ORIGINAL ARTICLE

Implementation of the Choosing Wisely Campaign at a Medical Clinic Internship

Implementação da Campanha Choosing Wisely no Internato de Clínica Médica

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KEYWORDS

- Medical Education.
- Internship and Residency.
- General Practice.
- Health Care Costs.

ABSTRACT

Objective: *to evaluate the implementation of the Choosing Wisely (CW) campaign strategies at a medical clinic internship.* ***Methods:*** *This interventional study involved internship teachers and students, using online questionnaires on the SurveyMonkey platform, and face-to-face activities. Using the Delphi technique, teachers identified three unnecessary situations that commonly occur in practice. The recommendations were grouped by frequency and subject, adapted to the CW format. A Likert scale was used to classify the specialists' opinion aiming to obtain the final list of recommendations. Before the introduction of the CW campaign, we conducted an Objective Structured Clinical Examination (OSCE). Two groups of students were compared: one group that underwent the same OSCE evaluation before the implementation of the CW campaign (110), and another group that participated of all educational actions (n = 98). The CW campaign was implemented by developing educational actions using the recommendations during workshops, banners, and theoretical evaluation, in addition to an Objective Structured Clinical Examination (OSCE).* ***Results:*** *after grouping the recommendations, 24 items remained. The specialists selected eight recommendations by frequency, addressing unnecessary behaviors such as requesting multiple exams, overuse of non-hormonal anti-inflammatory drugs, the indication of digestive endoscopy in younger patients with dyspepsia, excessive chest X-rays in intensive care unit, prescribing antibiotic prophylaxis for longer than recommended, routine indication of allergic tests, inadequate initial screening for thyroid assessment, and spirometry in asymptomatic patients. The educational actions resulted in a process of awareness and discussion among the participants, evidenced by theoretical evaluation (> 95%), as well as in the OSCE, where the level of successes was higher in the exposed group when compared to the nonexposed group (p = 0.001).* ***Conclusion:*** *the implementation of the CW campaign improved the clinical skills of medical clinic internship students and allowed positive discussions about cost-consciousness in health.*

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PALAVRAS-CHAVE

- Educação Médica.
- Internato e Residência.
- Medicina Geral.
- Custos de Cuidados de Saúde.

RESUMO

Objetivo: *avaliar a implementação de estratégias da campanha Choosing Wisely (CW) no internato de clínica médica.* ***Métodos:*** *Este estudo de intervenção envolveu professores e alunos do internato, por meio de questionários on-line na plataforma SurveyMonkey e atividades presenciais. Usando a técnica Delphi, os professores identificaram três situações desnecessárias que geralmente ocorrem na prática. As recomendações foram agrupadas por frequência e assunto e adaptadas ao formato CW. Utilizou-se uma escala Likert para classificar a opinião dos especialistas, obtendo-se a lista final de recomendações. Antes da introdução da campanha da CW, realizamos um Exame Clínico Objetivo Estruturado (OSCE). Foram comparados dois grupos de estudantes: um grupo que realizou a avaliação OSCE antes da implantação da campanha CW (110) e outro que participou de todas as ações educativas (n = 98). Implementamos a campanha da CW, desenvolvendo ações educativas usando as recomendações durante oficinas, banners e avaliação teórica, além de um Exame Clínico Objetivo Estruturado (OSCE).* ***Resultados:*** *após o agrupamento das recomendações, restaram 24 itens. Os especialistas selecionaram oito recomendações, abordando comportamentos desnecessários como solicitação de vários exames, uso excessivo de anti-inflamatórios não hormonais, indicação de endoscopia digestiva para pacientes mais jovens com dispepsia, excesso de radiografia de tórax em unidade de terapia intensiva, prescrição de profilaxia antibiótica por mais tempo do que o recomendado, indicação de rotina de testes alérgicos, triagem inicial inadequada para avaliação da tireóide e espirometria em pacientes assintomáticos. As ações educativas resultaram em conscientização e discussão entre os participantes, evidenciado por meio de avaliação teórica (> 95%), bem como no OSCE, onde o nível de sucessos foi maior no grupo exposto quando comparado ao grupo não exposto (p = 0,001).* ***Conclusão:*** *a implementação da campanha CW melhorou as habilidades clínicas dos estudantes do internato em clínica médica e permitiu discussões positivas sobre custo-consciência em saúde.*

