Association of Patients' Past Misdiagnosis Experiences with Trust in Their Current Physician Among Japanese Adults

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BACKGROUND: Previous qualitative research has described that previous misdiagnoses may reduce patient and their families' trust in healthcare.
OBJECTIVE: To quantify the associations between patients or family members' misdiagnosis experiences and trust in their physician.
DESIGN: Cross-sectional study.
PARTICIPANTS: Adult Japanese people with non-communicable diseases (cancer, diabetes, depression, heart disease, and connective tissue disease), recruited using a web-based panel survey.
MAIN MEASURES: Surveys assessed the patient and the patient's family's experience with misdiagnosis. Trust in the respondent's current physician was measured using the Japanese version of the 11-item Trust in Physician Scale.
KEY RESULTS: Among 661 patients (response rate 30.1%), 23.2% had a personal history of misdiagnosis and 20.4% had a family history of misdiagnosis. In a multivariable-adjusted general linear model, patients or a family members' misdiagnosis experiences were associated with lower confidence in their current physician (mean difference −4.3, 95%CI −8.1 to −0.49 and −3.2, 95%CI −6.3 to −0.05, respectively). The impact of having a personal and a family member's experience of misdiagnosis on trust was additive, with no evidence of interaction (P for interaction = 0.494).
CONCLUSIONS: The patient's or family members' misdiagnosis experiences reduced trust in the patient's current physicians. Interventions specifically targeting misdiagnosed patients are needed to restore trust.

KEY WORDS: misdiagnosis; patient trust; physician; family member; non-communicable disease.

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INTRODUCTION

Patient trust in physicians is central to the patient-physician relationship.[1] It refers to patients' belief in the physician's credibility or their confidence in the latter's capacity to influence health outcomes, called competence.[2] Interpersonal trust between patients and clinicians fosters shared decision-making regarding treatment plans.[3] Low trust is associated with negative health behaviors, including lower adherence to medications, compliance with treatment plan,[4–8] and lower continuity of care.[8]

Misdiagnosis may lead to distrust in physicians, as the patient's negative experience diminishes perceptions of physician's competence, which is a theoretical component of trust. Approximately 5% of the adult population in the USA experience a misdiagnosis.[9] Misdiagnosis accounts for about a third of preventable deaths in England[10] and often leads to medical litigation.[11,12] Despite the serious consequences, limited studies have examined the impact of previous misdiagnosis experiences on trust in future physicians.

Previously, the effects of misdiagnosis experiences on the trust of patients and their families were described as components of medical errors. Qualitative studies report that medical errors, including misdiagnosis, cause patients and their families to lose confidence in healthcare and avoid medical care,[13] which persist over five years.[14] Although misdiagnosis remains a vivid negative memory for patients[14] and may shape their attitudes toward other physicians,[15] no quantitative studies have assessed whether patients or their family members' past misdiagnosis experiences affect trust in their current physicians. Studies quantifying such impacts could help to develop interventions to restore trust in current physicians and maintain a favorable therapeutic relationship. Japan is a

good laboratory, since the population is largely comprised of a single ethnic group that is matched to physicians.

Our study's purpose was to investigate the associations of Japanese patients and their family members' misdiagnosis experiences with patient trust in their current physician.

METHODS

Setting and Participant Selection

Our study, a cross-sectional online survey, was approved by the Institutional Review Board at Kansai University (# 138). We conducted a panel survey supported by a web-based company (Cross Marketing, Shinjuku-ku, Tokyo) to recruit Japanese patients with non-communicable diseases, aged 20 years or older. Participants were offered incentive points, which can be redeemed for cash, gift certificates, mileage, etc. Participants answered an online questionnaire form prepared by the company. The response data were collected between April 27, 2020, and April 28, 2020, and stored in the server owned by the company. Participants were instructed to answer only once, and researchers could use only the initial entry if they answered more than once. Only those who provided informed consent statement could answer the questionnaire.

