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Predicting diagnoses from illness experiences with common cold symptoms before physician consultation: a mixed-methods research

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ABSTRACT

Objectives We aimed to explore whether patients' illness experiences with common cold symptoms could help with predicting the final diagnosis before consultation.

Design Exploratory sequential design of mixed methods: Qualitative and quantitative studies used inductive qualitative content analysis and multinomial regression analysis, respectively.

Setting Consecutive patients at the primary care clinic of a general hospital.

Participants New patients aged 15 years or older were included in the study. Of the 1512 eligible patients who received the questionnaire sheet, 408 selected the common cold as their reason for visiting. All 408 patients responded to the questionnaire.

Main outcome measures First, factors representing illness experiences in patients with common cold symptoms were explored. Second, variables with significant relative risk ratio (RRR) were used to diagnose common cold, influenza or other diseases.

Results A total of 171 codes were identified from the responses of 408 patients, which were visually mapped to show their frequencies and occurrence in the same person according to their final diagnoses. Of the 171 codes, 22 found in over nine patients represented the variables for the three independent final diagnoses. The adjusted final model revealed that (1) 'worry about influenza infection', 'want influenza test' and 'transmission from a colleague at school or workplace' predicted the influenza rather than the common cold, when other predicting variables were constant (RRR, 6.20 $p<0.001$; RRR, 26.1 $p<0.01$; and RRR, 4.69 $p<0.05$, respectively); (2) 'want further examination' predicted other diseases (RRR, 2.84 $p<0.05$); and (3) the combination of 'worry about influenza infection' and 'want influenza test', which predicted the opposite diagnosis: the common cold rather than influenza (RRR, 0.01 $p<0.001$).

Conclusion These findings provide useful information on how illness experiences before consultation can predict final diagnoses for patients with common cold symptoms.

Trial registration number UMIN000030697.

Strengths and limitations of this study

- ► We allowed a total of 408 patients with common cold symptoms to be explicit about their illness experiences by directly stating their feelings, ideas, effects on their functions and expectations before consultation.
- ► A mixed-method analysis enabled us to predict the final diagnoses from the data of the patients' illness experiences, without the physicians' biased perspectives.
- ► The patients' illness experiences could not be wholly determined without direct patient–physician communication because patients occasionally needed help from health professionals to articulate their disease and illness experiences.
- ► This study was conducted at a single rural hospital in Japan, which may have introduced selection bias and limited the generalisability of the results.
- ► Further studies, including those in primary care settings in urban areas, are necessary to validate these results.

INTRODUCTION

Patient-centred care positively influences outcomes such as patient adherence, patient self-reported health and physiological health outcomes.[1] Furthermore, interventions to improve patient-centred communication have proven to be effective in changing practitioner behaviour. In assessments performed using the patient-centred clinical method (PCCM), a physician explores the concepts of health, disease and illness experience from the patients' perspective. Four key dimensions have been proposed as components of PCCM and can help physicians form a perspective of a patient's illness experiences by understanding the patient's personal experiences: (1) feelings, (2) ideas, (3) function and (4) expectations, which are abbreviated as FIFE. By exploring FIFE, physicians aim to perceive (1) patients' feelings about their problems, particularly their fears, (2) their ideas about what is wrong, (3) the effects of the illness on their functioning and (4) their expectations of their clinicians.[2] Several studies have attempted to explore patients' illness experiences during and after physician consultation

using questionnaires, interviews or audio recordings.[3–5] However, the use of more direct observations and more interpretive analyses of communication between patients and physicians to create patient-centred care is desirable.[6] Our literature survey revealed that direct exploration using self-administered questionnaires before consultation has not yet been attempted.

Trainees in family medicine residency have the opportunity to learn patient-centred care during their training.[7] They require plenty of time and experience to gain expertise in PCCM, which is facilitated through feedback from attending physicians.[8] Moreover, without the appropriate skills, trainees would require a relatively long time to elicit FIFE-related information concurrently while recording medical history in a busy clinic. Therefore, to facilitate efficient collection of FIFE-related information, questionnaires were developed that asked patients about their FIFE directly, which could be completed while spending time in a clinic's waiting room before seeing a physician (online supplemental file 1).

