

A Systems Thinking Approach to Understanding Public Trust in Healthcare Services and Doctor-patient Relationship in the Contexts of Medical Errors

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Abstract

Background: Medical malpractice lawsuits in Thailand have been increasing, often leading to conflicts among stakeholders that could deteriorate the doctor-patient relationship and the public trust in healthcare services. To address this complex problem, we report on a systems thinking approach to developing a mutual understanding among stakeholders on the root causes of deteriorating trust in healthcare services and weakening doctor-patient relationships in the contexts of medical errors.

Methods: We adopted a systems thinking approach and conducted a series of group model building sessions with participating stakeholders from various organizations in Thailand (n=20), including policymakers, administrators of healthcare organizations, healthcare providers, advocates of patient rights, and the victims of medical errors. The initial causal loop diagram was mutually created during the group model building workshop. It was then reviewed and elaborated by community leaders and experts in patient safety and health systems development.

Results: The group model building process revealed that the shared understanding of what causes this persistent problem is lacking, and that multiple perspectives are needed to create sustainable solutions. The final model of our causal loop diagram, which explains why both the public trust in healthcare services and the doctor-patient relationship have been deteriorating over time, consists of four domains: 1) medical errors and malpractice lawsuits; 2) the roles of third-party beneficiaries in medical lawsuits and the conflicts presented on mass and social media; 3) the public trust of healthcare services; 4) the healthcare quality improvement efforts.

Conclusions: Our findings provide an insight into the potential high-leverage points within health systems for reducing medical errors, improving public trust in healthcare services, and strengthening the doctor-patient relationship in Thailand. One of the emerging policy recommendations was to change the existing law towards a balance of monetary and non-monetary remedies for victims of medical errors.

Background

A strong doctor-patient relationship and trust of the public in healthcare services are critical components of effective health systems. A healthy relationship can smooth and complete the exchange of health information between physicians and patients [1], and also improves the outcome of the medical treatment [2]. On the contrary, a weak doctor-patient relationship and a low-level of public trust in healthcare services are factors that can lead to medical errors for healthcare professionals [3]. The World Health Organization (WHO) has reported an 8-12% of medical error occurs in the European Union hospitals within the last century [4]. These medical errors often lead to a change in the patient's trust and the doctor-patient relationship [5]. In Thailand, despite a lack of precise statistical data for the prevalence of medical errors, it was reported that accusations of medical malpractice could jeopardize the relationship between healthcare providers and patients, with an increasing number of patients taking

legal actions against their doctors [6]. Some cases have been brought to court, others to the Medical Council of Thailand, and many others presented by the mass media.

The phenomena of changing doctor-patient relationships and people's trust in healthcare services in the contexts of medical errors are complex, with several unique factors that can interact among themselves. Therefore, the application of systems thinking is needed to reveal every relevant causal factor of the deteriorating trust in healthcare services [7]. More specifically, the current movement of healthcare quality improvement and patient safety has intensified the need to understand the doctor-patient relationship and the patient's trust in their healthcare services after the medical errors happen. Unfortunately, the existing studies fall short of addressing this problem from all relevant stakeholders in Thailand's health systems. Therefore, a whole system approach to understanding this dynamic phenomenon is needed.

We aimed to gain a better understanding of what causes this complex problem and also to explore solutions that could help to improve the public trust and to strengthen doctor-patient in the medical error's context in Thailand. By examining this problem through a systems thinking approach, a more effective intervention should be designed and implemented at the high-leverage points of health systems to improve the public trust and to strengthen the doctor-patient relationship before, during, and after the adverse incidents. Through a structured process of group model building (GMB), we engaged with stakeholders who are embedded in the systems to examine the nature of these complex problems, the pattern of system behaviors over time, and also to highlight the feedbacks within the structure of health systems. In this present paper, we report the results from working with the stakeholders in our GMB sessions.

Methods

Setting

The study was carried out as a research project by Mahidol University's Faculty of Medicine Ramathibodi Hospital, collaborating with Thailand's Healthcare Accreditation Institute. The Ethics Committee of the Faculty of Medicine Ramathibodi Hospital, Mahidol University, approved the protocol of our study (a reference number COA. MURA2019/631). The initial GMB sessions were held as a workshop in Bangkok, Thailand, in November 2018. The follow-up and additional consultation sessions with specific stakeholders were conducted in various places during 2019.