Designing Screener Items

To assess for the presence of careless participants,[16,17] multiple "screener" items were designed to identify and exclude them from our analysis.[17]

Screening for Non-communicable Diseases

Participants were asked to select any of the following diseases for which they had received medical treatment twice or more within the past six months: heart disease (arrhythmia), heart disease (angina pectoris, myocardial infarction), heart disease (heart failure), diabetes, rheumatic diseases (rheumatoid arthritis), rheumatic diseases (systemic lupus erythematosus), cancer (limited only to those currently being treated), and depression. These chronic diseases were selected for our survey because they either had high prevalence or required lifelong treatment. Then, they identified the most troublesome illness from those chosen previously. Participants who selected a disease different from the previous choices were excluded.

Validation by Self-reported Drug Name

Participants were instructed to provide the name of a medication prescribed for the most troubling disease in a free-text format. We searched for label information online to assess whether the relevant disease was listed for the indication, in which case, the responses were considered valid. Those who chose cancer and answered "none" for their prescribed drugs were also included, as not all cancer treatments require drug prescriptions. Two researchers conducted these assessments independently; if the evaluations varied, a decision was reached through discussion.

Response Time

We excluded those completing the survey in under 5 min, based on pilot testing of required time to complete the questions. Those who responded too quickly were categorized as careless[16,17] and excluded from our analyses.

Modified Version of the Trust in Physician Scale

For this study, the 11-item Trust in Physician Scale modified by Thom[8] was translated into Japanese after obtaining the original developer's permission. Two physicians (N.Y. and N.O.), a physician researcher (N.K.), and a quantitative psychologist (T.W.) with experience in scale development translated the scale into Japanese. Then, it was back-translated into English by two bilingual individuals (one American and one Canadian). The items were compared with the original items, and the translated and back-translated versions were amended. Finally, they were sent to the original author, and some minor improvements were made. The final version was approved by the original author (Supplementary Table 1).

Before answering the questionnaire, participants read the following statements: "Please answer about your doctor who provides care for your [the most troublesome disease selected by the participant was automatically displayed here]. How much do you agree or disagree with the following statements?" Participants were instructed to rate each item on a Likert scale ranging from 1 (*totally disagree*) to 5 (*totally agree*). We then inverted the score for four negatively-worded items, and converted the sum of all item scores to a score ranging from 0 to 100.[8]

Experience with Misdiagnosis

To assess participants' own experience of misdiagnosis, they were first given the following instruction: "Looking back at all the medical care you have received, please choose 1 (*have had*) or 2 (*have not*) if you have or have not experienced it, respectively." Then, the following question was asked: "Have you been misdiagnosed about your illness?"

To assess a family member's misdiagnosis experience, participants were provided the same aforementioned instructions, following by the question "Has a family member ever been misdiagnosed by a physician?"

Other Patient Survey Variables

A detailed description of items selection and their hypothesized correlations with patient trust are provided in supplementary material (Supplementary Item 1). Patient satisfaction, scored on a 5-point Likert scale ranging from *strongly disagree* to *strongly agree*, was assessed using the

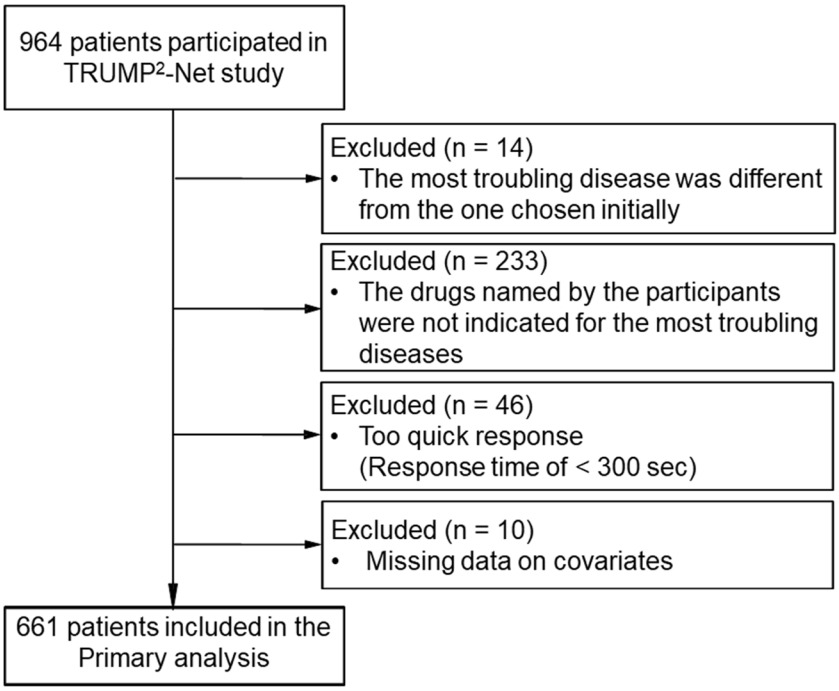

Figure 1 Flow of the study. Abbreviations: TRUMP [2]-Net, Trust Measurement for Physicians and Patients - the Net survey.