The aims of this study were (1) to explore the typical factors representing FIFE in patients who visited a clinic with common cold symptoms and (2) to identify predictor variables with significant relative risk ratio (RRR) to diagnose common cold, influenza or other diseases. The results demonstrated the relationship between patients' illness experience before physician consultation and clinical diagnosis after physician consultation. We focused on patients with common cold symptoms because of their growing numbers at primary care clinics. The common cold is the most frequent acute illness in Japan, the USA and the industrialised world.[9–11] In Japanese primary care hospitals, approximately 11%–16.7% of all patients are diagnosed with upper respiratory infection at their first visit to the clinic.[9 10] Therefore, in this study, we selected patients with cold symptoms to explore their FIFE.

METHODS

Participants

This study was conducted in an outpatient clinic of the Department of General Medicine in a general hospital located in a city in Japan with a population of 47 000 people since January 2018. New patients aged 15 years or older who had not visited the hospital within 3 months met the inclusion criteria for the study. Patients who sought specialists other than primary care physicians were excluded because of free access to medical services in Japan. Eligible new patients were consecutively selected and given a self-administered questionnaire sheet by a nurse. Patients who selected the common cold as the answer to the initial question based on their own perspectives were sampled for further analyses. The patients received an oral explanation about the study from the nurse when the sheet was distributed, and they gave it back in exchange for their consent. The opt-out policy after leaving the clinic was not established in this study because the included questionnaire asked only the details of their symptoms during the course of medical treatment.

Confirmation of clinical diagnosis

The medical charts of all patients were retrospectively reviewed by two researchers. The common cold was defined as an upper respiratory tract infection that predominantly affected the nasal part of the respiratory mucosa, such as acute nasopharyngitis.[12] Therefore, the common cold was distinguished from other upper respiratory infections such as pharyngitis, tonsillitis, sinusitis, otitis media and bronchitis. The final diagnoses were classified into three disease categories: (1) common cold, (2) influenza (diagnosed clinically and/or by a positive result on the rapid antigen test) and (3) other diseases such as pneumonia and urinary tract infection.

Study design and data collection

This study used an exploratory sequential design of the mixed methods.[13] For the qualitative study, a self-administered questionnaire was used for inductive qualitative content analysis to classify the written data into identified categories of similar meanings.[14] Patients' caregivers or nurses supported those who could not write by themselves. The sheet included four questions describing the key dimensions of the illness experiences (ie, FIFE). The sheets were numbered anonymously in a chronological order. The handwritten data, age and sex were entered and saved in a Microsoft Excel file. The Excel database was imported into the MAXQDA 2020 software (VERBI GmbH, Berlin, Germany). The text data for each participant were entered as individual document files in the MAXQDA as a unit of analysis. Simple frequency analysis of codes does not prove a significant association between codes and final diagnosis. The multidimensional analysis could visualise the code occurrence according to the final diagnosis, but the complicated lines and dots often hinder researchers from obtaining adequate results. Therefore, we conducted a regression analysis to confirm and discover our qualitative results.

The document variables in the MAXQDA were converted into an Excel database. The Excel database was imported into Stata V.14 for quantitative analysis (StataCorp). The quantitative study used multinomial regression analysis, and dependent variables were categorised into common cold, influenza and other diseases to find significant independent predictor variables such as those categories explored by the qualitative analysis.

Qualitative data analysis

Two independent researchers coded the content of the words and sentences. Discrepancies were resolved through discussion. Categories were created for cases involving similar codes. Concurrently, analytical rigour was achieved through attention to credibility, dependability and confirmability.[15] For credibility, the researchers spent time assessing the original data and discussed the underlying meanings of the patient responses. Dependability

was achieved using data code–recode procedures in a coding scheme. Confirmability was achieved by recording notes of the codes in MAXQDA during coding procedures and maintaining the coding scheme's objectivity. Two researchers reviewed individual medical charts when the data contained vague wording.