Study design and participants

This study employed systems thinking and modeling methodology based on the system dynamics approach [8]. We adopted five phases of the systems thinking and modeling methodology put forth by Maani & Cavana (2007), including 1) problem structuring, 2) casual loop modeling, 3) dynamic modeling, 4) scenario planning and modeling, 5) implementation and organizational learnings. Our ongoing project aimed to carry on all five phases using a structured process of group model building (GMB) [10, 11]. In this present paper, however, we only report the first two phases of problem structuring and casual loop

modeling that helped us understand the changes of public trust and the doctor-patient relationship in the contexts of medical errors in Thailand.

Our research goal, methods, and collected data were defined before engaging with relevant stakeholders. Research protocols and extensive group model building script were developed by modifying GMB scripts from Scriptapedia [12]. Roles among team members in GMB sessions, including facilitators, modeler, recorder, and production coordinator, were assigned to each member of the research team beforehand. All research team members received training in both GMB methods and techniques for large and small group facilitation before the workshop.

We invited stakeholders from various organizations (n=20) to our GMB sessions. Our participants included 1) policymakers (officers of the Ministry of Public Health: MOPH and that of the Healthcare Accreditation Institute: HAI), 2) healthcare administrators (directors of community hospitals), 3) healthcare providers (physicians and nurses), 4) leaders of non-government organizations (NGOs) that advocates for patient rights (The Thai kidney club, the Diabetes club of Chulalongkorn Hospital, The Thai Hemophilia patient club), and 5) the victims of medical errors and their family members (The Network of Victims of Medical Errors). We identified and approached 24 potential participants by face-to-face communications, by email, and by telephone, but only 20 persons can join our sessions. For the other four who were not able to attend our workshop, one did not return both phone calls and emails; two informed us that they were not interested in the topic; one was not available to participate on the given date.

Our GMB Sessions included a series of scripts designed to explore the interactions and interdependencies between factors affecting the public trust and strengthening doctor-patient in the medical error's context in Thailand. The sessions also aimed to develop a mutual mental model by constructing causal loop diagrams (CLDs) to explore possibilities for intervention to reduce medical errors, improve the public trust, and strengthen doctor-patient in Thailand. There were three phases in our workshop: 1) introducing systems thinking and research goal to participants; 2) developing CLDs; and 3) reflecting, revising CLDs, and discussing policy recommendations. In each GMB session, participants were divided into four subgroups; each group consisted of diverse five people from various sectors. Activities in each session and description of the Scripts are shown in Table 1.

Results

The results of our GMB sessions were a series of causal loop diagrams that documented the mutual understanding of stakeholders about the structural causes of the medical errors, the public trust in healthcare services, and the doctor-patient relationship in Thailand. Figure 1 presents the preliminary CLD (in Thai) co-created at the end of the GMB workshop, and Figure 2 illustrates the revised CLD (in English).

The critical variables discussed in the GMB sessions include the quality of healthcare services, medical errors in healthcare services, patients and families suffering, medical malpractice lawsuits, physician's self-efficacy, and workload per physician. Those variables are linked together in the forms of feedback

loops. The revised and final model contains multiple interacting feedback loops that can be categorized into the four domains: 1) medical errors and malpractice lawsuits, 2) roles of the third-party beneficiaries in medical lawsuit cases and the conflicts presented on mass and social media, 3) the public trust in healthcare services, and 4) the healthcare quality improvement efforts. Table 2 summarizes the balancing and reinforcing loops that constitute the dynamic hypotheses of how system components interact and result in rising medical errors, declining public trust in healthcare services, and weakening the doctor-patient relationship over time.

The first reinforcing loop (R1) shows that medical errors in healthcare services are not directly connected to patients' and families' suffering. But medical errors naturally lead to patients' and families' demand for remedies. A gap between the currently available interventions and the needed remedies result in the suffering of patients and families. Without appropriate communication, counseling, and other forms of non-financial remedies, patients' and families' suffering usually lead to malpractice lawsuits. Finally, the legal litigations can decrease physician's self-efficacy and also the number of physicians of the public healthcare facilities in certain areas, which is the one crucial determinant of the quality of healthcare services in Thailand.