item "Overall, are you extremely satisfied with the doctor?"[18] Patients' willingness to follow their physicians, scored on a 5-point Likert scale ranging from *strongly disagree* to *strongly agree*, was examined using the item "If my doctor moves to another medical institution, I would like to visit that institution to see them."[19] Further, physicians' supportive attitudes during visits, scored on a 6-point ranging scale from *completely disagree* to *completely agree*, were assessed using the item "My doctor helped me understand all the information." [20] This item is considered as an attitude that reflects patients' trust in their physician to prioritize what the patient cares about and provide required medical support.[2] The item "I can overcome most illnesses without a physician's help" examined patients' skeptical attitude toward medical care; it was scored on a 5-point Likert scale ranging from *strongly disagree* to *strongly agree*.[21]. This is a modified item from a scale that evaluates medical skepticism.[22] Patients' general level of interpersonal trust was assessed using the 6-item General Trust Scale,[23] rated on a 5-point Likert-type scale ranging from *strongly disagree* to *strongly agree*. The score was computed by summing the items.

Demographic characteristics including age, sex, education level, total household income, and zip code were collected as covariates. We categorized residents' prefectures based on the first three digits of the zip code. The durations of the patient-physician relationships were categorized as less than 1 year, 1–3 years, and more than 3 years.[8,24]

Statistical Analysis

All statistical analyses were performed using the Stata/SE version 15 (Stata Corp., College Station, TX, USA). Participant characteristics were summarized as mean and standard deviation for continuous variables, and frequencies and proportions for categorical variables.

A factor analysis using the MINRES examined the factorial structure of the Trust in Physician Scale items. The number of latent factors was assessed by the eigenvalue attenuation.[25] The absolute factor loadings were calculated. We performed a confirmatory factor analysis to evaluate the fit of the one-factor model to the data, because the original scale had one factor.[8] Reliability was assessed using Cronbach's α and McDonald's ω coefficients.[26] Construct validity was examined by using the correlation between the Trust in Physician Scale and the following factors: patient satisfaction, patient's choice of physician, physician's supportive attitude during the visit, and duration of patients' relationship with their physician.[8] Additionally, it was assessed by testing the correlation between the Trust in Physician and the General Trust scales and patients' attitude toward medical care. Spearman's correlation coefficient was calculated to test the correlation.

To estimate the association between misdiagnosis experience and trust in physicians, we fitted a series of general linear models with cluster-robust variance that accounted for the clustering effect by prefectures.[27] In unadjusted analyses, patients and their family's misdiagnosis experiences were fit to a separate model. In the multivariable-adjusted analysis, patients and their families' experience of misdiagnosis, as well as covariates (age,[8,24,28] sex,[28] level of education, total household income,[28] comorbidities, and the duration of the relationship with their physicians[8,24]), were fitted to a single model. These covariates were chosen as they could be associated with both trust in physicians and the misdiagnosis experience. To examine any interaction between patients and their

Table 1 Participant Characteristics (N = 661)