The code frequency was counted based on sex, age and groups representing FIFE elements in the variable table in MAXQDA. The similarity of code occurrence in the questionnaire responses was analysed by creating code maps using MAXQDA. The code map was visualised by positioning the codes in a classic multidimensional scaling method; that is, the more similar two codes were in terms of their occurrence in the data document file, the closer they were placed together on the map.[16] In the code map, each circle symbolises a code with a code name. The larger the size of the circles, the greater the number of code assignments that had been made with that code. In addition, connecting lines between codes indicated co-occurring codes. The thickness of the connecting lines increased with the number of co-occurrences for the two codes. The more popular combinations of codes were displayed on the code map for each final diagnosis by linking the larger circle (codes) with the titles of FIFE codes.

Quantitative data analysis

To analyse the significance of these popular codes for each final diagnosis, a multinomial regression analysis was performed. By designating the common cold as a base outcome, the RRR of influenza and other diseases was calculated for each predictor variable. Patients with missing data for any code were included in the analysis by designating the code as missing. In a univariate analysis to assess the likelihood ratio χ^2 of the final model, factor variables with p-values less than 0.10 were selected for the subsequent multivariate analysis. Variables were assessed for multicollinearity and interactions. Bayesian information criterion (BIC) values in the Stata Fitstat output were used to compare the suitability of the models. The forward–backward stepwise selection method was used to develop the final model. A second adjusted model included an interaction, which was derived from the results of qualitative analysis, because average marginal effects modelling for multinomial regression ignored the interaction in Stata.[17]

Patient and public involvement

The study questionnaire was implemented to help clinicians perform PCCM for outpatients. The clinicians initially used the previous questionnaire asking about medical history, family history, social history and allergies to foods and drugs. Physicians could use the study questionnaire as an ancillary tool to facilitate better patient communication. The study results directly contributed to patient care because the physicians were reminded of specific illness experience patterns using the questionnaire.

RESULTS

Sample and codes

A total of 10 441 people attended the clinic of the general medicine department during the study period from January 2018 to December 2019. Of these, 1512 patients were eligible and received the questionnaires, and 408 patients selected the common cold as the reason for their visit. All 408 patients (200 men and 208 women) completed the questionnaires. The mean±SD age of male and female patients was 48±20 and 52±22 years, respectively. The age distributions of male and female patients did not show statistically significant differences in the two-sample t-test (p=0.12).

The code variables for FIFE included (1) 80 codes for feelings, (2) 29 codes for ideas, (3) 44 codes for function and (4) 18 codes for expectations. The total number of patients who responded to FIFE was 311 (76%), 173 (42%), 106 (26%) and 202 (50%), respectively. Six of the 408 patients provided questionnaire responses indicating 'nothing much' for all four questions.

Final diagnosis of common cold, influenza and other diseases

The review of medical charts from the first visit and follow-up visits yielded the following final diagnoses in 408 patients: (1) common cold, 148 patients; (2) influenza, 92 patients; (3) pneumonia, 15 patients; (4) urinary tract infection, 9 patients; and (5) other conditions, 148 patients, including pharyngitis (16 patients) and sinusitis (12 patients). Four patients had two final diagnoses such as the common cold and a urinary tract infection; therefore, these patients were excluded from the multinomial regression analysis. Finally, 404 patients comprising 145 common cold, 91 influenza and 168 other disease cases were included in the analysis.

FIFE codes observed in patients with common cold symptoms

Frequently observed codes with their numbers are summarised according to the FIFE category in table 1. In the visualised code maps, the top four FIFE codes were adopted to analyse code occurrence because the results were similar when the top seven FIFE codes were used (figures 1–3). The quotes from typical patterns are listed in table 2.