The second and the third reinforcing loops (R2 and R3) show that the relationships between medical errors and medical lawsuits can be amplified by the active roles of third-party who benefit from medical mistakes, such as lawyers, mass media, and social media, etc. Thus, the suffering of patients and families potentially increases an opportunity for the involvement of third-party beneficiaries. Moreover, mass and social media often presented the suffering of patients and families, which can result in even more conflicts between patients and physicians. Consequently, those raised conflicts can lead to a lower level of people's trust in healthcare services, as shown in the fourth reinforcing loops (R4).

The first and the only balancing loop (B1) shows that the quality of healthcare services is one of the potential high-leverage points in the causal loop diagram. From the stakeholders' perspective, improving healthcare quality improvement efforts and related healthcare infrastructure produce fewer medical errors. Many workshop participants also claimed that people's contribution to healthcare quality improvement is a vital issue. The gap between the ideal quality and current quality of healthcare services accelerates the willingness of people in people's participation in healthcare quality improvement efforts.

At the end of our GMB sessions, the facilitators also initiated a discussion about possible high-leverage points within the health systems to change the current dynamics of the problem, and our participants came up with two sets of policy interventions.

First, allocating more resources to healthcare quality improvement efforts and strengthen the governance mechanisms that control healthcare services quality in the country can be a high-leverage intervention that leads to minimizing medical errors. As a result, we could reduce medical malpractice lawsuits in Thailand and improve the doctor-patient relationship and public trust in healthcare services.

Second, providing adequate remedies for patients and families who have suffered from medical errors can alleviate their suffering. However, during our discussion of remedy options, most of the workshop participants think of expanding the use of the remedies funds. After having been consulted with community leaders and experts in patient safety, healthcare quality improvement, and health systems development, we were suggested that financial remedies can lead to both positive and negative consequences. Although remedies fund decreases the suffering of patients and families, the fund also increases their demands for financial remedies, which can create the gap between available interventions and the need for remedies. As the term “remedies” can refer to both monetary interventions, policymakers should consider both the financial compensations paid by the remedies fund and non-monetary interventions such as empathetic communications from the healthcare teams. Therefore, one of the emerging policy recommendations was to change the existing law towards the balance between monetary and non-monetary remedies for victims of medical errors.

Discussion

Concerning the negative impacts of the medical errors, our research is among the first empirical study that utilized the GMB process to investigate the causal structure of why the public trust in healthcare services and the doctor-patient relationship have been weakening over time. Working with relevant stakeholders, we identified potential high-leverage points in health systems to reduce medical errors, improve public trust in healthcare services, and strengthen the doctor-patient relationship in Thailand. The implications of our research are two-fold: that the GMB methods can serve as a useful tool to elicit a common understanding that is usually lacking, and that multiple perspectives are needed to create a more sustainable solution.

The shared understanding is lacking

Our study demonstrates that the GMB methods can serve as a useful tool to elicit a common and in-depth understanding of complex problems of why the public trust in healthcare services and the doctor-patient relationship have been declining. Most workshop participants indicated that the GMB process encouraged them to learn and collaborate with people from various organizations in both the public and private sectors of Thailand. They primarily benefited from hearing the direct experiences of people who had been impacted by medical errors. This benefit has been well reflected by an in-depth understanding of the problem, as shown in the mutually-synthesized CLD.

Even though the GMB process is an effective method for participatory research that addresses cultural and ideological barriers to collaboration, there are many other reasons why partnerships were difficult [13]. We also encountered several challenges during our GMB workshop. For instance, in the “hopes and fears” session designed to decrease the barriers among the workshop participants, participants were confused with the ideas of whose hopes and fears. Such confusion could also suggest a lack of shared understanding of this problem and a lack of common goals of problem-solving among the stakeholders. Besides, improving the quality of healthcare services was suggested as the best potential intervention to

enhance patient trust and the doctor-patient relationship in medical errors. Nonetheless, one participant insisted that people's participation in healthcare quality control and improvement is more crucial and should be identified as a critical point instead. Without enough time to elaborate and discuss to reach the consensus among the stakeholders, it was not clear to many why and how people's participation in healthcare quality control can be the high-leverage points.

Looking back, we might need further discussions in our GMB sessions on the term "people's participation" in healthcare quality control and improvement, as a different group of stakeholders has different interpretations. We have learned first-hand that people from different backgrounds usually bring about different assumptions in problem-solving that sometimes can create the barriers to the synthesis of our shared understanding of this complex problem of the diminishing trust in healthcare services by the public.

