ORIGINAL ARTICLES

Impact of quaternary prevention as a brief intervention in medical students' clinical decisions: experience from Vietnam

Impacto da prevenção quaternária como intervenção breve nas decisões clínicas de estudantes de medicina: experiência do Vietnã

Impacto de la prevención cuaternaria como intervención breve en las decisiones clínicas de estudiantes de medicina: experiencia de Vietnam

Tran, Thi Hoa Vi. Lecturer. Family Medicine Department. Pham Ngoc Thach University of Medicine. Hochiminh city, Vietnam. hoavi1880@yahoo.com
Vo, Thanh Liem. Lecturer. Family Medicine Department. Pham Ngoc Thach University of Medicine. Hochiminh city, Vietnam. thanhliem.vo@gmail.com
(*Corresponding author*)

Abstract

Objective: to evaluate undergraduate medical students' clinical decision-making process after a brief intervention lecture on quaternary prevention (P4). **Methods**: quantitative self-controlled intervention study carried out with fifth-year medical students of Pham Ngoc Thach University, Hochiminh city, Vietnam. The medical students were asked to list their eventual interventions based on three different simulated clinical scenarios. The survey was conducted before and after the intervention. Student's propositions were classified into one of the four groups of prevention, according to Jamoulle's model. **Results**: 115 students participated, resulting in 211 answered sheets. The interventions proposed by the students were mostly centered on prevention groups 1, 2 and 3; the three clinical scenarios partially explained student's intentions of counseling, screening and palliative care. Comparing the data of second phase survey, the intervention was associated with changes in students' aptitude on clinical decision-making, which was especially more important for prevention group 1 (OR = 7.5) and prevention group 4 (OR = 30.05). There was no statistically significant difference in changing students' decision for prevention group 2 (OR = 0.95 p = 0.466) and prevention group 3 (OR = 2.29 p = 0.932). **Conclusion**: introducing quaternary prevention to the undergraduate medical course can help to steer clinical decisions toward primary prevention and to avoid inappropriate medical interventions.

Resumo

Objetivo: avaliar o processo de tomada de decisão clínica por estudantes de graduação em medicina após uma breve intervenção sobre prevenção quaternária (P4). **Métodos**: estudo quantitativo de intervenção autocontrolada realizado com estudantes do quinto ano do curso de medicina da Pham Ngoc Thach University, na cidade de Hochiminh, Vietnam. Os estudantes foram convidados a listar suas eventuais intervenções com base em três diferentes cenários clínicos simulados. A pesquisa foi realizada antes e depois da intervenção. As proposições dos estudantes foram classificadas em um dos quatro grupos de prevenção, de acordo com o modelo de Jamoulle. **Resultados**: participaram 115 estudantes, resultando em 211 folhas de respostas. As intervenções propostas pelos estudantes foram principalmente centradas nos grupos de prevenção 1, 2 e 3; esses três cenários clínicos explicaram parcialmente as intenções dos estudantes para aconselhamento, rastreamento e cuidados paliativos. Comparando com os dados da segunda fase do estudo, a intervenção foi associada a mudanças na aptidão dos alunos no processo de tomada de decisão clínica, que foi especialmente importante para o grupo de prevenção 1 (OR = 7,5) e para o grupo de prevenção 4 (OR = 30,05). Não houve diferença estatisticamente significativa na mudança de decisão dos alunos para o grupo de prevenção 2 (OR = 0,95 p = 0,466) e para o grupo de prevenção 3 (OR = 2,29 p = 0,932). **Conclusão**: a introdução da prevenção quaternária no curso de graduação em medicina pode auxiliar a orientar as decisões clínicas em direção à prevenção primária e também a evitar intervenções médicas desnecessárias.