Data saturation of qualitative analysis

The original qualitative data, that is, written text, were collected during the study period. Each questionnaire sheet was numbered anonymously in chronological order, and it produced codes on four FIFE components. A list of the cumulative number of codes of four FIFE components demonstrated similar patterns in the top seven codes in a certain time span during the study period. The 10 most frequent codes for 'feelings' were the same in the data collected in 2018 and 2019. The seven most frequent codes for 'ideas', 'function', and 'expectations' were also consistent between 2018 and 2019. We concluded that data saturation could be confirmed by collecting data over 2 years.

Table 1 Number of participants responding to the top seven codes in FIFE

	Feelings		Ideas		Function		Expectations	
	n=311		n=173		n=106		n=202	
1	86	Worry about influenza infection	31	Transmission from family (environmental factors)	22	Influence on the job	55	Improve general status
2	57	Worry about persistent cough	21	Habitual or self-administered factors	14	Insomnia	52	Want prescription
3	46	Worry about fever	21	Transmission from a colleague at school or workplace (environmental factors)	10	Loss of appetite	38	Want influenza test
4	19	Worry about persistent sore throat	20	Having cold	10	General malaise	30	Want further examination
5	18	Worry about pneumonia	18	Fatigue	8	Insomnia by cold symptoms	17	Want some treatment
6	17	Worry about having cold	9	Insomnia	7	Body pain	12	Want injection
7	15	Worry about headache	7	Due to air conditioner use	5	Influence on motion	9	Want blood test

The codes of each key dimension were categorised in order of frequency. The initial number of each code is the number of patients responding to the codes.

Multinomial regression analysis

The subsequent quantitative analysis rationally adopted three categories of diagnoses as the outcomes: common cold, influenza and other diseases, based on the substantial ratio in this population. Of note, it is worth diagnosing these three in primary care settings to treat patients with common cold symptoms. We adopted 22 types of codes that were observed in more than nine cases in the univariate regression analysis. Age and sex were also included in the univariate regression analysis, and age showed a significant value for the likelihood ratio χ^2 ($p<0.01$). Next, 11

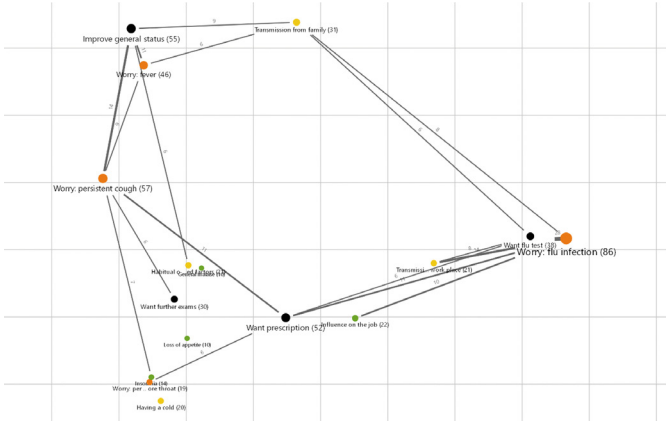

Figure 1 Visualised map showing the occurrence of codes within the same patients visiting the clinic with common cold symptoms (n=408). Coloured circles indicate codes belonging to the four key dimensions of illness experiences, namely, 'feelings', 'ideas', 'function' and 'expectations' (FIFE), which are shown in orange, yellow, green and black circle, respectively. The size of the circle and code font is proportional to the frequencies of the code. Lines reflect relationships between codes observed more than or equal to six times. Both the numbers on the lines and the line thickness reflect the frequencies of combinations of the connected codes among patients. The proximity of the codes reflects the frequency of co-occurrence of the codes in the same patient. The most frequent FIFE relating to 'worry about influenza infection' locates on the right side near 'want influenza test'.