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INTRODUCTION

The "Choosing Wisely" campaign has drawn attention worldwide as a potentially promising approach to the problem of unnecessary care. The campaign focuses its actions on the value of care and potential risks to patients, rather than using cost as a motivating factor in healthcare[1]. Currently, quality of health care is directly associated with the number of prescribed procedures, scientific uncertainty about the most appropriate conduct, patients' insistence in requiring more tests and treatments, and the conflicts of interest involving physicians, pharmaceutical and medical equipment industries and health clinics. The culture of "better is more" alerts to the overuse problem in health care, which refers to those circumstances in which the care provided is more likely to cause harm than benefits to the patient[2,3].

Excessive testing and treatments represent important causes of waste in medical practice[4,5], and medical decisions account for 80% of all health care expenditures[5]. In 2014, the American Board of Internal Medicine (ABIM) interviewed 600 physicians about the use of unnecessary tests and procedures in the health care system. Seventy-three percent of the 600 physicians recognized that over-testing and excessive procedures are serious problems for the health care system; 72% reported requesting an unnecessary test or procedure at least once a week; 47% reported that patients request an unnecessary exam, and 53% of the physicians admitted they would request an unnecessary test if the patients insisted in their request. The main reasons for requesting unnecessary tests or procedures were concern about malpractice issues (52%); just to be safe (36%) and wanting more information (30%)[6]. Defensive medicine has emerged in the United States, especially in the 90s, due to medical malpractice. The costly results of defensive medicine were the over-requesting of tests or procedures to reduce concerns about malpractice liability risk [7].

Eliminating unnecessary medical care has received increasing attention from worldwide health systems[1]. The growing of public health costs and wastefulness with unnecessary procedures in health are frequent, and these scenarios require changes in education initiatives by managers and current medical societies around the world. The Institute of Medicine in the United States reported that in 2009, about $ 750 billion were wasted in unnecessary health spending[4,5] . The World Health Organization reported that about 20 to 40 percent of health spending that could be redirected to reach universal coverage is diverted through fraud or misuse of resources[8] . In 2015, the Brazilian wastefulness of resources with unnecessary exams was about 2.5 billion US dollars [9].

In 2012, the ABIM Foundation launched the Choosing Wisely (CW) campaign, with the collaboration of nine specialty societies, releasing a "Top Five" list from those societies, indicating unnecessary behaviors in health care. The initial campaign proposal did not have the primary objective of saving resources but rather of improving the quality of care, increasing treatment benefits and reducing the risk of harm. Currently, about 20 countries participate in the CW campaign, integrating the Choosing Wisely International. Among them are the United States, Canada, England, Australia, Brazil, Germany, Italy, Japan, the Netherlands, New Zealand and Switzerland[10] .

Stimulating undergraduate medical students to make rational use of health resources represents one of the possibilities of changing wasteful behavior and overuse in medical practice. There are few medical undergraduate students involved in the CW campaign worldwide[10, 11]. Canada is one of the countries that has systematized this initiative in undergraduate medical institutions. Medical undergraduate students, supervised by their teachers, are encouraged to create lists of unnecessary behaviors in health care[11]. In Brazil, the Bahiana School of Medicine has

a pioneer project, which involves medical undergraduate students in the CW campaign. We aimed to evaluate the effect of the CW campaign implementation on the medical internship of a medical clinic.

MATERIAL AND METHODS

This intervention study included medical teachers and internship students from a medical clinic, attending the tenth semester, at Bahiana School of Medicine and Public Health. We used the Delphi[12,13] technique to build a list of recommendations. The teachers, using an online questionnaire, addressed three unnecessary situations that commonly occur in clinical practice. We grouped the recommendations by topic and frequency of citation, adapted them to the CW format, and forwarded the grouped list to the panel of suggestions. We excluded repeated topics and sentences without scientific evidence support. A Likert-type scale was used (4: strongly agree, 3: moderately agree, 2: moderately disagree, 1: strongly disagree) to obtain the experts' opinion about the most relevant recommendations, which we used as a guide for educational interventions. Before the introduction of the CW campaign, we conducted an Objective Structured Clinical Examination (OSCE) model evaluation, using clinical cases, images, and videos, based on the recommendations built by the present study.

