

Pay-for-Performance Programs in Diabetes Care: The Perspective of Medical Satisfaction and Value Co-creation

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Abstract

Background: Few studies have addressed quality of care in pay-for-performance (P4P) diabetes programs from the perspective of patients' perceptions. This study aimed to explore the relevance among interaction, trust, co-decision-making, information disclosure, medical satisfaction and value co-creation.

Methods: A large-scale survey of P4P diabetes patients was conducted from April to June in 2014. The total number of qualified outpatients was 313 and the return rate was 50.2%.

Result: Significant impacts were observed after the implementation of the P4P programs for diabetic patients. Interaction ($\beta=0.155$, $p<0.01$) and information disclosure ($\beta=0.698$, $p<0.001$) had a significant positive effect on medical satisfaction, Interaction ($\beta=0.134$, $p<0.01$) and information disclosure ($\beta=0.563$, $p<0.001$) had a significant positive effect on value co-creation.

Conclusions: A good patient–physician relationship can be established through information disclosure and effective communication by both parties. Fluent communication between patient and physician helps improve satisfaction with medical service and facilitate the creation of higher value. Health authorities could develop policies to increase participation in P4P programs and encourage continued improvement in health care outcomes.

Keywords: Pay-for-performance; Interaction, Information disclosure; Medical satisfaction

Introduction

The health competent authority in Taiwan initiated the allowance reduction of the outpatient visits at regional hospitals and higher hierarchical hospitals from 2018, the allowance of outpatient visits at the regional hospital and medical centers will be reduced by 2%, followed by a total of 10% reduction in 5 years, the ultimate goal is to implement a hierarchical medical system [1]. Therefore, patients are free to visit physicians at community clinics or hospital outpatient departments for any episode based on their preference. In addition, Taiwan’s National Health Insurance (NHI) was launched in 1995, and has improved public access to health care services [2].

The characteristics of ambulatory care in Taiwan differ somewhat from those in other countries [3]. As a result of the freedom of choice and the easy access to ambulatory care, the average number of annual western physician visits was ~12.1 per capita, compared with an average of 1.9 visits per year in 2017 in other developed countries in the Organization for Economic Cooperation and Development [4] Primary care workloads (the number of patients seen per day) are also relatively high in Taiwan compared with those in other countries, and the duration of patient visits with the physician is very short—often 2 to 5 minutes [5-6]. Accordingly, patients are often criticized for their doctor shopping behavior, which may hamper the continuity of care between patients and their physicians [5].

Diabetes has been the fifth leading cause of death in Taiwan since 1986, accounting for 3% of the total healthcare expenditure of the NHI program. The standardized mortality rate of diabetes grew from 15.6 per 100,000 in 1981 to 26.6 per 100,000 in 2009 [7]. In October 2001, the Bureau of National Health Insurance (BNHI) implemented a pay-for-performance (P4P) program for diabetes, the Diabetes Mellitus P4P (DM-P4P) program. Physicians may also receive quality bonuses (paid quarterly), which vary according to their performance (relative to their peers) in a number of selected measures, 2017 diabetes standard mortality rate has dropped to 23.5 per 100,000 [8]. Hospitals and community clinics with physicians specializing in internal medicine,

pediatrics, family medicine, metabolic medicine, endocrinology, cardiology, or hematology are eligible for voluntary participation. Physicians seeking to participate in the DM-P4P program were required to be certified as medical personnel for the diabetes shared care system [9].

P4P programs—payment initiatives that reward providers for improving or delivering high quality healthcare—can improve a variety of healthcare processes and outcomes [10-11], and reduce overall health care expenses over the long term [12]. The primary feature of P4P programs is the financial incentive to encourage providers to follow certain patient-centered treatments and practice recommendations to improve the quality of care [13-14]. P4P programs have been widely advanced in health care as a means to improve the value of care [15].

The patient–physician relationship evolves with time. In the past, most doctors played dominant roles while patients fully cooperated and followed doctors’ instructions. Disclosure refers to how much information regarding diagnosis, therapies and conflicts of advantages the doctor tells the patient. In the 21st century information disclosure received greater attention and better communication between doctors and patients began. Then, the idea took hold that shared decision-making in health care begins with a good patient–physician relationship [16]. The interaction between physicians and patients is a multidimensional social relationship [17-19] in which patients play active rather than passive roles in maintaining or improving their health. In other words, patients and physicians must share information, authority and responsibility [20-21]. A good patient–physician relationship is beneficial in terms of creating higher value when medical services are provided and used. Sassy and Hollander [17] pointed out early in the 1950s that the patient–physician relationship is the interpersonal interaction between doctors or related health care professionals and patients [22].

From a value creation theory [23-24], value co-creation with customers has become a relevant topic academically and managerially [25] and is when two stakeholders expansively create and increase the common value via joint activities [26-27]. About the patient-physician relationship, a higher mutual trust through continual services, it usually leads to the medical satisfaction and more favorable outcomes [7,28-30]; transparent information disclosing may add idly reduce information asymmetry [31-35]; the patient-physician interaction creates customer value [36]. In addition, shared decision-making, evidenced-based, promotes collaboration between patients, family members, and healthcare providers to determine the best treatment plan [36-39]; the interaction is essential to value, enhances the medical co-creation [40-43], and thus is complex and determines the medical care value.