Resumen

Objetivo: evaluar el proceso de toma de decisiones clínicas hecho por estudiantes de pregrado en medicina después de una breve intervención sobre la prevención cuaternaria (P4). **Métodos**: Estudio cuantitativo de intervención auto-controlado llevado a cabo con estudiantes de quinto año de medicina de la Pham Ngoc Thach Universidad en la ciudad de Hochiminh, Vietnam. Se pidió a los alumnos que enumerasen sus posibles intervenciones basadas en tres diferentes escenarios clínicos simulados. La encuesta se realizó antes y después de la intervención. Las proposiciones de los estudiantes se clasificaron en uno de los cuatro grupos de prevención, de acuerdo con el modelo de Jamoulle. **Resultados**: 115 estudiantes participaron, lo que resultó en 211 hojas de respuesta. Las intervenciones propuestas por los alumnos se centraron principalmente en los grupos de prevención 1, 2 y 3; estos tres escenarios clínicos explican parcialmente las intenciones de los estudiantes para la consejería, el cribado/tamizaje y la atención paliativa. En comparación con los datos de la segunda fase del estudio, la intervención se asoció con cambios en la capacidad de los estudiantes en el proceso de toma de decisiones clínicas, que fue especialmente importante para el grupo de prevención 1 (OR = 7,5) y para el grupo de prevención 4 (OR = 30,05). No hubo diferencia estadísticamente significativa en el cambio de decisión de los estudiantes para el grupo de prevención 2 (OR = 0,95 p = 0,466) y para el grupo de prevención 3 (OR = 2,29 p = 0,932). **Conclusión**: la introducción de la prevención cuaternaria en el pregrado en medicina puede ayudar a guiar las decisiones clínicas hacia la prevención primaria y también para evitar intervenciones médicas innecesarias.

Introduction

In the last decades medical practice underwent an explosion of scientific facts that brought medicine to a new era of experiential science, known as evidence-based medicine (EBM).[1] The EBM paradigm prompted medical practice into a new culture of protocols, technical procedures, heavy equipment, or simply of scientific evidence with intellectual information processing.[2] In this scenario, patients sometimes are not at the centre of caregivers' concerns leading to a medical decision that might be decontextualized from patient's perspectives on their health needs.[3] Thus, this health care model seems to be unsustainable in the quest for a best practice modern medicine ideal.

The EBM has also radically altered the patient's role in many respects. For instance, doctor-patient relationship has changed from the patient's dependent status (i.e. in traditional medicine where health professionals were more in control over clinical decision-making and clinical intervention), to a mutual decision sharing model or holistic model where patients take a privileged role. That requires health professionals to involve actively and effectively the patient's participation in clinical decision-making process whenever possible.[3] Payton et al.,[4] have pointed out that patients participation is based on the "recognition of the values of self-determination and the worth of individuals". Hence, physicians need to develop their own approaches to doctor-patient relationship by involving their patients in decision-making processes, as well as by understanding their patients' rights and responsibilities.

In this same stream of thoughts, in 1986, Jamoulle[5] introduced a new concept into doctor-patients decision-making process. According to his model, built on the 2×2 crosstab (Figure 1), there is an interaction between doctor's judgment as an 'objective' view and patient's judgment as a 'subjective' view. Based on this interface, he expressed four fields of healthcare preventive activities. Jamoulle's important contribution refers to the fourth field which became known as quaternary prevention (P4).[5] In its first version, quaternary prevention aimed to avoid over-medicalizaron and to protect patients from unnecessary interventions. As this concept was further explored, P4 has become more comprehensive, entailing also issues such as under-medicalization and prevention of iatrogenesis.[6-8] In this way, the current concept of P4 helps to harmonize some of commonly accepted general medical practices reinforcing that medical evidence should be 'tamed' by patient-centred approach. Thus, P4 concept has become a useful tool to strengthen the holistic approach of family medicine,[9] particularly for undergraduate medical students.

In 2013, P4 concept was introduced for the first time in the curriculum of postgraduate family medicine training programme at Pham Ngoc Thach University of Medicine in Hochiminh city, Vietnam[10] Since then, P4 was further integrated into the fifth-year of the undergraduate medical programme, raising some interesting development in research and medical education activities. This has also allowed for more medical students to benefit from this new reflective activity, which might potentially impact on students' future profession activities as well. The present article evaluates the fifth-year undergraduate medical student's attitude in medical decision-making process with the introduction of P4 concept on the course module: *'Screening and Prevention for Individual and Family'*.
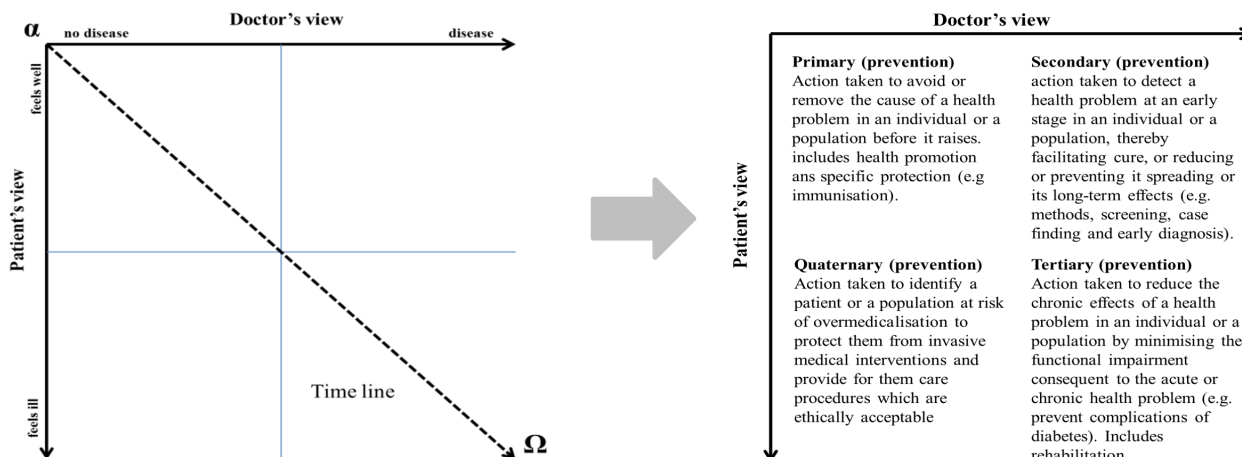
Figure 1. Jamoulle's quaternary prevention concept (P4) definition, reproduced with author's permission.[8]