All students and teachers participated in the CW campaign during a 1-year period. Educational interventions comprised a two-hour workshop, using the active learning methodology to discuss the recommendation lists with evidence-based justifications. Banners, containing the eight propositions, were placed in the internship area. We shared with medical students and teachers the videos and literature about the recommendation list and used the campaign topic in theoretical-practical activities.

We addressed the topic of the CW campaign at two different evaluation time points. We used a descriptive clinical case, approaching the recommendations in a reflective context, and used the Objective Structured Clinical Examination (OSCE) model evaluation with a clinical case format, using a simulated patient (previously trained in a workshop). In order to evaluate the student's reflective attitude towards a practical situation, we used a recommendation that was not among the top-eight recommendation list. We previously trained all teachers, achieving the content of the case and the checklist, containing questions and answers expected for the simulated case. We compared two groups of students (Figure 1): one group that underwent the same OSCE evaluation before the implantation of CW campaign (G1=110), and another group that participated of all educational actions (G2= 98).

We used the SurveyMonkey platform to send all questionnaires at different phases of the survey. The SPSS Software 23.0 was used to analyze the quantitative data, described as frequency and percentage for categorical variables. We used the chi-square test to compare exposed (G2) and nonexposed students (G1) to the CW campaign. The Equator checklist was used to report evidence-based practice in educational interventions and teaching (GREET)[14] to achieve transparency and reproducibility of our research.

Ethics

This study is part of a broader research that investigated the CW campaign implementation in several areas of medical internship at a private medical school[12] . This research was performed according to Brazilian Resolution n. 466/2012 of the National Health Council, and the Declaration of Helsinki. The Research Ethics Committee of the Bahiana School of Medicine and Public Health approved the protocol under number 1,627,477. All volunteers signed a consent form.

RESULTS

The panel of specialists consisted of 13 Internal Medicine teachers with a median age of 52 years (IQR: 49-56), with a predominance of females (69.2%), with a median time after graduation of 31 years (IQR: 27-34.5). About 92.3% of the teachers had a Master's or Doctorate degree, and 84.6% reported prior knowledge of the CW campaign. Ninety-eight students participated in the study, with a median age of 23 years (IQR: 22-24), and a majority of females (64.0%).

Each Internal Medicine teacher indicated three unnecessary behaviors in daily health care, resulting in 39 recommendations. We excluded three recommendations due to lack of scientific evidence. After grouping the propositions, and excluding the repeated themes, we obtained 24 recommendations that were adapted to the CW format. We forwarded the 24-item list to the experts, and asked them to choose the top five items, rating them using a Likert scale. Eight recommendations showed 100% of agreement; therefore, we decided to maintain all of them in the final list (Table 1).

All 13 teachers and 98 students (G2) participated in the educational activities. Teachers discussed the eight recommendations, using interactive methodologies (audiovisual resources and videos). The workshop content was evaluated as excellent/very good by 95.9% of students, as showing high quality of presentation by 98%, and high quality of the discussion by 93%.

In the end of the internship period, the students (G2) were submitted to a theoretical evaluation, which used clinical cases that included two of the medical clinic recommendations (Table 2).

In the OSCE model evaluation, two groups were compared: one group of students who participated in the CW campaign (G2: 98) and another, who did not participate in the CW campaign (G1: 110). Table 3 showed the percentages of hits and misses obtained in each group. The level of hits was higher in the CW exposed group when compared with the nonexposed group (P = 0.001).

Figure 1
Flowchart of the study

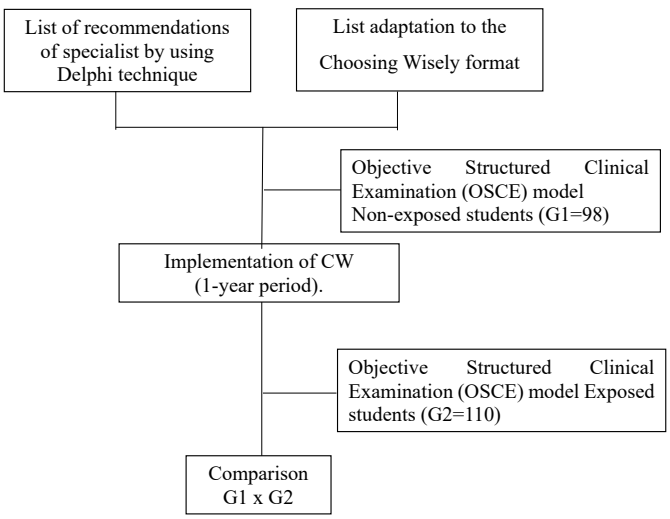

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Table 1

Frequencies of the 24 recommendations suggested by 13 Internal Medicine specialists attending internship at a Medical School, Salvador, Bahia, Brazil, 2018.