It auxiliary improves the relationship value by applying resources [44-45]. The medical service top goal is to: provide highly efficient medical treatment; finally produce the best probable medical outcomes [46]. Moreover, more and more scholars value the co-creation [47-50]; the reliable sources mainly emphasize that mutual trust [51-52], interaction [53], shared decision-making [54], and information disclosing [31-35] enhance the medical co-creation values [40-42].

The effect of the value co-creation on patient satisfaction is to highlight the mutual trust for deciding and interacting. Therefore, the medical service input and output on patient satisfaction are to achieve the patient satisfaction-based value co-creation, specifically to explore the related: interaction; mutual trust; shared decision making; information disclosing. Consequently, the health care gap can be bridged.

Methods

Research design and subjects

It is a cross-sectional survey study on the hospital which has been graded “Excellent” in the hospital accreditation and classified as a regional hospital in the National Health Insurance program, a survey of P4P diabetes patients was conducted from April to June in 2014. For the sampling, patients were convenience sample selected and interviewed by well-trained interviewers at outpatient settings or clinic offices in participating institutions. Diabetic patients with ICD-9-CM diagnosis code 250 at the time of their outpatient visits who could communicate in Mandarin or the Hocking dialect were eligible to participate. Patients who agreed to participate were asked to sign a letter of consent. Patients were encouraged to fill out the questionnaire themselves. Trained interviewers provided assistance to patients who were illiterate or suffered from presbyopia or other eye diseases. The total number of qualified outpatients was 313 and the return rate was 50.2% (n=623). Sex and education were used to examine the appropriateness and prove the effectiveness of the samples, and the result showed that these two factors did not have significant influence ($p=0.251$; $p=0.246$), indicating that each feature was representative. The questionnaire and research design were inspected and approved by the Institutional Review Board of Show Chwan Memorial Hospital (IRB 1030403) and all subjects signed an informed consent form.

Tools

The “Pay-for-Performance Programs” questionnaire, the research tool in this study, was drafted with reference to related literature. The questionnaire includes six dimensions, i.e. interaction, trust, shared decision making, information disclosure, medical satisfaction and value co-creation. In the early stage of the research, we compiled 47 questions, and scored using a 5-point Likert scale from “strongly disagree” 1 to “strongly agree” 5. Higher score indicates better medical satisfaction and value co-creation.

Interaction refers to the interpersonal interaction and relationship between doctors and patients; trust refers to the confidence between patients and physicians and the degree of confidence in medical treatment. Shared decision making means that doctors allow patients to join in the process of medical care while being treated and allow them to participate in treatment decisions. Information disclosure refers to full information disclosure between physicians and patients, and the exchange and sharing of the medical knowledge required to eliminate information asymmetry

in both parties. Medical satisfaction and value co-creation are the measures used to improve the quality and cooperation of medical service as well as value co-creation through finding and solving problems in medical and health care.

The basic information on subjects includes sex, age, education, marital status, smoking status, alcohol consumption, exercise habits, family history of diabetes and length of time since diabetes diagnosis. After the draft of the scale was completed, five experts in health care administration and medical care were invited to conduct expert validation and provide modification suggestions. After the experts reviewed and discussed the questions, eight of the original 72 questions were deleted and 63 questions were left for inspection. The Content Validity Index (CVI) for the appropriateness of the questions was 0.93. In general, the questions on the original questionnaires determined the first draft before the grading method was selected. Thus, the questionnaire has effects to some degree on the measurement of variables and constructs. Finally, the final questionnaire was modified based on the content validity and face validity of actual interviews and theories.

Data analytical method

SPSS for Windows 19.0 was used to create files and analyze research data, and the level of significance was set as $p < 0.05$. First, the demographic variables, smoking status, alcohol consumption, exercise habits, family history of diabetes and length of time since diabetes diagnosis are shown through the descriptive statistics of patients. The patients' data were used to determine the best regression model. To prevent sampling errors from affecting the study, non-response error verification was conducted immediately after questionnaires were received. The received questionnaires were divided into early respondents and late respondents based on the criteria of Armstrong and Overton [55] and verified using important constructs such as interaction and value co-creation. Our results showed no significant difference in these important constructs, and therefore non-response errors should not affect the sampling of the study.

Results

Descriptive statistics of sample characteristics

Table 1 summarizes P4P patient demographic characteristics and characteristics of the participating healthcare institutions. Of the 313 effective samples of P4P participants, 56.9% were male. In the female and male respondent groups, 30.4% and 42.8% were aged >50 years ($p < 0.05$), 14.7% and 20.8% were senior high school students ($p < 0.05$), 31.9% and 48.2% were married ($p < 0.05$), 41.2% and 46.0% were non-smokers ($p < 0.001$), 42.2% and 46.0% were non-drinkers ($p < 0.001$), 29.7% and 47.0% exercised regularly ($p < 0.01$), 31.9% and 37.7% had a family history of diabetes ($p < 0.05$), and 11.5% and 18.2% had been diagnosed with diabetes <5 years prior ($p < 0.05$).