Multiple perspectives are needed to create sustainable solutions

Inviting patients and families who are the victims of medical errors to be actively involved in our GMB process could be seen as one of the strengths of our study. Many workshop participants also indicated that the GMB process encouraged them to learn and collaborate with people from various organizations in both the public and private sectors of Thailand. They significantly benefited from hearing direct experiences of those who had been impacted by medical errors. Research also showed that patients could provide a unique perspective. For instance, it is found medical record accessibility contributes to co-management of personal health care from the patient perspective, which can contribute to better communications, patient participation, and doctor-patient relationship [14]. The benefits of having learned from multiple views of all relevant stakeholders can be seen in all four domains of our final CLD.

Reforms should go beyond liability issues; they should also harness and enhance physicians' ability to act. More visible efforts by physicians to reduce harm, better communication with patients and others, and actual evidence of improved patient safety should reduce patient anger and litigiousness [15]. Reforms should pay a good deal of attention to developing a better rapport with patients, providing information, and involving the patient in decision-making about care [16]. Nonetheless, we also observed that the participants who advocate for patient rights especially emphasized that the remedies for the victims are the definitive solution to this complex problem. Remedies, which can be monetary or non-monetary, were also suggested as a possible solution to promote the doctor-patient relationship when medical errors happen.

Currently, all the remedy programs provided under the National Health Services Act 2002 covers only about 70% of Thai populations under the Universal Coverage Scheme (UCS) under Thailand's Universal Health Coverage (UHC), leaving patients under other payment schemes uncovered by any remedy programs. The UCS remedy program pays up to 400,000 Baht (13,000 USD) and has no support for permanent loss or damage that needs long-term treatment [17]. A new bill specifically designed to support patients who were affected by medical error was already drafted. It was aimed to reduce the patient's hassle by fastening the process of remedy payment to be within one year, and to extend the

coverage to all Thai patients under the other public healthcare financing schemes besides the UCS. But to date, this bill has not been passed into law despite more than ten years of urging from the patient's network.

By prioritizing a monetary option, it could create a tangible solution. According to our CLD, however, advancing the patient's remedy bill would be only a part of the potential policy interventions. There was hope that this bill will help provide a powerful remedy to the patient and lessen the number of cases proceeding to a lawsuit by utilizing mediation instead. Nonetheless, the result from our GMB suggested that the financial compensations might not be enough in alleviating the suffering of patients and families.

A balance of monetary and non-monetary remedies for victims of medical errors is needed. Research has shown that a prompt sincere apology and communication to investigate the case and develop future prevention from healthcare providers can reduce the situation's escalation to a lawsuit in several countries and settings [18–20]. Physicians who understand and can respond appropriately to the emotional needs of their patients are less likely to be sued [21]. As suggested by this stream of patient safety literature, a new governance mechanism that can promote straightforward apologies and communications of healthcare providers should be included in the bill or the policy discussions. The public trust in healthcare services can be nurtured by fostering psychological safety among health professionals [3, 22], which would allow them to apologize and communicate with the victims of medical errors appropriately. Furthermore, as social media can amplify the situation and be utilized for both sides, developing its regulatory environment is also appealing for policymakers. These lessons learned can only be obtained by seeing the problem from the perspectives of all stakeholders during the GMB process, and hence multiple perspectives are needed to create sustainable solutions

Study limitations

Although our study was very focused on involving a diverse group of stakeholders in health systems, the diversity within each group of stakeholders was limited. For instance, we only learned after the workshop that most participants who represented patients and families in the GMB process have already been involved in the networks that advocate for enacting the law to finance the remedies fund. Consequently, the relationship to the 'remedies' variable in our CLD is mainly focused on the remedies fund, but not on other aspects of the remedy process. Consultations with experts from various areas, such as lawyers, and additional literature reviews in the related fields, such as health policy and systems research, are required to explore every aspect of the problems. Consultations with experts from other areas of study and additional literature reviews can lead to a more comprehensive causal mapping. But it should be more focused on some confusing terms, as experienced in our GMB process—either to clarify the concepts or to elaborate some interconnected relationships among them.