N.	Items*	Total Score (Likert-type)	Strongly agree % (n)	Moderately agree % (n)	Moderately disagree % (n)	Strongly disagree % (n)
1	Avoid prescribing multiple tests to inpatients whose results will not influence therapeutic management.	52	100 (13)	0 (0)	0 (0)	0 (0)
2	Avoid prescribing non-steroidal anti-inflammatory drugs in most clinical situations with self-limiting evolution.	52	100 (13)	0 (0)	0 (0)	0 (0)
3	Do not request upper gastrointestinal endoscopy for patients below the age of 50 with recent onset dyspepsia and no warning signs.	52	100 (13)	0 (0)	0 (0)	0 (0)
4	Do not request daily chest x-rays in an intensive care unit for patients who are not on mechanical ventilation and have a stable clinical course.	52	100 (13)	0 (0)	0 (0)	0 (0)
5	Do not prescribe antibiotic prophylaxis for longer than recommended.	52	100 (13)	0 (0)	0 (0)	0 (0)
6	Do not request allergy skin tests routinely and without well-established clinical criteria.	52	100 (13)	0 (0)	0 (0)	0 (0)
7	Avoid requesting tests at the initial screening for patients at risk of thyroid disease, prioritizing TSH levels first.	52	100 (13)	0 (0)	0 (0)	0 (0)
8	Do not request spirometry for asymptomatic patients with no risk factors for lung disease.	52	100 (13)	0 (0)	0 (0)	0 (0)
9	Do not order a colonoscopy or do not repeat it at short intervals, especially in less than five years, without considering well-established clinical criteria and risk factors.	51	92 (12)	8 (1)	0 (0)	0 (0)
10	Avoid imaging studies for the diagnosis of acute low back pain in the emergency unit.	51	92 (12)	8 (1)	0 (0)	0 (0)
11	Do not prescribe antibiotics for acute respiratory infections suggestive of viral etiology.	51	92(12)	8 (1)	0 (0)	0 (0)
12	Do not perform chest-computed tomography for patients with uncomplicated pneumonia.	51	92 (12)	8 (1)	0 (0)	0 (0)
13	Do not prescribe acetylsalicylic acid as a primary prevention to all diabetic patients.	50	85 (11)	15 (2)	0 (0)	0 (0)
14	Do not request chest X-rays at the end of treatment as a control for uncomplicated pneumonia with good clinical outcome.	50	85 (11)	15 (2)	0 (0)	0 (0)
15	Do not routinely request urine cultures for all patients, except for asymptomatic pregnant women.	50	85 (11)	15 (2)	0 (0)	0 (0)
16	Do not routinely prescribe lipid-lowering medications to patients older than 75 years of age, without considering comorbidities and life expectancy.	49	77 (10)	23 (3)	0 (0)	0(0)
17	Do not perform routine preoperative cardiac evaluation tests in asymptomatic patients before low-risk surgical procedures.	49	77 (10)	23 (3)	0 (0)	0 (0)
18	Do not request a sinus x-ray for the diagnosis of acute rhinosinusitis.	48	77 (10)	15 (2)	8 (1)	0 (0)
19	Do not prescribe proton-pump inhibitors to prevent acute mucosal injury in patients without risk factors.	48	84 (11)	8 (1)	0 (0)	8 (1)
20	Avoid requesting routine pre- and post-capillary glycemic measurements for insulin adjustments.	47	69 (9)	23 (3)	8 (1)	0 (0)
21	Avoid requesting daily blood gas analysis in an intensive care unit for patients without acute respiratory failure.	47	69 (9)	23 (3)	8 (1)	0 (0)
22	Do not request complementary cardiological exams (ergometric test and echocardiogram) for asymptomatic patients.	46	61 (8)	31 (4)	8 (1)	0 (0)
23	Do not request urinalysis for the diagnosis of urethritis or cystitis in non-pregnant women in case of emergency care.	45	54 (7)	38 (5)	8 (1)	0 (0)
24	Avoid routinely requesting complementary exams for a check-up, without clinical correlation.	43	77 (10)	0 (0)	0 (0)	23 (3)

n: number of Internal Medicine specialists * The bold letters represent the chosen items

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Table 2
Theoretical evaluation using Choosing Wisely recommendations with 98 medical clinic internship students, Salvador, Bahia, Brazil, 2018.