Reliability and validity test of the measurement model

The examination of the measurement model includes internal consistency, convergent validity and discriminated validity. First, three indicators are used to test the convergent validity of the research tools in accordance with Lee and Scott's research guidelines [56] as follows. (1) Factor loading should be significant and ≥ 0.5 . (2) Cronbach's alpha and composite reliabilities (CR) should be ≥ 0.60 and 0.70 [57]. (3) Averaged variance extracted (AVE) should be ≥ 0.50 . (Note: In other words, the square root of AVE should be ≥ 0.71 .) It can be seen in Table 2 that the AVE of each construct is 0.5 or higher on average, meaning that the measurement model has great convergent validity. Cronbach's alpha and complex reliability (CR) are consistent with the aforementioned. Hence, the research tools meet the basic requirements of the three convergent validity indicators mentioned above, indicating that this study has convergent validity and discriminated validity, which proves the accuracy of the measurement result.

Discriminated validity describes how well the measurement variables discriminate between different constructs. The correlation coefficient of each variable and other variables by which the same construct is tested should be higher than that of the variables that are used to measure different constructs. To conduct the discriminated validity test, the AVE square root (Table 3, bold values appearing diagonally) of each individual construct should be higher than the correlation coefficient of other constructs in the model (Table 3, values not appearing diagonally). Table 3 shows the matrix of correlation coefficient of each construct. The AVE square roots of the construct are shown diagonally. As shown in Table 3, the AVE square root of the measurement variable of each construct is higher than the correlation coefficient of any two constructs, indicating that the study has good discriminated validity.

Multiple regression analysis was conducted on variables regarding the effect of P4P programs on diabetes care and medical satisfaction. The analysis showed that after controlling for the other variables, R^2 of medical satisfaction model was forecast to attain 71.0% and $F=38.195$, $p<0.001$, reflecting the statistical significant difference. The factors with a significant difference included time since diagnosis, interaction and information disclosure. Time since diagnosis less than 5 years and medical satisfaction showed a significant negative correlation ($\beta=-0.118$, $t=-3.14$, $p<0.05$), and interaction and medical satisfaction showed a significant positive correlation ($\beta=0.155$, $t=2.896$, $p<0.05$). Information disclosure and medical satisfaction showed significant positive correlation ($\beta=0.698$, $t=10.307$, $p<0.001$). There was no significant primary effect of sex, age, educational level, marriage status, smoking status, alcohol consumption, exercise habits, family history of diabetes, trust and shared decision making toward the medical satisfaction, and there was no statistical significant difference in β value ($p>0.05$).

The analysis showed that after controlling for other variables, R^2 of the value co-creation model was forecast to attain 67.6% and $F=29.599$, $p<0.001$, reflecting a statistically significant difference. The factors with significant differences included interaction and information disclosure. Interaction and value co-creation showed a significant positive correlation ($\beta=.134$,

$t=2.283$, $p<0.05$), and information disclosure and value co-creation showed a significant positive correlation ($\beta=.563$, $t=7.594$, $p<0.001$). There was no significant primary effect of sex, age, educational level, marriage status, smoking status, alcohol consumption, exercise habits, family history of diabetes, time since diagnosis, trust or shared decision making on medical satisfaction, and there was no statistically significant difference ($p>0.05$) in value co-creation (Table 4).

Discussion

Since 2001, the Bureau of the NHI has implemented a P4P program for diabetes care. Physicians who specialize in metabolic disorders or endocrinology and physicians who have undergone a training program for diabetes shared care can voluntarily apply to participate in the P4P program [12]. This study aimed to explore the effect of the P4P program on diabetes care and value co-creation. Multiple regression analysis of the empirical evidence from the questionnaires showed that interaction and information disclosure have a positive influence on medical satisfaction and value co-creation. This is consistent with previous studies showing that the interaction between patients and doctors makes patients more willing to follow doctors' instructions and attach importance to health behaviors [34, 58-59]. Patients are allowed ensure their own safety by raising questions openly or providing relevant physical and psychological information to caregivers during interaction. Moreover, it is more likely that patients will know more about health-related values. Hospitals strengthen interaction with other patients to improve medical quality, and if the hospital staff commits to interaction, they can effectively create value for the hospital [60]. However, some scholars find that patients may already know their rights to know their health status and that doctors have the obligation to fully inform them during interaction. Nonetheless, patients often feel reluctant to challenge the authority of medical professionals in some circumstances. For example, they tend to talk less so as to avoid irritating doctors, or they may think that doctors are too busy to be asked [61]. Furthermore, patients may feel the authority of doctors through non-verbal expression, such as tone of voice, attitude and eyes [62] so their courage to express ideas will be constrained. The empirical results of the study show that better interaction results in higher medical satisfaction and co-created value.