	n (%)
Age, in years	62.7 (10.1)
Female, n (%)	175 (26.5%)
Education, n (%)	
Junior high school	19 (2.9%)
High school	209 (31.6%)
Junior college	65 (9.8%)
University	325 (49.2%)
Graduate school	30 (4.5%)
Not answered	13 (2.0%)
Total household income, n (%)	
< 1,000,000 yen	40 (6.1%)
1,000,000–< 3,000,000 yen	157 (23.8%)
3,000,000–< 5,000,000 yen	203 (30.7%)
5,000,000–< 10,000,000 yen	205 (31.0%)
≥ 10,000,000 yen	56 (8.5%)
Region, n (%)	
Hokkaido	35 (5.3%)
Tohoku	34 (5.1%)
Chubu	98 (14.8%)
Kanto	273 (41.3%)
Kansai	132 (20.0%)
Chugoku	29 (4.4%)
Shikoku	19 (2.9%)
Kyushu-Okinawa	41 (6.2%)
Reported disease, n (%)	
Cardiac disease, arrhythmia	37 (5.6%)
Cardiac disease, angina pectoris or myocardial infarction	119 (18.0%)
Cardiac disease, heart failure	15 (2.3%)
Diabetes	191 (28.9%)
Connective tissue disease	17 (2.6%)
Cancer	255 (38.6%)
Depression	127 (19.2%)
The most troublesome disease, n (%)	
Cardiac disease, arrhythmia	17 (2.6%)
Cardiac disease, angina pectoris or myocardial infarction	89 (13.5%)
Cardiac disease, heart failure	8 (1.2%)
Diabetes	175 (26.5%)
Connective tissue disease	13 (2.0%)
Cancer	242 (36.6%)
Depression	117 (17.7%)
Duration of relationship with physician, n (%)	
< 1 year	60 (9.1%)
1–<3 years	212 (32.1%)
≥ 3 years	389 (58.9%)

Continuous variables summarized as means and standard deviations (in parentheses)
Categorical variables summarized as frequencies and proportions (in parentheses %)

families' misdiagnosis experience, their product term was entered into the multivariable-adjusted model. Interaction was assessed using the Wald test.

RESULTS

Overall, 3199 individuals received the email invitation to the survey, and 964 individuals participated (response rate 30.1%). After excluding 303 individuals for carelessness or missing covariates, 661 were included in the primary analysis (Fig. 1).

Participant Characteristics

The mean age was 62.7 years, and 175 (26.5%) participants were female (Table 1). Residence included 46 prefectures, with Kanto being the most common one (41.3%), followed by Kansai (20.0%). Cancer was the most common troublesome disease (36.6%), followed by diabetes (26.5%), depression (17.7%), and heart disease (17.3%). Excluded respondents were slightly younger and less likely to be female, but did not differ in education, total household income, or region (Supplementary Table 2).

Table 2 Correlation Between the Trust in Physician Scale and Selected Variables

	Correlation coefficients*	*P*-value
Patient's satisfaction with the physician	0.732	< 0.001
Patients' willingness to follow their physician	0.347	< 0.001
Physician's supportive attitudes during visits	0.731	< 0.001
Duration of the relationship with the physician	0.078	0.044
Patient's skeptical attitude toward medical care	−0.205	< 0.001
Patient's general level of interpersonal trust	0.300	< 0.001

**All variables were tested using Spearman's correlation coefficient*

DESCRIPTIVE STATISTICS AND PSYCHOMETRIC TESTING OF THE TRUST IN PHYSICIAN SCALE

The eigenvalue indicated that the items had a strong unidimensionality (Supplementary Figure 1) with loadings suggesting a single factor solution (Supplementary Table 3). Our data was well fitted (RMSEA: 0.086, CFI: 0.95, SMSR: 0.049), and the survey had good reliability (Cronbach's alpha: 0.91 and McDonald's ω coefficient: 0.93)

The mean trust score was 70.5 (standard deviation: 15.1), ranging from 11.4 to 100, with only 2.6% of participants at the ceiling score of 100. The Trust in Physician Scale strongly correlated with satisfaction with the physician ($\rho = 0.732$) and their supportive attitudes during the visit ($\rho = 0.731$), suggesting construct validity (Table 2). The scale weakly correlated with the willingness to follow their physicians ($\rho = 0.347$) and very weakly with the duration of the relationship with the physician ($\rho = 0.078$). Trust as measured by the Trust in Physician Scale showed a weak positive correlation with general interpersonal trust ($\rho = 0.300$), suggesting that it measured a different concept. Furthermore, it was weakly and negatively correlated with skeptical attitudes toward medical care ($\rho = -0.205$).

Frequency of Misdiagnosis Experiences and Its Relationship with Trust in Physician

Overall, 153 participants (23.2%) had a history of misdiagnosis, and 135 (20.4%) had a family member who had been misdiagnosed. Of all the participants, 71 (10.7%) had both been misdiagnosed and had a family member who had been misdiagnosed.