Medical clinic recommendation	Hits n (%)	Misses n (%)
Do not request upper gastrointestinal endoscopy for patients below the age of 50 with recent-onset dyspepsia and no warning signs.	98 (100.0)	-
Avoid prescribing multiple tests to inpatients whose results will not influence therapeutic management.	95 (97.0)	3 (3.0)

n: number of medical students

Table 3
Frequency of answers in the OSCE evaluation in exposed and nonexposed students to the CW campaign in the medical clinic internship, Salvador, Bahia, Brazil, 2018.

Medical clinic recommendation	Nonexposed to CW campaign (N=110)		Exposed to CW campaign (N=98)		†P-value
	Hits n (%)	Misses n (%)	Hits n (%)	Misses n (%)	
Avoid routinely requesting complementary exams for a check-up, without clinical correlation.	45 (40.9)	65 (59.1)	93 (94.9)	5 (5.1)	0.001

n: number of medical students
*OSCE: Objective Structured Clinical Examination
† Chi-square test

DISCUSSION

One of the most important challenges in medical undergraduate courses is to enable the adoption of cost-conscious attitudes, using appropriate care and treatments, based on scientific evidence. The adoption of wise decisions is as important as avoiding unnecessary conducts in health care[10,15]. In this study, we built a list with eight main medical recommendations, including complementary exams and conducts, which doctors should avoid when providing health care. We discussed the literature support for each recommended item.

The first recommendation was "Avoid prescribing multiple tests to inpatients whose results will not influence therapeutic management". In recent decades, the number of complementary exams requested in the hospital environment has increased worldwide[16]. In 2004 and in 2013, 3.4 and 4.6 complementary exams were prescribed per patient/day in Brazil, respectively. Therefore, in ten years, a 37% increase was observed. Although some tests may aid in diagnosis and treatment, it is known that a large number of requested tests is not necessary for the proper management of patients. The excess of prescriptions generates high financial costs, either to the patient or to the health system[16].

The cost with laboratory tests represents less than 5% of hospital budgets. However, these costs affect the health system since laboratory tests influence around 60% to 70% of all medical decisions. Health professionals and managers should carefully plan and optimize efforts to reduce daily laboratory tests without influencing therapeutic management. To date, numerous interventions have been implemented in several institutions, using three main strategies: professional education, auditing, and implementation of management to control over-testing and overuse in health care[17] .

The second recommendation "Avoid prescribing non-steroidal anti-inflammatory drugs in most clinical situations with self-limiting evolution" is relevant for medical clinic practice. This pharmacological group is among the most often used medications in medical practice, especially for pain, presenting potential and important adverse effects[18, 19]. In the United States, about 116 million people suffer chronic pain, whereas in Europe, chronic pain affects 27% of the population[18]. In 2016, a study on self-medication in Brazil showed that the most frequently used groups of drugs were analgesics (33.4%), followed by muscle relaxants (13.8%) and anti-inflammatory/antirheumatic drugs (11.7%)[19] .

The most common side effects of non-steroidal anti-inflammatory drugs occur in the gastrointestinal tract. About 20% of patients have abdominal pain, heartburn, and diarrhea. Chronic use may trigger gastric/duodenal erosion and ulcers and, more rarely, bleeding and perforation. There is evidence that COX-2 inhibitors may cause thrombotic effects, resulting in complications such as the increased risk of myocardial infarction, stroke, heart failure, and hypertension, mainly in patients with prior cardiovascular disease. Renal perfusion may also be compromised leading to renal vasoconstriction, medullary ischemia and, under certain conditions, acute renal failure. Therefore, the prescription of these medications should be reserved for special situations, avoiding their use in self-limiting illnesses, which will show no change in their evolution[20].