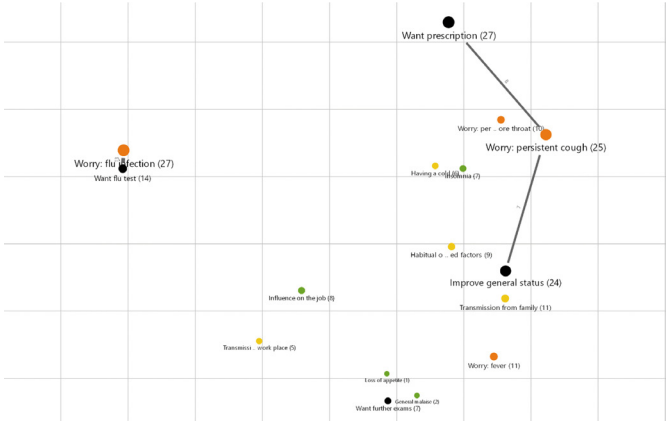

Figure 2 Code map of typical FIFE in the common cold group (n=148). Coloured circles indicate codes belonging to the four key dimensions of illness experiences, namely, 'feelings', 'ideas', 'function' and 'expectations' (FIFE), which are shown in orange, yellow, green and black circle, respectively. The size of the circle and code font is proportional to the frequencies of the code. Lines reflect relationships between codes observed more than or equal to six times. Both the numbers on the lines and the line thickness reflect the frequencies of combinations of the connected codes among patients. The proximity of the codes reflects the frequency of co-occurrence of the codes in the same patient. The most frequent FIFE patterns of the common cold group are located on the left side, relating to 'worry about influenza infection' near 'want influenza test'.

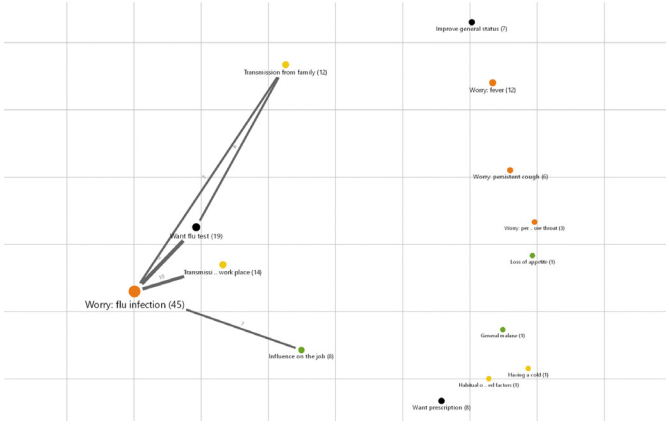

Figure 3 Code map of typical FIFE in the influenza group (n=92). Coloured circles indicate codes belonging to the four key dimensions of illness experiences, namely, 'feelings', 'ideas', 'function' and 'expectations' (FIFE), which are shown in orange, yellow, green and black circle, respectively. The size of the circle and code font is proportional to the frequencies of the code. Lines reflect relationships between codes observed more than or equal to six times. Both the numbers on the lines and the line thickness reflect the frequencies of combinations of the connected codes among patients. The proximity of the codes reflects the frequency of co-occurrence of the codes in the same patient. The most frequent FIFE patterns of the influenza group locates on the left side, relating to 'worry about influenza infection' near 'want influenza test' and 'transmission from a colleague at school or workplace'.