Information disclosure was shown to have a significant influence on medical satisfaction and value co-creation. In the field of medical care, economists consider doctors as income seekers [63] because medical service is a heterogeneous product, and it is difficult for patients to search for information because of the information structure of the medical market. There is an obvious information asymmetry between patients and doctors, and doctors serve as the representatives of patients. Therefore, doctors have a stronger dominance over the medical care service of patients. In such a circumstance, an imperfect representative relationship often occurs as follows. (1) The doctor may not respond to or may misunderstand the requirements of the patient. (2) Doctors may not know which therapy can cure the patient or lack complete information. (3) The doctor may mislead the patient about the effects of treatment [64]. Thus, Rush [65] strongly argues for the necessity of information disclosure and obtaining patients' agreement. Information asymmetry already exists in the medical care market but the development of mass media and the

internet allows patients to obtain adequate knowledge of health-related information and have the ability to make decisions to ensure that the doctor effectively discloses information to the patient [66]. Patients can solve the problems together by selecting the therapy and medical service to be provided. Under the NHI system, the P4P program is accompanied by a fee-for-services payment scheme. The increase in health care expenses for diabetes-related physician visits under the fee-for-service payment system was attributed to case management fees and the fees for additional physical examinations, laboratory tests, medications, and physician visits. Conversely, patients in the P4P program had fewer diabetes-related hospitalizations and lower hospitalization expenses due to diabetes-related conditions. This result implies that regular, comprehensive follow-up care can help physicians to detect minor conditions at earlier stages or to pay greater attention to the details of symptoms [12]. Research on the factors that influence patients' decisions to join medical decision-making has been compiled through a systematic review of literature. These data show that the demographics of patients (e.g., young, well-educated, female, medical decision), as well as medical history, health care and health conditions have an influence on the medical decision-making of patients. However, these studies have not investigated the influence of the different roles of patients on decisions and differing meanings of involvement and joining in decision-making [67]. Medical service is offered based on a series of professional judgments. It is an interactive decision, and an interactive mode of shared decision-making [68]. When a patient actively joins in the discussion of medical decisions and expresses his/her ideas, conflicts in decision making are less likely to occur [69] and satisfaction with the medical decision will be improved [70]. More importantly, if patients have adequate relevant knowledge to join medical decision-making, shared decision making will influence value co-creation. In this study, information disclosure did not have a significant influence on medical satisfaction and value co-creation.

Patients and doctors should trust each other [71] and trust plays a core role [33, 54, 72]. When a patient has confidence in a doctor, he/she tends to follow the doctor's instructions [58,73] and believe that he/she can maintain long-term health [74]. This helps reduce the uncertainty with regard to medical behaviors [74]. If a patient have greater confidence, this results in better health outcomes [75]. It also results in benefits for hospital management, such as improvement of patient satisfaction, decreased transfers to other hospitals [76] and an increase positive feedback for the doctor [77]. Accordingly, the patient-physician relationship is established on the basis of interaction of both parties and confidence [78], and the results show that interaction and trust have a positive influence on value co-creation. This study did not show a significant effect of trust and shared decision making on medical satisfaction and value co-creation. The reasons for this may be investigated in future studies.

Conclusions

There are an increasing number of pay-for-performance (P4P) program models that provide financial incentives to health care providers according to specific predetermined quality benchmarks or provision of proper follow-up care [12, 79-80]. A P4P program can be designed

with respect to process or outcome, at the level of the physician or the hospital and in an outpatient or inpatient setting [12, 81]. Because of the increased level of medical knowledge, education, and higher levels of medical information among the population, patients will compare and select hospitals with more complete equipment and better quality service, incentivizing hospitals to change the hospital-centered relationship more swiftly [82]. Hospitals need to strengthen interactions with patients to provide quality health and well-being. The way doctors and all medical professionals apply professionalism, thinking, and decision making in medical care will influence the outcome in terms of value co-creation to some degree [60]. A good patient–physician relationship can be established through information disclosure and effective communication by both parties [83-84]. Fluent communication between both parties helps improve satisfaction with medical service and facilitate the creation of higher value [35]. Interpersonal interaction [18,85], trust [76], shared decision-making [83,86], eliminating information asymmetry, and information disclosure [83-84] will determine the final outcome in terms of value co-creation.

This study showed that interaction and information disclosure have a positive influence on medical satisfaction and value co-creation. As the medical environment has changed, individualism and customer awareness have risen, and medical service has become more easily accessible, medical institutions and doctors face fierce competition. Today, more focus has been put on understanding and respecting patients’ autonomy. This also includes understanding the psychology and behavior modes of patients and how to use knowledge and experience win patients’ trust and have great interaction, thus attracting potential customers and acquiring new customers. The method of quantitative analysis for large samples applied in this research of value co-creation fills a gap in the qualitative research. It is concluded that interaction and information disclosure are key drivers of medical satisfaction and value co-creation from the perspective of patients.