Symptoms of dyspepsia may be present in about 20% of the world's population, causing high costs to the health care system and to society, including frequent absenteeism at work[21]. The third recommendation "Do not request upper gastrointestinal endoscopy for patients below the age of 50 with recent onset dyspepsia and no warning signs" is explained by the high frequency of unnecessary endoscopies in health care. The American College of Gastroenterology and the Canadian Association of Gastroenterology recommends that patients with dyspepsia, under the age of 60, should perform a noninvasive test for *Helicobacter pylori*. If the test is negative, the use of a proton-pump inhibitor is indicated. Studies comparing the "test and treat" approach and the use of endoscopy did not report differences in symptom control and evidenced unnecessarily increasing costs. Other drugs may also be used, such as tricyclic and prokinetic antidepressants. Upper digestive endoscopy should be performed in patients above 60 years. Below this age, especially in patients younger than 50 years, endoscopy is indicated only if there are risk factors such as a first-degree positive family history for malignancy; unintentional weight loss; digestive bleeding; dysphagia, and frequent vomiting[21, 22].

The chest x-ray is the most often requested imaging exam in the intensive care unit (ICU)[23], and it is often unnecessarily indicated, which justifies the fourth recommendation "Do not order daily chest x-rays in an intensive care unit for patients who are not on mechanical ventilation, and have a stable clinical course". The American College of Radiology recommends that the chest X-ray indication in the ICU is only justified in case of acute cardiopulmonary problems or need for mechanical ventilation, especially with changes in clinical evolution. In the ICU, the

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patient is usually restricted to the bed, incapable of assuming postures that provide good-quality radiographic incidences, leading to misinterpretation or false-positive results. The correct indication of the radiograph exams prevents potential damages caused by radiation exposure and its indication must always be based on clinical justifications and the possibility of patient treatment change [23]. A meta-analysis performed with 7,078 ICU patients, in which 91% of cases were due to the clinical cause and 61% were on mechanical ventilation at admission, showed that about 3,429 of these patients (48.4%) underwent chest radiography daily and 3,649 (51.6%) did so only when there was a clinical indication. The mean number of chest radiographs per patient in the daily group ranged from 2.4 to 10.5, and it was much lower in those who underwent x-ray by clinical indication (0.4 to 4.4). The study reported that there was no difference between the two groups regarding the time of ICU stay, use of mechanical ventilation and mortality[24].

The importance of the fifth recommendation "Do not prescribe antibiotic prophylaxis for longer than recommended" is based on the fact that the indiscriminate use of antibiotics may cause resistance and selection of bacterial flora, an increase in adverse reactions, and high costs for health care. Generally, the antibiotic choice and timing depend on the type of surgery or procedure. Fifty percent of infections may be avoided if evidence-based strategies are used. The variability in compliance with global guidelines was demonstrated in a systematic review conducted from 2004 to 2014, which reported inadequate antibiotic indication ranging from 2.3% to 100%; administration at the appropriate time from 12.7% to 100% and the correct choice of antibiotic from 22% to 95%[25].

The sixth recommendation "Do not request allergy skin tests routinely and without well-established clinical criteria" is justified based on the fact that allergy skin tests are the most often used tests for allergic disease diagnosis, together with specific immunoglobulin E (IgE) test. The skin test is fast, simple and accessible; however, its main disadvantage is the lack of standardization. The test results depend on the types of extracts used and the experience of the professional in the analysis. The skin test may be positive in 10% to 15% of asymptomatic patients due to sensitization and not necessarily to allergy. The clinical correlation is necessary to conclude there is allergic disease[26, 27]. In 2014, a systematic review evidenced that the reliability of the skin test depends on the application method. According to the authors, the test needs to be standardized and adequate to the most characteristic types of allergens in the region investigated. There are a number of specific reagents tested worldwide, with no consensus on which the main allergens are that should be applied, which can lead to diagnostic error. In addition, the skin test should not be used alone for the diagnosis of allergic disease[27].