types of codes with the probability of the likelihood ratio χ^2 less than 0.10 were assessed for postestimation: 'worry about influenza infection', 'want influenza test', 'want further examination', 'transmission from a colleague at school or workplace', 'insomnia', 'idea of having cold', 'worry about persistent cough', 'loss of appetite', 'want prescription', 'transmission from family' and 'habitual or self-administered factors'. The four codes, 'worry about influenza infection', 'want influenza test', 'want further examination' and 'transmission from a colleague at school or workplace', were adjusted in the first model; thereafter, the forward–backward stepwise selection method was used to compare BIC values of the models. The best-designated models included only significant predictors and minimised the BIC values. Marginal analysis suggested the possibility of interaction with age for these four factor variables, but the adjusted model with age did not show significance of the interaction (online supplemental file 2). Additionally, the BIC value of the model containing age did not show suitability compared with model 1 (online supplemental file 2). Therefore, age was not included in the final model. In the next analysis of the interaction of factor variables, the results of the code map were used (figures 1–3) because the Stata commands do not compute marginal effects for interaction terms.[18] Multicollinearity could become a problem in logistic regression when one independent variable is linearly or non-linearly related to another independent variable. By comparing the code maps, we could see 'worry about influenza infection' and 'want influenza test' were close in the following groups: all 408 cases (figure 1), common cold group (figure 2) and influenza group (figure 3). These results suggested that these two codes tended to occur in the same person in both the common cold and influenza groups, implying the existence of an interaction between 'worry about influenza infection' and 'want influenza test'. Model 2 was adjusted for the interaction term of 'worry about influenza infection' and 'want influenza test' and compared with Model 1 (table 3). Multinomial regression analysis revealed three conclusions: (1) 'worry about influenza infection', 'want influenza test' and 'transmission from a colleague at school or workplace' predicted influenza infection rather than common cold, when other variables were kept constant (RRR, 6.20 $p<0.001$; RRR, 26.1 $p<0.01$; and RRR, 4.69 $p<0.05$, respectively); (2) 'want further examination' predicted other diseases (RRR, 2.84 $p<0.05$); and (3) significant interaction was observed in the combination of 'worry about influenza infection' and 'want influenza test', which predicted the opposite diagnosis: common cold rather than influenza (RRR, 0.01 $p<0.001$). We constructed 2×2 tables to examine the statistically sufficient number of combinations of these two factor variables in each disease group (online supplemental file 3). In the influenza group, 49% (45/91) worried about the influenza and 21% (19/91) wanted influenza tests, which were significantly higher proportions than those in the common cold group, 19% (27/145) and 10% (14/145), respectively. In contrast, the proportion of patients expressing a combination of both feeling and expectation was almost the same in the common cold and influenza groups, at 9% (13/145) and 13% (12/91), respectively.

DISCUSSION

Main findings

We explored patients' illness experiences with common cold symptoms before physician consultation at a primary care clinic of a general hospital using a mixed-method analysis. Four codes of illness experiences relating to feelings, ideas and expectations independently predicted final diagnoses, such as influenza and other diseases, rather than the common cold. The codes for feelings, 'worry about influenza infection', and the code for expectations, 'want influenza test', individually predicted the influenza, rather than the common cold, but their coexistence predicted the common cold, rather than the influenza.

We speculated the reasons for the interesting results based on our clinical experience. To the best of our knowledge, no previous research has explored the expectations of influenza test results from the general population. Generally, people may believe that the influenza test results and clinical diagnoses are the same. They sometimes want a positive influenza test to get a day off from work or school. On the one hand, influenza patients

Table 2 Quotes observed as the most typical pattern of FIFE in patients worrying about the influenza infection

	Feelings	Ideas	Function	Expectations	Final diagnosis
Case 38 (39 y.o. F)	I worry if I have a common cold or influenza.	Since New Year's day, the influenza has become epidemic in my company. I was exposed to all colleagues developing the influenza.	I can't get off work so long because it is difficult to replace me.	It might be too early, but I want to take the influenza test.	Influenza
Code	Worry about having cold. Worry about influenza infection.	Transmission from colleague at school or workplace (environmental factors).	Influence on the job.	Want influenza test.	
Case 61 (26 y.o. F)	I worry I have the influenza. I wish I could exclude the possibility.	I was exposed to the influenza.		I want to take the influenza test. I want cough medicine.	Common cold
Code	Worry about influenza infection.	Other environmental factors.	N.A.	Want influenza test. Want prescription.	
Case 300 (35 y.o. M)	I worry about the influenza infection.	My daughter developed the influenza on Monday. One of my colleagues also had the influenza.	It will affect my work.	I want to take the influenza test.	Influenza
Code	Worry about influenza infection.	Transmission from family. Transmission from a colleague at school or work place.	Influence on the job.	Want influenza test.	
Case 411 (34 y.o. F)	I worry about the influenza infection.	Three people had the influenza around me.		I want to take the influenza test. If negative result, I want some medicine for a common cold.	Common cold
Code	Worry about influenza infection.	Other environmental factors.	N.A.	Want influenza test Want prescription.	