Table 3 Associations Between Misdiagnosis Experience and the Trust in Physician Scale

Trust in Physician Scale, points	Mean difference	(95%CI)	P-value
Unadjusted*			
Patient's experience with a misdiagnosis	**−5.80**	**(−9.09 to −2.51)**	**0.001**
Patient's family experience with a misdiagnosis	**−5.19**	**(−8.23 to −2.14)**	**0.001**
Multivariable-adjusted†			
Patient's experience with a misdiagnosis	**−4.30**	**(−8.12 to −0.49)**	**0.028**
Patient's family experience with a misdiagnosis	**−3.20**	**(−6.34 to −0.05)**	**0.047**
Age, per 10 years	**1.17**	**(0.06 to 2.29)**	**0.040**
Sex, female	1.17	(−1.49 to 3.83)	0.379
Duration with patients' physician			
< 1 year	Ref		
1–< 3 years	1.13	(−2.86 to 5.11)	0.573
≥ 3 years	**4.28**	**(0.28 to 8.27)**	**0.036**
Education			
Junior high school	Ref		
High school	−1.34	(−6.6 to 3.88)	0.607
Junior college	1.48	(−5.6 to 8.58)	0.677
University	−0.43	(−5.7 to 4.84)	0.869
Graduate school	−3.67	(−12.0 to 4.61)	0.377
Not answered	−1.16	(−9.2 to 6.85)	0.772
Total household income			
< 1,000,000 yen	Ref		
1,000,000–< 3,000,000 yen	5.93	(−1.56 to 13.4)	0.118
3,000,000–< 5,000,000 yen	4.43	(−2.25 to 11.1)	0.188
5,000,000–< 10,000,000 yen	4.81	(−1.54 to 11.1)	0.134
≥ 10,000,000 yen	**9.22**	**(3.38 to 15.1)**	**0.003**
Reported disease			
Cardiac disease, arrhythmia	−0.34	(−6.2 to 5.55)	0.907
Cardiac disease, angina pectoris or myocardial infarction	−1.30	(−5.2 to 2.56)	0.502
Cardiac disease, heart failure	2.41	(−5.0 to 9.78)	0.514
Diabetes	−2.22	(−6.3 to 1.89)	0.282
Connective tissue disease	−1.38	(−8.6 to 5.81)	0.701
Cancer	2.08	(−0.5 to 4.69)	0.114
Depression	−2.49	(−6.4 to 1.44)	0.208

Analysis of 661 patients from 46 prefectures. Bold font indicates significance at P <0.05 in P-value column and corresponding mean difference and 95% confidence interval.
**General linear models with consideration of prefectural-level correlation using cluster-variance*
†General linear model adjusted for age, sex, duration of the relationship with the physician, comorbidities, education, and total household income with consideration of prefectural-level correlation using cluster variance. The variable in each unadjusted model was included in the multivariable model

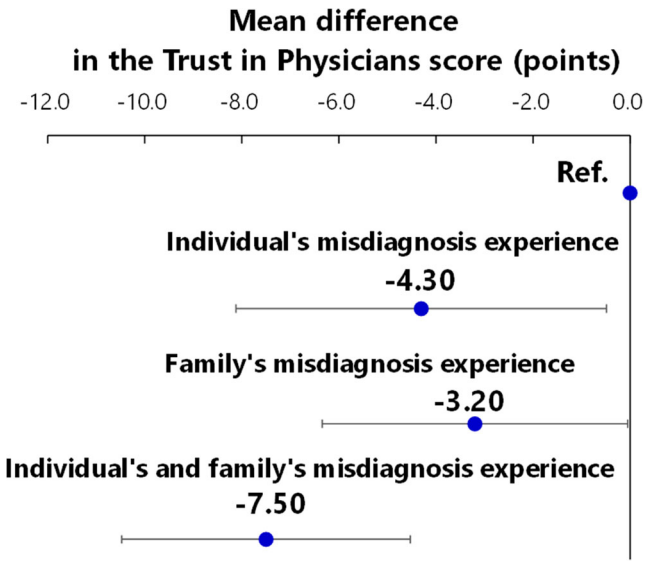

Figure 2 Associations of individual and family misdiagnosis experiences with the Trust in Physicians score. Mean differences were estimated using a general linear model adjusted for age, sex, duration of patient-physician relationship, comorbidities, education, and total household income with consideration of prefectural-level correlation using cluster variance.