Methods

Study design

This is a quantitative self-controlled intervention study carried out with fifth-year medical students of Pham Ngoc Thach University in Hochiminh city, Vietnam in September, 2014. A short pre-test and post-test survey was performed in order to assess the introduction of a lecture on P4 concept to the medical students. This lecture consisted of two slides addressing the P4 concept; followed by a talk about the differences between patient's and doctor's health perspectives; and finally some explanation on P4 concept applied as a tool in everyday clinical practice and its relation to other principles of family medicine.

To assess the impact of P4 concept on medical student decision-making process, three different simulated clinical scenarios were used as prompt to medical students. These three clinical vignettes were based on open-end scenarios with non-specified diseases, allowing students for more than one proposition or decision (Table 1). The medical students were asked to list their eventual interventions on two of three different simulated clinical scenarios. Students' propositions were classified into one of the four groups of prevention, according to Jamoulle's model.

In the above scenarios, based on voluntary participation, students were asked for writing down (on free-text) about their interventions/propositions prompted by an open question such as: "If you were a clinician/physician, which interventions would you have recommend for this patient?" These three simulated clinical scenarios were randomly assigned to the medical students in a way that each student would not have the same clinical scenario for the pre-test and post-test evaluation. The questionnaire collected no personal information of respondents, keeping all the students anonymised.

Based on Jamoulle's predefined four prevention groups, another researcher coded whatever the students have or not specified one of the four prevention groups. The student would be considered for having interest in specific a prevention group if they had at least one concerned proposition. In this way, for each student, it was expected to have four dichotomous 'Yes/No' variables for every pre-test – post-test evaluation. This research protocol had been verified and approved by the family medicine department of Pham Ngoc Thach University of Medicine, Hochiminh city, Vietnam.

Table 1. Simulated clinical scenarios, Pham Ngoc Thach University, Hochiminh city, Vietnam, 2014.

Scenario 1:	30-year-old woman who had been having a dental radiography of her tooth and had found to have a positive result of pregnancy quick-stick test.
Scenario 2:	52-year-old healthy man coming to see his doctor just for an annual medical check-up.
Scenario 3:	55-year-old man who was at his last stage of liver cancer and had a heavy pain in upper right abdomen.

Logistic regression model and variable selection method

The output variables are dichotomous which receive two possible outcomes: "yes" and "no". Therefore, the linking function for the output variable can be a logistic regression. For instance, student "i" has a probability $P(i,j)$ of having a proposition classified in group "j" of prevention. In the same manner, the probability of not having a proposition classified in group "j" of prevention must be $1-P(i,j)$. Hence, the logistic regression function with random error variables should come in the following formula:

$$\log\left(\frac{P(i,j)}{1-P(i,j)}\right) = f(i,j) = f(\theta_i, \alpha_j)$$

Where α_j is an error variance for specific prevention, θ_i represents the impact of covariates in the function. The left part of this function represents the odds ratio (OR) of having a positive answer for a specific prevention group. The more this value is high, the more students are in favour of this group of prevention. Conversely, the right part of this function reserves to evaluate the impact of included parameters. In this case, the P4 lecture's impact is our main object of interest in this study. Further, we included clinical scenarios in the function as confounding factors.