F, female; M, male; y.o., years old.

have obvious symptoms, such as high fever and general malaise, which convince them that they have a influenza, regardless of the test result. Conversely, some common cold patients who present with subtle symptoms may worry about influenza too much and ask for a influenza test because of: (1) their underlying diseases, (2) the worry of infecting vulnerable family members and (3) working at hospitals or care facilities. If these hypotheses are true, physicians need to determine the purpose of the influenza test by sufficiently asking the patients about their illness context. Further studies are necessary to clarify the differences in illness experiences between the common cold and influenza.

Strengths and limitations

Emotional support, defined as recognising a patient's emotional state and implementing a set of behaviours that ensures emotional support for the patient, is a patient-centred dimension.[19] The strength of our study was that we allowed patients to be explicit about their feelings by directly stating their fears and/or worries. Namely, we used data on patients' illness experiences without physicians' biased perspectives. Our questionnaire sheet was simple enough to express patients' preferences, including their illness experience and expectations, particularly for sick patients suffering from the influenza, even if they were hesitant to ask about something they found difficult to discuss with physicians. A previous study reported patient preferences related to patient-centredness for those who were psychosocially vulnerable or very sick.[20]

A limitation of our study was that we used written answers from the questionnaire sheet without confirming their real meanings. Patients' FIFE could not be wholly revealed without communicative interaction between patients and physicians at the clinic because patients occasionally needed help from health professionals to verbalise their disease and illness experiences, and video recording would be needed to accurately interpret real illness experiences to eliminate interviewers' subjectivity in such a data collection method. We did not make sure of the limitations while filling in the questionnaire, such

Table 3 Multinomial logistic regression to predict final diagnoses

Model 1					Model 2				
Worry about influenza infection (p<0.001)					**Worry about influenza infection (p<0.001)**				
Final diagnosis	**RRR**	**95% CI**	**Coefficient**	**P value**	**Final diagnosis**	**RRR**	**95% CI**	**Coefficient**	**P value**
Common cold	1.0 (ref)				Common cold	1.0 (ref)			
Influenza	**3.43**	1.79 to 6.60	1.23	<0.001	Influenza	**6.2**	2.98 to 12.92	1.83	<0.001
Other diseases	0.55	0.27 to 1.15	−0.59	0.354	Other diseases	0.68	0.29 to 1.55	−0.39	0.354
Want influenza test (p<0.001)					**Want influenza test (p<0.001)**				
Common cold	1.0 (ref)				Common cold	1.0 (ref)			
Influenza	1.04	0.44 to 2.50	0.04	0.926	Influenza	**26.1**	2.95 to 231.29	3.26	<0.01
Other diseases	0.39	0.13 to 1.19	−0.93	0.099	Other diseases	1.24	0.10 to 14.71	0.22	0.86
Want further examination (p<0.001)					**Want further examination (p<0.001)**				
Common cold	1.0 (ref)				Common cold	1.0 (ref)			
Influenza	0	0.00 to 0.00	−13.53	0.978	Influenza	0	0.00 to 0.00	−15.06	0.986
Other diseases	**2.89**	1.19 to 7.05	1.06	<0.05	Other diseases	**2.84**	1.17 to 6.90	1.04	<0.05
Transmission from a colleague at school or workplace (p<0.001)					**Transmission from a colleague at school or workplace (p<0.001)**				
Common cold	1.0 (ref)				Common cold	1.0 (ref)			
Influenza	**3.32**	1.07 to 10.31	1.2	<0.05	Influenza	**4.69**	1.46 to 15.11	1.55	<0.05
Other diseases	0.38	0.07 to 2.18	−0.96	0.279	Other diseases	0.43	0.07 to 2.48	−0.85	0.344
					(Worry about influenza infection)×(Want influenza test)				
					Common cold	1.0 (ref)			
					Influenza	**0.01**	0.00 to 0.12	−4.53	<0.001
					Others	0.25	0.01 to 4.58	−1.37	0.354

