal of Law and Economics* 57 (2): 501–27.

Hashimoto, H., N. Ikegami, K. Shibuya, N. Izumida, H. Noguchi, H. Yasunaga, H. Miyata, J.M. Acuin, and M.R. Reich. 2011. "Cost Containment and Quality of Care in Japan: Is There a Trade-Off?" *Lancet* 378 (9797): 1174–82.

Haynes, R.B., P.J. Devereaux, and G.H. Guyatt. 2002. "Physicians' and Patients' Choices in Evidence Based Practice." *BMJ* 324 (7350): 1350.

Hurwitz, B. 1999. "Legal and Political Considerations of Clinical Practice Guidelines." *BMJ* 318 (7184): 661–4.

Japan Health Care Evaluation Agency. 2020. Minds Clinical Practice Guideline Creation Manual 2020 Ver. 3.0. https://minds.jcqhc.or.jp/docs/various/manual_2020/ver3_0/pdf/all_manual_2020ver3_0.pdf (accessed February 26, 2022).

Lakdawalla, D.N., and S.A. Seabury. 2012. "The Welfare Effects of Medical Malpractice Liability." *International Review of Law and Economics* 32 (4): 356–69.

Leflar, R.B. 2021. "Medical Injury Litigation and Compensation Systems in Japan." In *Medical Liability in Asia and Australasia*, edited by V. Raposo, and R. Beran. Singapore: Springer. Also avaliable at https://ssrn.com abstract_id=3730549.

Maeda, J. 2016. "Guidelines for Appropriate Approaches to Medical Litigation: Based on the Proposal for Improving the Management of Medical Litigation (1998 Judicial Research)." *Konan Journal of Legal Studies* 12: 55–71. (in Japanese).

Mori, D. 2020. "Duration of Civil Litigation in Japan: Expectations versus Reality." *Journal of Social Sciences* 71 (2): 111–30. (in Japanese).

Nakajima, K., C. Keyes, T. Kuroyanagi, and K. Tatara. 2001. "Medical Malpractice and Legal Resolution Systems in Japan." *JAMA* 285 (12): 1632–40.

Organisation for Economic Co-operation and Development. 2011. *OECD Health Data 2011*. Paris: OECD. https://www.oecd.org/health/health-systems/49105858.pdf (accessed August 14, 2022).

Oshima, S. 2018. "Judges Talk about the Reality of Medical Lawsuits: Patients' Win Rate in Medical Lawsuits Declines; what Are the Reasons?" *Nikkei Medical*. https://medical.nikkeibp.co.jp/leaf/mem/pub/clinic/saibankan/201712/554074.html (accessed August 14, 2022) (in Japanese).

Ramseyer, J.M. 2010. "The Effect of Universal Health Insurance on Malpractice Claims: The Japanese Experience." *Journal of Legal Analysis* 2 (2): 621–86.

Shurtz, I. 2014. "Malpractice Law, Physicians' Financial Incentives, and Medical Treatment: How Do They Interact?" *The Journal of Law and Economics* 57 (1): 1–29.

Supreme Court of Japan. 2001. Rules of the Medical Affairs Litigation Committee. Tokyo, Japan: Government of Japan. https://www.courts.go.jp/saikosai/vc-files/saikosai/file2/804001. pdf (accessed February 26, 2022).

Supreme Court of Japan. 2021a. Statistics of Medical Litigation Cases and Court Data Book 2020, Tokyo, Japan: Government of Japan. https://www.courts.go.jp/saikosai/vc-files/saikosai/ 2020/2011191heikinshinri.pdf, https://www.courts.go.jp/vc-files/courts/2020/DB2020/ 17_db2020_all.pdf (accessed February 26, 2022).

Supreme Court of Japan. 2021b. Plaintiff Win Rate of Civil Cases in the First Instance and Medical Cases in the District Court, Tokyo, Japan: Government of Japan. https://www.courts.go.jp/ saikosai/vc-files/saikosai/2020/2011193tujoninyouritu.pdf (accessed February 26, 2022).

Supreme Court of Japan. 2021c. Study Group on the Verification of the Expediting of Trials, Tokyo, Japan: Government of Japan. https://www.courts.go.jp/saikosai/iinkai/zinsokuka_ kentoukai/index.html (accessed February 26, 2022).

Wasserstein, R.L., and N.A. Lazar. 2016. "Editorial, the ASA Statement on *P*-Values: Context, Process, and Purpose." *The American Statistician* 70 (2): 129–33.

Wright, D.J. 2011. "Medical Malpractice and Physician Liability under a Negligence Rule." *International Review of Law and Economics* 31 (3): 205–21.