As one simulated clinical scenario can generate four different groups of prevention, there were four logistic regression functions for each student. These functions were solved in parallel and shared some of the same proprieties of the included parameters. With this function, the coefficient θ gives directly an estimation OR of this factor on the clinical decisions, as shown in Table 2.

Table 2. The coefficient θ as a direct estimation OR on clinical decisions.

When $\theta = 0$, so OR = 1, it means that the probability of a positive decision and of a negative decision are equal.
When $\theta < 0$, so OR < 1, it means that the probability of a positive decision is less important than probability of a negative decision.
When $\theta > 0$, so OR > 1, it means that the probability of a positive decision is more important than probability of a negative decision.

Statistics analysis

All statistic tests were performed in the SPSS software, version 22. To estimate the coefficients in the logistic linking function, we applied a Bayesian approach with Markov chain Monte Carlo methods (MCMC). A more detailed description of this method can be found elsewhere.[11,12] Therefore, to make the MCMC inferences, we used Winbugs version 1.4.[13] There was a burn-out phase using a 50,000 first update to set up a prior value, therefore, a further 100,000 update was used to store the estimated parameters. A statistical decision threshold was conventionally set at p = 0.05.

Results

Data properties

A total of 115 fifth-year medical students attended the course module '*Screening and Prevention for Individual and Family*' resulting 230 answered questionnaires. From this, 10 pre-test survey questionnaires and 9 post-test survey questionnaires were not filled by students. Therefore, these 19 questionnaires were excluded off our data. This resulted in 211 answered questionnaires for data analysis comprising 109 pre-test and 102 post-test survey questionnaires (Table 3).

Table 3. Characteristics of the data presented corresponding to the three clinical scenarios.

Clinical scenarios	Questionnaires (%)		total
	Pre-test	Post-test	
Female, 30y old, pregnant + X-ray (1)	38 (34.9)	32 (31.4)	70 (33.2)
Male, 52y old, healthy (2)	40 (36.7)	36 (35.3)	76 (36.0)
Male, 55y old, liver cancer (3)	31 (28.4)	34 (33.3)	65 (30.8)
Total	109	102	211

Between these three simulated scenarios, the number of questionnaires was equally distributed; there was no significant difference in distribution (p = 0.650, using One-sample chi-square test at theory distribution ratio of 1:1:1). The same finding occurred within subgroup pre-test and post-test surveys and the statistical tests showed no significance in results p = 0.541 and p = 0.889, respectively. Comparing between two pre-test and post-test surveys, the difference was not significant as well (p = 0.729, Chi-square test).

Groups of prevention

Students' propositions were coded into one of the four groups of prevention according to Jamoulle's model. With the combined data of the two periods, results showed out that a majority of students proposed predominantly their actions in prevention groups 1 and 2 (Table 4). Concerning the third scenario, 34% of students had one or more interventions classified in prevention group 3, which corresponds to the patient with last-stage of liver cancer coming to see a doctor for pain relief.

Table 4. Proportion of students who had at least one clinical intervention corresponding to each group of prevention.

Scenarios Group 1		Groups of prevention (presented in percentage % of the students answering to the specific scenario)				Students
		Group 1	Group 2	Group 3	Group 4	
Female, 30y old, pregnant + X-ray (1)	Pre-test	29 (76.3)	34 (89.5)	11 (28.9)	36 (5.3)	38
	Post-test	26 (81.3)	28 (87.5)	16 (50.0)	22 (31.3)	32
Male, 52y old, healthy (2)	Pre-test	27 (57.5)	38 (95.0)	6 (15.0)	39 (2.5)	40
	Post-test	33 (91.7)	36 (100)	2 (5.6)	36 (100)	36
Male, 55y old, liver cancer (3)	Pre-test	13 (41.9)	21 (67.7)	24 (77.4)	23 (25.8)	31
	Post-test	22 (64.7)	18 (52.9)	29 (85.3)	6 (82.4)	34