Model 1: Common cold as reference value. See text for other more explanation about predictor variables. Pseudo R^2=9.9%, log ratio of χ^2=85.83 (p<0.0001). BIC=837.
Model 2: Common cold as reference value. See text for other more explanation about predictor variables. Pseudo R^2=12.4%, log ratio of χ^2=106.61 (p<0.0001). BIC=828.
Bold font indicates significance at p≤0.05.
BIC, Bayesian information criterion ; RRR, relative risk ratio.

as time and space. Additionally, this study was conducted at a single rural hospital in Japan, which may have introduced selection bias and limited the generalisability of the results. Further studies, including those in primary care settings in a city area, are warranted to validate these results.

Comparison with existing literature

It was notable that patients presenting to the clinic with common cold symptoms responded more frequently to 'feelings' (76%) rather than 'ideas' (42%), 'function' (26%) and 'expectations' (50%) in comparison with the responses in a previous study that observed outpatients at a clinic.[21] In the previous study, 311 consultations with general practitioners showed that patients' issues were more frequently associated with 'ideas' (89%) rather than 'expectations' (79%), 'function' (58%) and 'feelings' (42%). This difference in results could be attributed to the fact that our study method focused on the specific reason for the visit, while the previous study coded patients' verbal behaviour that was recorded in an audiotape of the visit with the physician. Moreover, the differences may also have been influenced by the clinical settings (the previous study included a variety of new patient problems aside from the common cold) and cultural background.

In a study assessing the knowledge of the common cold and influenza in the general population in three European countries,[22] tending to personal hygiene (handwashing, avoiding direct contact with sick people or contaminated objects, frequently ventilating and cleaning rooms), adequate weather attire, as well as avoidance of environmental factors such as drafts and cold temperatures were strongly identified as relevant factors. Our results for the top three codes in 'ideas' corresponded with these findings in that (1) environmental factors were considered to be associated with the risk of viral transmission, and (2) habitual or self-administered factors such as inadequate weather attire and inappropriate air conditioner use were identified as beliefs potentially inducing the common cold or influenza infection in the general population (table 2).

Another previous study also suggested that contact with patients with influenza-like illness predicted influenza infection combined with other cold symptoms.[23] Our study results were novel in that patients' subjective illness experience instead of patients' present illness predicted the final diagnoses in patients with common cold symptoms.

Implications for research and/or practice

Our findings suggest the importance of collecting contextual information from patients. If we survey patients' illness experiences for other diseases using this clinical practice method, we would find new prediction rules to diagnose these diseases before physician consultation. In view of using mixed methods, our study method is an example of the complementary use of qualitative findings and quantitative analysis. The visualised map of qualitative findings created by multidimensional analysis alone could not indicate the significance of the explored factors. Moreover, it helped to choose clinically significant predictor variables to establish the best-fit model for a multinomial regression analysis. Given that the average marginal effects modelling for multinomial regression ignores interactions, the map helps to visually identify the interactions of the variables. The integrated use of qualitative and quantitative analyses was beneficial for this study.

CONCLUSIONS

We directly explored patients' illness experiences that predicted diagnoses based on common cold symptoms before physician consultation. Patients with the influenza tended to worry more frequently about influenza infection or wanted influenza test compared with patients with the common cold. In contrast, patients with common cold tended to have both illness experiences. The idea of transmission from a colleague at school or workplace independently predicted the influenza rather than the common cold. The expectation of further examination predicted diseases other than the common cold. These findings provide useful information for predicting the final diagnosis of patients with common cold symptoms.

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