Lastly, to test policy options and identify the high-leverage policy quantitatively, a stock and flow diagram based on the present CLD is needed to be further developed for a system dynamic simulation modeling. The findings from system dynamic simulation modeling presented as a visualized trend of outcomes

could lead to a more rigorous design of interventions and a more decisive, evidence-informed policy decisions.

Conclusions

In dealing with the complexity of deteriorating doctor-patient relationship and the public trust in healthcare services in the contexts of medical errors, we found that systems thinking and modeling methodology offers an alternative way to obtain a better understanding of this complex program. This problem-solving approach, as described in our study, is driven by multiple perspectives of stakeholders embedded within Thailand's health systems. Building upon the knowledge and expertise of the participants, our study provides a robust and sophisticated casual map, with potential policy recommendations actionable at the high-leverage points of systems.

With this GMB framework that pays attention to the implicit knowledge of people, our systems thinking approach can provide a room for a reflection of collaborative stakeholders and policymakers on the problems on hands, which allows for emerging policy interventions at the high-leverage points within health systems. While focusing on mutual outcomes, the process can also create the opportunity to build a common goal among stakeholders, which is crucially needed to create the momentum for actions. This participatory process is incredibly valuable for perplexing problems such as increasing medical errors and deteriorating public trust in healthcare services in the fast-paced changing of health systems.

Abbreviations

GMB: Group Model Building; CLD: Causal Loop Diagram; BOT: The Behavior Over Time; UCS: The Universal Coverage Scheme; UHC: The Universal Health Coverage; USD: The U.S. Dollar; WHO: The World Health Organization; MOPH: The Ministry of Public Health; HAI: Healthcare Accreditation Institute; NGO: non-government organization

Declarations

Ethics approval and consent to participate

The protocol of our study was approved by the Ethics Committee of the Faculty of Medicine Ramathibodi Hospital, Mahidol University (a reference number COA. MURA2019/631). We obtained the written informed consent from all participants of our group model building sessions.

Consent for publication

Not applicable.

Availability of data and materials

The datasets generated and analyzed during the current study are not publicly available as they contain sensitive information and data that could potentially identify participants.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

SR, PW, AS, and GS conceived the original ideas of the project. SR, PW, AS, GS, and PK carried out the group model building sessions under the supervision of PL and BL. PK, PP, KS, and BL contributed to the interpretation of the preliminary findings. PP, KS, and PK identified additional consultations with experts after the group model building sessions and carried out further consultations. PP, KS, PK, and BL finalized the causal loop diagram and its interpretation. PK, PP, KS, and BL drafted the manuscript and revised it critically for important intellectual contents. All authors read and approved the final manuscript.

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Tables

Table 1 Group model building session plan and description of GMB Scripts

Activity	Description
Phase I: Introducing systems thinking and research goal to participants	
Introduction to Systems and Defining Terms	<ul style="list-style-type: none"> <li data-bbox="313 310 1549 384">– The lead facilitator and the team members opened the meeting and introduced the basic concept of systems thinking, causal loop diagram, and methods. <li data-bbox="313 405 1549 478">– The lead facilitator also explained the overview of the project and the goal of the meeting to participants. <li data-bbox="313 499 1549 573">– The workshop participants were requested for an active engagement throughout the workshop.
Phase II: constructing causal loop diagrams (CLDs)	
Hope and Fear	<ul style="list-style-type: none"> <li data-bbox="313 667 1549 772">– The participants were asked to write their hope and fear toward the medical error system in Thailand using sticky notes and post their messages on the board in front of the meeting room. <li data-bbox="313 793 1549 835">– The participants were assigned to process their hope and fear by themselves. <li data-bbox="313 856 1549 919">– The facilitators then categorized the notes and chose significant variables for future activities. <li data-bbox="313 940 1549 1077">– Variables were chosen base on subjects that were mentioned most on sticky-notes and received the most votes from the participants. The recorder recorded variables as a list, and the modeler sketched variables with the Vensim software during this process.
Variable Elicitation and CLD Elaboration	<ul style="list-style-type: none"> <li data-bbox="313 1108 1549 1182">– The lead facilitator explained medical errors as a dynamic problem and introduced the “Behavior Over Time Graph” (BOT) to the participants. <li data-bbox="313 1203 1549 1308">– The participants discussed with their group for variables from previous activity. The variables they chose must be either had influenced or had been affected by medical error over time in Thailand. <li data-bbox="313 1329 1549 1434">– The participants drew the BOT on the board, with the X-axis was labeled as “time” (from the last ten years to the next ten years), and the Y-axis labeled as the variable name that each group selected. <li data-bbox="313 1455 1549 1560">– The facilitators suggested each group to choose the variable that was able to measure and sketched the variable on the graph, with the three options of best-case, business-as-usual, and worst-case scenarios. <li data-bbox="313 1581 1549 1686">– The facilitators were designated to mentor each 5-people group during this session. Each group described the graph, and the facilitator discussed each graph and asked for more information. <li data-bbox="313 1707 1549 1791">– The facilitators encouraged each group to work on finding drivers of system behaviors and solicit outcomes and causes on sticky notes. <li data-bbox="313 1812 1549 1885">– The participants were asked to brainstorm and drew the “Circular Relationship Graph” to identify possible relationships between variables on the board. <li data-bbox="313 1906 1549 1980">– Each group was assigned with one variable from the variable list, then refined or added other variables that connected with the given variable.