Study Limitations

The data in this study have been compiled and analyzed as completely as possible but there still are some limitations. For example, the variables of “interaction” and “information disclosure” proposed in the study have content validity but there is no comparison since patients are the only subjects, with no doctors included. Future research may be conducted on the basis of this study to provide a more detailed theoretical framework. No empirical support for variables (such as trust) were obtained, so the reason for this should be investigated via field interviews, gathering of secondary data and other qualitative research. Finally, P4P is a medical care team composed of physicians, health educators, case managers and dietitians, it can effectively improve the patient's continuous medical treatment and overall care. research and analyses of other stakeholders in should be conducted in future research.

Abbreviations:

NHI: National Health Insurance; P4P: Pay-for-performance

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References

1. National Health Insurance Administration: Why would to push outpatient visits the reduction? Available online: https://www.nhi.gov.tw/Content_List.aspx?n=F361672F1AED77BF&topn=0B69A546F5DF84DC. Accessed 6 July 2019.
2. Cheng TM. Taiwan's new national health insurance program: genesis and experience so far. *Health Aff* 2003; 22: 61-76.
3. Chang RE, Lin SP, Aron DC. A pay-for-performance program in Taiwan improved care for some diabetes patients, but doctors may have excluded sicker ones. *Health Aff* 2012;31: 93-102.
4. OECD: OECD Health statistics 2019. Available online: <http://www.oecd.org/els/health-systems/health-data.htm>. Accessed 6 July 2019.
5. Chen TJ, Chou LF, Hwang SJ. Patterns of ambulatory care utilization in Taiwan. *BMC Health Serv Res* 2006; 6: 54.
6. Weng RH, Huang CY, Huang JA. Does a good patient-physician relationship enhance patient loyalty to a hospital?. *Taiw J Public Health* 2006; 25: 293-302.
7. Department of Health (R.O.C.). *2009 Statistic of Cause of Death*; Department of Health: Taipei, ROC. 2010.
8. Health and Welfare Department: Health statistics trends 2017. [Cited 6 July 2019]. Available online: <https://dep.mohw.gov.tw/DOS/cp-2157-46233-113.html>. Accessed 6 July 2019.
9. Chiou ST, Lin HD, Yu NC, et al. An initial assessment of the feasibility and effectiveness

- of implementing diabetes shared care system in Taiwan—some experiences from I-Lan County. *Diabetes Res Clin Pract* 2001; 54: S67-S73.
10. Dudley RA, Frolich A, Robinowitz DL, et al. *Strategies to support quality-based purchasing: A review of the evidence*. Agency for healthcare research and quality, AHRQ Publication No. 04-0057. Rockville, MD: Agency for Healthcare Research and Quality, July 2004.
 11. Petersen LA, Woodard LD, Urech T, et al. Does pay-for performance improve the quality of health care? *Ann Intern Med* 2006;145: 265-72.
 12. Cheng SH, Lee TT, Chen CC. A longitudinal examination of a Pay-for performance program for diabetes care: evidence from a natural experiment. *Med Care* 2012; 50L: 109-16.
 13. Ryan AM. Effects of the premier hospital quality incentive demonstration on medicare patient mortality and cost. *Health Serv Re* 2009; 44: 821-42.
 14. Glickman SW, Ou FS, DeLong ER, et al. Pay for performance, quality of care, and outcomes in acute myocardial infarction. *J Am Med Assoc* 2007; 297: 2373-80.
 15. Ryan AM, Blustein J. The Effect of the Mass Health Hospital Pay-for-Performance Program on Quality. *Health Serv Res* 2011; 46: 712-28.
 16. Yen JC, Hsu MH. The evolution of doctor-patient rapport—from the perspective of informed consent and co-decision-making. *Taipei City Med* 2007; 4: 643-9.
 17. Szasz TS, Hollender MH. The basic models of the doctor-patient relationship. *Arch Intern Med* 1956; 97: 585-92.
 18. Hardyman W, Daunt KL, Kitchener M. Value Co-Creation through Patient Engagement in Health Care: A micro-level approach and research agenda. *Publ Manag Rev* 2015;17: 90-107.
 19. Ong LML, De Haes JCJM, Hoos AM, et al. Doctor patient communication: A review of the literature. *Soc Scie Med* 1995; 40: 903-18.
 20. Kaplan SH, Greenfield S, Ware JE. Assessing the effects of physician-patient interactions on the outcomes of chronic disease. *Med Care* 1989; 27: 110-27.
 21. Mead N, Bower P. Patient-centredness: A conceptual framework and review of the empirical literature. *Soc Scie Med* 2000; 51: 1087-110.
 22. Braunstein JJ, Toister RP. *Medical application of the behavior science*: Year Book Medical Publishers, Chicago, USA. 1981.
 23. Galvagno M, Dalli D. Theory of value co-creation: a systematic literature review. *Manag Serv Qual* 2014; 24: 643-83.
 24. Ramaswamy V, Ozcan K. What is co-creation? An interactional creation framework and its implications for value creation. *J Bus Res* 2018;84: 196-205.
 25. Zhang TC, Jahromi MF, Kizildag M. Value co-creation in a sharing economy: The end of price wars?. *Int J Hosp Manag* 2018;71: 51-8.
 26. Grönroos C. Value co-creation in service logic: A critical analysis. *Marketing Theor* 2011;11: 279-301.
 27. Grönroos C. Conceptualising value co-creation: A journey to the 1970s and back to the future. *J Market Manag* 2012; 28: 1520-34.