Clinical scenarios

Since each scenario has its prior properties they might have influenced the students' preventive intervention proposition. In this data, the results of the logistic regression function have the purpose to figure out the expected intentions of these scenarios (Figure 2). For instance, in the first two scenarios, there were tendencies to have actions on health promotion (Group 1), whereas screening for health risk problems tended to occur in Group 2. Since these two simulated patients did not manifest any relevant disease, they attributed a negative coefficient of action for prevention groups 3 and 4. In the third scenario, the analysis gives a positive coefficient for prevention group 2 and group 3, where actions should be concentrated on curative treatments and palliative care, which reflects the true medical needs of this simulated patient at later stage of liver cancer.
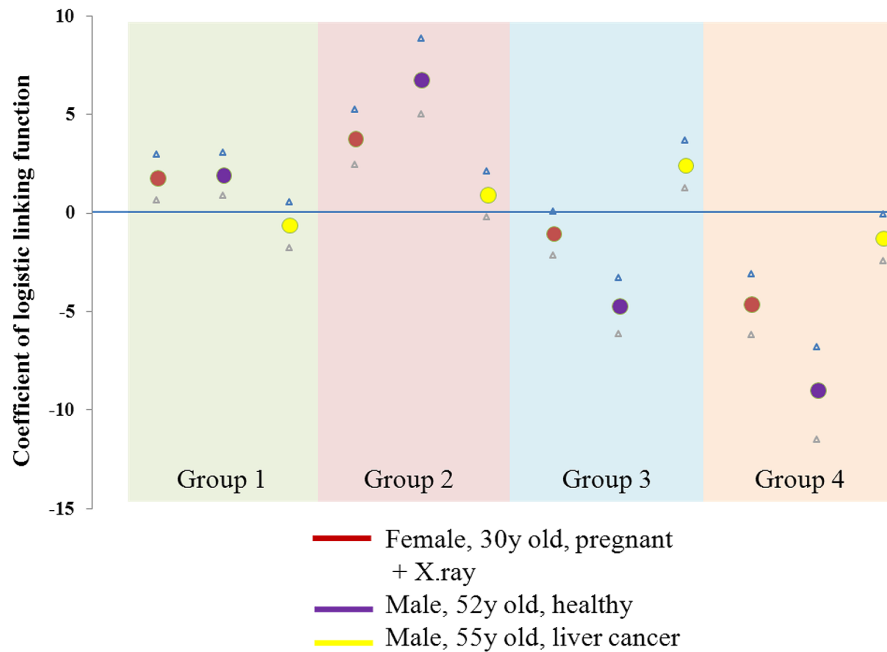
Figure 2. Coefficient of logistic regression function that determines the intention to propose an intervention in each prevention group in accordance to three clinical scenarios (coefficient > 0 means students having more intention to take action in the corresponding prevention group and vice-versa).

Impact of P4 in the 'Screening and Prevention for Individual and Family' course module

Table 5 presents the independent effects of a lecture on P4 concept when it was introduced in the course module. There were important OR for the intervention in the prevention groups 1 and 4. For this specific experience, after our lecture, the students might have significantly 7.46 times more likely to propose an action in prevention group 1. Further, this effect was as high as 30.05 times more likely to propose an action in prevention group 4. Meanwhile, the lecture had almost no influence on the student's proposition of action to prevention group 2 (OR = 0.95 p = 0.466) and prevention group 3 (OR = 2.29 p = 0.932).

Table 5. Coefficient of the logistic function attributed to the introduction of P4 concept in the course, presented by each group of prevention.

	Coefficient	Standard deviation	OR *	p
Group 1	2.01	0.526	7.46	<0.001
Group 2	-0.05	0.641	0.95	0.466
Group 3	0.83	0.558	2.29	0.932
Group 4	3.40	0.680	30.05	<0.001

* odd ratio (OR), is estimated by the natural log base "e" to the exponent of the correspondent coefficient. OR means how important the introduction of P4 concept has an influence on the student's proposition toward specific group of prevention. "p" value indicates the statistical level of significance of Z-test for the hypothesis of the difference of coefficient from 0. Note that when p > 0.05, which statistically corresponds to no significant effect of lecture on the student's proposition.

Discussion

In 2003, for the first time, a prevention approach to overmedicalization and inappropriate medical interventions was recognized as the new preventive concept in WONCA's dictionary: the quaternary prevention.[6] As P4 operates in a different logic of the previous prevention concepts (which are bound to linear time construct), its new reflective approach to prevention

fills the gap within doctor-patient relationship and also supports an important role of patients' active involvement in health care decision-making process.