- The facilitators then led each group to transfer their variables to CLD and drew their CLD on the board separately.
- The lead facilitator challenged the participants to put the direction of each relationship, either with the plus signs representing a change in the same direction, or minus signs representing a change in the opposite direction on their models.
- The facilitators were also designated to mentor each group while participants discussed their models.
- The modeler and recorder clustered, reviewed, and verified variables and connections from each group's CLD. They also rechecked if all variables were precisely connected in the right direction in the model.
- The modeler put CLD results on the Vensim software and prepared for the final CLD to be discussed in the next phase of the workshop.

Phase III: reflecting, revising CLDs, and discussing policy recommendations

Model Review

- Each subgroup presented and talked about their CLDs and together discussed each group model.
- The lead facilitator then showed the final CLD that was already deliberated among team members to the participants and summarized by pointing out the reinforcing loop and balancing loop.
- The facilitator opened the opportunity for participants to suggest their opinions for final CLD.
- The modeler reviewed each suggestion carefully and adapted them into the model.

Initial Policy Options

- The lead facilitator presented the concept of policy interventions and policy levers to participants after the afternoon break, and then encouraged participants to identify leverage points from the model and discussed them within each group.
- Each group was assigned to vote only one significant leverage point that will create a sustainable change to the problem and recommend policy interventions that might help improve the medical error system in Thailand.
- The facilitators were further reviewed and adjusted some variables and connections in the final CLD along with linkage directions to achieve the current causal loop diagram, conclusions, and recommendations that apply to the Thai context and able to be implemented.

Model Review

- After the workshop, the researchers continue revising the final causal loop diagram in terms of linking polarity and variable clarification.
- The research team continually presented this causal loop diagram to policymakers at the national level, including stakeholders from Thailand's Medical Council, Ministry of Public Health, and the Healthcare Accreditation Institute, and asked for their feedback to improve its validity.

Table 2 Important feedback loops found in the final Causal Loop Diagram model		
Loop	Name	Description
R1	Medical Errors and Medical Malpractice Lawsuits	Low quality of care creates medical errors, while the gap between the currently available interventions and the needed remedies creates tremendous suffering of patients and families and eventually lead to medical lawsuits. The litigations, in turn, reduce physician's self-efficacy that increases can the turnover rate, and increases the workload per physician that inevitably increases the chance of them providing a lower quality of care and create even more medical errors.
R2	Roles of Third-party Beneficiaries in Lawsuits	The suffering of patients and families from medical errors increase an opportunity for the involvement of the third-party such as lawyers, mass media, and social media, which recreates lower quality of care through a lesser physician's self-efficacy.
R3	Conflicts Presented on Mass and Social Media	The suffering of patients and families from medical errors also lead to a greater chance of more conflicts between patients and physicians presented on mass and social media.
R4	Public Trust in Healthcare Survives	More significant conflicts presented on mass and social media lead to a lower level of people's trust in healthcare services over time.
B1	Healthcare Quality Improvement Efforts	Healthcare quality improvement efforts have driven the gap between the ideal quality and current quality of healthcare services, which accelerates the willingness of people in people's participation, if not having been compromised by a low-level of public trust in healthcare services.

Figures