28. Moretta Tartaglione A, Cavacece Y, Cassia F, et al. The excellence of patient-centered healthcare: investigating the links between empowerment, co-creation and satisfaction. *TQM J* 2018;30: 153-67.
29. Petrocchi S, Iannello P, Lecciso F, et al. Interpersonal trust in doctor-patient relations: Evidence from dyadic analysis and association with quality of dyadic communication. *Soc Sci Med* 2019; 112391.
30. Ford JA, Lenaghan E, Salter C, et al. Can goal-setting for patients with multimorbidity improve outcomes in primary care? Cluster randomised feasibility trial. *BMJ open* 2019; 9: e025332.
31. Krepia V, Tzenalis A, Lavdaniti M, et al. Diabetic patients' compliance to the recommended treatment: A qualitative study in Greece. *Int J Car Sc* 2011;4: 126-32.
32. Lee YY, Lin JL. The effects of trust in physician on self-efficacy, adherence and diabetes outcomes. *Soc Sci Med* 2008;68: 1060-8.
33. Thom DH, Ribisl KM, Stewart AL, et al. Further validation and reliability testing of the Trust in Physician Scale. *Med Care* 1999;37: 510-7.
34. Safran DG, Taira DA, Rogers WH, et al. Linking primary care performance to outcomes of care. *J Fam Pract* 1998;47: 213-20.
35. Martinez LS, Schwartz JS, Freres D, et al. Patient-clinician information engagement increases treatment decision satisfaction among cancer patients through feeling of being informed. *Patient Educ Couns* 2009;77: 384-90.
36. Anh PNT, Thuy PN. The effects of interaction behaviors of service frontliners on customer participation in the value co-creation: A study of health care service. *Serv Bus* 2017; 11: 253-77.
37. Metz MJ, Veerbeek MA, Twisk JW. et al. Shared decision-making in mental health care using routine outcome monitoring: results of a cluster randomised-controlled trial. *Soc psych psych epid* 2019;54: 209-19.
38. Hardyman W, Daunt KL, Kitchener M. Value co-creation through patient engagement in health care: a micro-level approach and research agenda. *Public Manag Rev* 2015;17: 90-107.
39. Boland L, Graham ID, Légaré F, et al. Barriers and facilitators of pediatric shared decision-making: a systematic review. *Implemen Sci* 2019;14: 7.
40. Hammervoll T. Transactional and value creation sources of dependence. *J Bus Bus Market* 2005;12: 41-66.
41. Hammervoll T, Toften K. Valuecreation initiatives in buyer-seller relationships. *Eur Bus Rev.* 2010;22: 539-55.
42. Moeller S, Ciuchita R, Mahr D, et al. Uncovering collaborative value creation patterns and establishing corresponding customer roles. *J Serv Re* 2013;16: 471-87.
43. Porter ME, Kramer MR. Creating shared value. In *Managing sustainable business* (pp. 323-346). Springer, Dordrecht. 2019.
44. Akaka MA, Chandler JD. Roles as resources: A social roles perspective of change in value networks. *Marketing Theor* 2012;11: 243-60.
45. Chih YY, Zwikael O, Restubog SLD. Enhancing value co-creation in professional service