The importance of the introduction of P4 in Vietnamese medicine course

Currently, P4 concept is gaining its momentum in medical professional around the world,[8,14,15] and has just been recently introduced in Vietnam. For instance, during the six years of undergraduate medical programme in Vietnam, students have a disproportionate medical and clinical formation based on focal-specialists (consultants) and a hospital type of care environment. Since most clinical practice is carried out in hospital context, medical students are exposed only to inpatient and referred hospitalized diseases (usually rare in community based settings). Meanwhile, students have not the privilege to get in contact with patients where they would have opportunity to understand the whole aspects of patients' health; a place where they could build up a confident relationship with patients to ensure a continuity of care; and where patients could share their concerns as well as get the opportunity to play a more active role in health decision-making process. Hence, the introduction of P4 in the undergraduate medical course might help in seeding a family medicine approach to patients care.

In this regard, P4 concept can better represent patient's advocacy role of general practitioners/family doctors. The long term relationship with a patient gives an opportunity to primary health care providers who can study the biopsychosocial model of their patients to explain and to understand patients' medical needs.[9] Further, by managing the interface with other medical specialties – as there are permanent concerns about the efficient use of health care resources and the iatrogenic risk of unnecessary medical interventions - the general practitioners' advocacy role ensures a protection and guides patients through the complexities of the health care system.[16] Thus, this has resonance with quaternary prevention, explaining its widespread use by general practice and family medicine.[6,8]

Moreover, P4 has a different logic in the definition of prevention, comparing to previous levels, which has the potential to strengthen the communication between patients and doctors in a shared decision-making process. In respect to this approach, patients can present their concerns, their specific social-familial situation, and their knowledge about their own body; while doctors can use practice wisdom and the best available medical evidence as reference for mutual decision-making. This mutual decision sharing practice is equally one of the characteristics of patient-centred care model.[16] For this reason, in our perspective, P4 should be used as a reasoning framework rather than just a classical fourth level of prevention.

Interpretation of findings

This study has just analysed P4 concept as a brief intervention, presented within a usual lecture on prevention. Despite this brief intervention, the differences found between pre-test and post-test questionnaire survey showed that changes in students' aptitude on the clinical decision can be attributed to the P4 lecture intervention. This means that P4 framework might change the clinical reasoning and decisions of medical students. For instance, students were more naturally concerned about the foetus' risk of an invasive diagnosis procedure on pregnant women, as well as about the use of unnecessary scanner image on a patient at later cancer stage. These significant results may provide two interesting findings.

First, the introduction of P4 reasoning framework might stimulate medical students in a holistic reasoning process, which is one of the principles of family medicine.[16] Students might also become more self-directed searchers for acquiring cognitive competencies in order to analyse relevant information on medical interventions based on patients' needs. Second, the introduction of P4 concept in the course module might contribute to students as future caregivers in the clinical decision-making process. Therefore, there is a potential for reproducing the same pedagogical effect to other health professionals.

Our findings suggest a positive behavioural change in students' decision-making process. For instance, the pre-test survey gave an important proportion of proposed clinical interventions, which are categorized only in the prevention groups 1, 2, and 3 of Jamoulle's model. These were not necessarily wrong decisions, but not the best practice either. How can a doctor be considered of having a good practice when he demands intensive laboratory tests/examinations without the required justifications that these interventions would necessarily lead to more benefit than harm?[15] This clinical practice could equally be recognized at all levels of Vietnam's national healthcare system,[10] which might be explained by the international trend of hospital-centrism described in the WHO 2008 report.[17]

Strengths and limitations

This is the first research attempt applying Jamoulle's quaternary prevention model as a tool for improving medical students' decision-making process. This is important for strengthening the core values of family medicine (i.e. patient-centred approach). However, it has some weaknesses in the applied research methodology as the pre-test/post-test survey during the lecture could have been exposed to subjective bias. For instance, students might have the tendency to give a positive answer corresponding to the lecture's content and teachers' opinions. Furthermore, the sample was limited only to the fifth-year undergraduate medical students who would have neither enough real experience of clinical decision nor concern of their professional responsibilities when facing a more complex clinical scenario.

Implications for further research

The significant impact of P4 framework on the clinical decision was measured just after the lecture. We have no information to support the retaining of this effect for long term. Additionally, our approach was based only on three simulated scenarios which were not appropriate to evaluate clinical aptitude, especially for P4 framework as it demands: (a) professional health care clinical context; (b) appropriate patient's information; and above all (c) patient participation in clinical decision. For these reasons, future researches should be conducted in order to explore these aspects.

Conclusion

Introducing quaternary prevention framework in the undergraduate medical course can help to steer clinical decisions toward the patient-centred model. Hence, quaternary prevention framework can be used as one of the reasoning tools to demonstrate family medicine principles and to avoid inappropriate medical interventions in clinical decision.

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