In general, Japanese patients had high levels of trust in their providers. Older participants had higher trust scores than younger ones (Table 3: mean difference per 10-year difference: 1.17, 95%CI: 0.06–2.29). Higher income (10 million yen or more) was associated with greater trust (mean difference: 9.22, 95%CI: 3.38 to 15.1). Additionally, a longer relationship with the physician was associated with greater trust (mean difference for more than 3 years and for 1–3 years versus less than 1 year: 4.28, 95%CI: 0.28 to 8.27 and 1.13, 95%CI: −2.86 to 5.11, respectively).

The association between misdiagnosis experience and trust in physicians is shown in Table 3. There is insufficient evidence to suggest the interaction between the individual and relative's misdiagnosis experience in the association with trust (P for interaction = 0.494); therefore, this result supports the associations between the two and trust is additive [29]. Further analyses were performed without considering the interaction term between the two. Patients with a personal history of a misdiagnosis had lower trust (mean difference −4.30, 95%CI −8.12 to −0.49). Having a relative with a history of misdiagnosis also decreased trust (mean difference: −3.20, 95%CI −6.34 to −0.05). A personal or family history of misdiagnosis additively reduced trust, compared with individuals with no personal or family history of misdiagnoses (Fig. 2: mean difference: −7.50, 95%CI −10.5 to −4.53).

DISCUSSION

Having a personal or family history of a misdiagnosis reduces the patient's trust in their current physicians. The impact of having both was additive, nearly doubling the impact on trust. Physicians should consider inquiring about misdiagnosis

experiences, though additional research will be needed to see if open discussion improves trust.

Our findings also support previous qualitative findings about patients and family members' negative emotions and behavioral responses to healthcare past misdiagnoses, and confirm previous general findings about patients' trust in physicians. First, we found that older, wealthier Japanese patients had higher levels of trust, similar to findings from the USA.[8,30] In addition, the finding of generally high levels of trust among Japanese adults was similar to the levels of trust among a predominately Caucasian American sample and a US Chinese older sample.[8,31] Secondly, we found that loss of trust persists to current physicians, extending previous qualitative studies that found distrust for the physician who had made the error.[13,14] Patients often have persistent memories from past medical errors,[14] and loss of trust in current physicians is not surprising. Past experiences shape patients' attitudes toward new physicians.[15] Third, unlike previous studies that treated misdiagnosis as a component of medical errors,[13,14,32] we isolated the effect of misdiagnosis. Since diagnostic accuracy can be considered part of a physician's competence, a misdiagnosis may make patients lose confidence in their physicians and skeptical of other physicians. [33]

Our findings have implications for physicians and researchers. First, physicians should inquire about patients and family members' misdiagnosis experiences as part of initial visits. Second, patients with a personal or family history of misdiagnosis may have lower levels of trust. However, there is no data on how to rebuild trust among this population of patients.[34] It is possible that the impact of a history of misdiagnosis on trust may be less when there has been a longer relationship between the patient and physician and this would be worth studying.

Several limitations of this study warrant mention. First, the sample may not be representative of patients. Men were nearly three times more represented than women, though we adjusted for gender in our analyses. Second, we were unable to determine whether the misdiagnosis experience was related to a current or a past condition. Third, we did not collect information on the consequence of the previous misdiagnosis; it could be that all misdiagnoses do have similar impact on trust.

In conclusion, individuals and family members' misdiagnosis experiences were associated with a reduction in trust of their current physician. Furthermore, these misdiagnosis experiences had an additive effect. Future studies should develop interventions to improve trust lost from past misdiagnosis experiences.

Acknowledgements: *The abbreviated name of the study, "the TRUMP [2]-Net (the Trust Measurement for Physicians and Patients - the Net survey)," was not derived from a specific individual; however, it was determined to suggest a trusted physician, through consideration of the fact that the word "trump" has an ancient meaning of "a dependable and exemplary person."*

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Declarations:

Conflict of Interest: *The authors declare that they do not have a conflict of interest.*

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