- projects: The roles of professionals, clients and their effective interactions. *Int J Proj Manag* 2019;37: 599-615.
46. Porter ME. What is value in health care?. *New Engl J Med* 2010; 363: 2477-81.
 47. McColl-Kennedy JR, Vargo SL, Dagger TS, et al. Health care customer value co-creation practice styles. *J Serv Res* 2012;15: 370-89.
 48. Lepak DP, Smith KG, Taylor MS. Value creation and value capture: A multilevel perspective. *Acad Manage Rev* 2007;32: 180-94.
 49. Pitelis CN. The co-evolution of organizational value capture, value creation and sustainable advantage. *Organ Stud* 2009;30: 1115-39.
 50. Priem RL. A consumer perspective on value creation. *Acad Manage Rev* 2007;32: 219-35.
 51. Chiu TC, Shiao YY, Yeh SC. The relationship among the tangible and intangible health-care service quality, Acupuncture outcome, Physician-patient relationship, and Patient satisfaction: Evidence from patients with soft tissue injury. *Organ Manage* 2013;5: 79-110.
 52. Van Oerle S, Lievens A, Mahr, D. Value co-creation in online healthcare communities: The impact of patients' reference frames on cure and care. *Psychol Market* 2018;35: 629-39.
 53. Prahalad CK, Ramaswamy V. The future of competition: Co-creating unique value with customers. Boston: Harvard Business School Press. 2004.
 54. Berrios-Rivera JP, Street RL, Garcia Popa-lisseanu MG, et al. Trust in physicians and elements of the medical interaction in patients with rheumatoid arthritis and systemic lupus erythematosus. *Arthrit Care Res* 2006;55: 385-93.
 55. Armstrong JS, Overton TS. Estimating nonresponse bias in mail surveys. *J Market Re* 1977;14: 396-402.
 56. Lee JH, Scott D. For better or worse? A structural model of the benefits and costs associated with recreational specialization. *Leisure Sci* 2006;28: 17-38.
 57. Hair JF, Jr Anderson RE, Tatham RL, Black WC (1998). *Multivariate Data Analysis*, (5th Edition). Upper Saddle River, NJ: Prentice Hall.
 58. Trachtenberg F, Dugan E, Hall MA. How patients' trust relates to their involvement in medical care. *J Fam Pract* 2005;54: 344-52.
 59. Bonds DE, Camacho F, Bell RA, et al. The association of patient trust and self-care among patients with diabetes mellitus. *BMC Fam Pract* 2005;5: 26.
 60. Shih YT. Establishing an ethical system of patient-centered care: Creating values in doctor-patient interactions. *Formosan J Med* 2007;11: 294-7.
 61. Chang C, Chang CH, Hu YH. Physician-Patient Communication Reported by Women of Hysterectomy. *Chinese J Public Health* 1997;16: 1-12.
 62. DiMatteo MR, Sherbourne CD, Hays RD, et al. Physicians' characteristics influence patients' adherence to medical treatment: Results from the medical outcomes study. *Health Psychol* 1993;12: 93-102.
 63. Eisenberg KM. Physician utilization the state of research about physicians' practice patterns. *Med Care* 1985;23: 461-81.
 64. Smith PC, Stepan A, Valdmanis V, et al. Principal-agent problems in health care systems: An international perspective. *Health Policy* 1997;41: 37-60.
 65. Rush B. *The progress of medicine and the vices and virtues of physicians. (1801). In the*

- selected writings of Benjamin rush. ed. D; Philosophical Library: New York, NY,USA. 1947.*
66. Mechanic D, Meyer S. Concepts of trust among patients with serious illness'. *Soc Sci Med* 2000;51: 657-68.
 67. Say R, Murtagh M, Thomson R. Patients' preference for involvement in medical decision making: A narrative review. *Patient Educ Couns* 2006;60: 102-14.
 68. Lin ML, Yeh LL, Chen CH. Patient involvement in medical decision making. *J Nur* 2009;56: 83-7.
 69. Kremer H, Ironson G, Schneiderman N, et al. It's My Body: Does patient involvement in decision making reduce decisional conflict?. *Med Decis Making* 2007;27: 522-32.
 70. Delany CM. Respecting patient autonomy and obtaining their informed consent: Ethical theory-missing in action. *Physiotherapy* 2005;91: 197-203.
 71. Gregory DJ. *Primum Non Nocere: The expanding "Honest Services" mail fraud statute and the physician-patient fiduciary relationship.* 51 (1998) 139. Available online: <http://hdl.handle.net/10822/910857>. Accessed 20 June 2011.
 72. Hall MA. The importance of trust for ethics, law, and public policy. *Camb Q Heathic Ethic* 2005;14: 156-67.
 73. Kaplan SH, Greenfield S, Ware JE. Assessing the effects of physician-patient interactions on the outcomes of chronic disease. *Med Care* 1989;27: 110-27.
 74. Crosby LA, Evans KR, Cowles D. Relationship quality in services selling: an interpersonal influence perspective. *J Marke* 1990;54: 68-81.
 75. Weng RH, Ho YC, Chiu PS, et al. Constructing the theoretical model of the relationship between customer-perceived relationship quality and customer loyalty in healthcare industry. *J Health Manage* 2004;5: 418-37.
 76. Thom DH. Stanford Trust Study Physicians. Physician behaviors that predict patient trust. *J Fam Pract* 2001;50: 323-8.
 77. Leisen B, Hyman MR. Antecedents and consequences of trust in a service provider: The case of primary care physicians. *J Bus Res* 2004;57: 990-9.
 78. Yeh YW. Doctor-patient relationship: A study of trust. *Formos J Med Humanit* 2012;13: 77-103.
 79. Institute of Medicine. *Committee on quality of health care in America crossing the quality chasm: A new health system for the 21st century;* National Academy Press: Washington, DC, USA. 2001.
 80. Meddings JA, McMahon LF. Measuring quality in pay-for-performance programs: from "one-size-fits-all" measures to individual patient risk reduction scores. *Dis Manag Health Outcomes* 2008; 16: 205-16.
 81. Mehrotra A, Damberg CL, Sorbero ME, et al. Pay for performance in the hospital setting: what is the state of the evidence? *Am J Med Qual* 2009;24: 19-28.
 82. Cheng YM. The effects of hospital marketing public relations and physician-patient relationship bonds on physician-patient relationship maintenance. *J Cust Satisf* 2010;6: 55-88.
 83. Charles C, Gafni A. Whelan T. Shared decision making in the medical encounter: What

- does it mean? (or it takes at least two to tango). *Soc Sci Med* 1997;44: 681-92.
84. Charles C, Gafni A. Whelan T. Decision-making in the physician-patient encounter: Revisiting the shared treatment decision-making model. *Soc Sci Med* 1999;49: 651-61.
85. Mead N, Bower P. Patient-centredness: A conceptual framework and review of the empirical literature. *Soc Sci Med* 2000;51: 1087-100.
86. Roter DL, Hall JA. Doctors talking with patients/patients talking with doctors: Improving communication in medical visits; Auburn House: Westport, CT, USA. 1992.

Table 1 Descriptive statistics (n=313)

Characteristics	Female		Male		p ^a
	n	%	n	%	
Total	135	43.1	178	56.9	
Age(years)					.108
<30	2	0.6	7	2.2	
31-40	12	3.8	6	1.9	
41-50	26	8.3	31	9.9	
>50	95	30.4	134	42.8	
Education level					.076
Junior high school and under	51	16.3	47	15.0	
Senior high school	46	14.7	65	20.8	
College and above	38	12.1	66	21.1	
Marriage status					.031
Single	13	4.2	14	4.5	
Married	100	31.9	151	48.2	
Others	22	7.0	13	4.2	
Smoking					.001
Never	129	41.2	144	46.0	
Yes	6	1.9	34	10.9	
Drink					.001
No	132	42.2	144	46.0	
Yes	3	1.0	34	10.9	
Exercise habit					.005
No	42	13.4	31	9.9	
Yes	93	29.7	147	47.0	
Family history of diabetes					.138
No	35	11.2	60	19.2	
Yes	100	31.9	118	37.7	
Suffering time: diabetes					.702
<5Years	36	11.5	57	18.2	

6-10Years	42	13.4	50	16.0
11-15Years	29	9.3	30	9.6
16-20Years	13	4.2	21	6.7
>20Years	15	4.8	20	6.4

^a There were significant differences ($p < 0.001$) in all variables of patients' characteristics among enrollee, potential enrollee, and comparison groups. The statistical difference was calculated by the χ^2 test for categorical variables and by the t test for continuous variables.

Table 2 Validity and average variable extracted

Construct	Average	SD	Cronbach's α	CV	AVE
Interaction	4.415	.528	0.954	0.916	0.577
Trust	4.501	.522	0.918	0.915	0.684
Information disclosure	4.478	.498	0.964	0.935	0.597
Shared decision-making	4.483	.468	0.955	0.940	0.612
Medical Satisfaction	4.478	.496	0.972	0.940	0.613
Value-Co Creation	4.414	.513	0.974	0.942	0.600

Note: Average variable extracted (AVE), Complex validity (CV), Standard deviation (SD)

Table 3 Variable Correlation Coefficient Matrix

Measure	1	2	3	4	5	6
1. Interaction	.760					
2. Trust	.663***	.827				
3. Information disclosure	.795***	.721***	.773			
4. Shared decision-making	.638***	.608***	.785***	.782		
5. Medical Satisfaction	.721***	.646***	.838***	.641***	.783	
6. Value-Co Creation	.692***	.633***	.803***	.673***	.851***	.775

Note: *** $p < .001$

Table 4 Multiple regression analysis of P4P diabetes care and medical satisfaction

Measure	Medical Satisfaction		Value Co Creation	
	Beta	t	Beta	t
Gender (Reference Group(RG): Female)	.007	.189	.015	.400
Age(years) (RG: >50)				
<30	.003	.108	-.042	-1.173
31-40	.014	.389	.029	.739
41-50	-.030	-.854	-.053	-1.389
Education level (RG: College and above)				
Junior high school and under	-.012	-.334	-.059	-1.468
Senior high school	-.009	-.248	-.035	-.859
Marriage status (RG: Married)				
Single	.044	1.248	.029	.733
Others	-.017	-.536	-.024	-.684
Smoking (RG: Never)	.064	1.857	.030	.806
Drink (RG: No)	.007	.193	.057	1.493
Exercise habit (RG: No)	.005	.157	-.015	-.405
Family history of diabetes (RG: No)	.021	.637	-.023	-.643
Suffering time: diabetes (RG: 6-10Years)				
<5Years	-.118	-3.140**	-.037	-.892
11-15Years	-.048	-1.321	-.018	-.446
16-20Years	-.065	-1.853	-.044	-1.159
>20Years	-.028	.780	.054	1.379
Interaction	.155	2.896**	.134	2.283**
Trust	.077	1.648	.078	1.526
Information disclosure	.698	10.307***	.563	7.594***
Shared decision making	-.066	-1.276	.091	1.619
Model explanation force change				
R^2		.729		.676
Adj. R^2		.710		.653
F		38.195		29.599
P		.000***		.000***

Note: *** p<.001, **p<.01, *p<.05