The seventh recommendation "Avoid requesting tests at the initial screening for patients at risk of thyroid disease, prioritizing TSH levels first" is related to the evaluation of effective laboratory tests that are critical for the accurate diagnosis and cost-effective monitoring of thyroid dysfunctions. The thyroid stimulating hormone (TSH) measurement is the most reliable initial test to diagnose the primary forms of hypothyroidism and hyperthyroidism. Hypophyseal TSH secretion regulates T4 (thyroxine) and T3 (triiodothyronine) secretion, in which small changes in the concentrations of free thyroid hormones result in large changes in serum TSH concentrations. This fact evidences that TSH is the best indicator of discrete changes in thyroid production. Therefore, T4 and T3 tests are indicated for subsequent investigation, as well as the measurement of antiperoxidase antibodies, which should be considered for the diagnosis of thyroid autoimmunity[28].

The spirometry test can be used as a tool in the diagnostic evaluation of respiratory diseases, especially in the differentiation between obstructive and restrictive diseases; to identify respiratory compromise in occupational diseases; to assess prognosis or treatment response prospects; in case of preoperative evaluation, surgical respiratory complications and smokers' pulmonary control function. Spirometry is still the most widely used test for the evaluation of respiratory function, with wide applicability, but should be based on clinical criteria and patients with risk factors for pulmonary disease. Therefore the last recommendation "Do not request spirometry for asymptomatic patients with no risk factors for lung disease" is according to recognized clinical criteria[29].

After creating this list of recommendations, we disseminated them among all teachers and students. We developed educational actions that resulted in discussions, regarding cost-conscious health care. The theoretical evaluation and the OSCE, based on recommendations, evidenced a high percentage of success responses by participants exposed to the CW campaign. The approached topic of the CW campaign in the form of clinical cases required from internship students not only prior knowledge but also the appropriation of a reflective attitude about risks and benefits to patients. One of the challenges in medical education is to use evaluation tools that do not focus exclusively on cognitive aspects. Among these instruments, the Objective Structured Clinical Examination is widely used in the evaluation of medical students and residents. The OSCE presents a summative and formative character since it is not restricted to the evaluation of knowledge. Competency-based learning plays a key role in medical education, and the OSCE is among the gold standard examinations to objectively assess knowledge, skills, and attitudes in situations involving practical decisions[30]. In the OSCE model evaluation, after a year of campaign implementation, even when addressing a recommendation that was not included in the list of the eight main ones, a significant difference regarding response success was observed in the group that was exposed to the CW campaign, when compared to the nonexposed group. Our results evidenced the educational method effectiveness, which may result in better health care.

The cost-consciousness topic is not routinely present in the curricular matrices of medical undergraduate courses[12,31]. Without formal education on this theme, students may adopt any supervisors' observed practices during health care. Therefore, students and residents should be educated to reflect and develop cost-consciousness practices, avoiding unnecessary conducts[12,31].

From the perspective that medical undergraduate students may learn cost-conscious attitudes in medical training, the involvement of medical students is the CW campaign is of great importance. In Canada, 17 medical schools are engaged in the challenge of spreading the culture against waste in health care, building lists of potentially harmful behaviors that students should question, including unnecessary treatments and exams. Another campaign, supported by CW Canada, called Students and Trainees Advocating for Resource Stewardship (STARS) is also being developed with the objective of promoting cost-conscious education, and changes in medical education curricula[32, 33]. Choosing Wisely Canada launched the STARS campaign in 2015 partnered with national medical

students' associations to establish medical education as a key strategic priority for establishing practice habits in healthcare and fill the gap in medical curricula. Canada's experience with the STARS campaign led to the implementation of a wide range of awareness-building activities and curricular changes in medical schools across the country[33].

CONCLUSION

The implementation of the Choosing Wisely campaign at undergraduate medical schools improved the clinical skills of medical clinic internship students and resulted in positive effects on the recommendations on not adopting unnecessary behaviors that could generate harm to the patient. The educational actions by the CW campaign implementation resulted in the students' better knowledge about cost-conscious behaviors in health care.

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AUTHORS' CONTRIBUTION

DRM has written the manuscript, worked on acquisition, analysis and interpretation of data, and approved the last manuscript version for publication.

CVNA has worked on the analysis and interpretation of data, revised the paper critically, and approved the last manuscript version for publication.

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AVAV worked on the acquisition of data, critically reviewed the manuscript and approved the last manuscript version for publication.

MSM has worked on the analysis and interpretation of data, revised the paper critically, and approved the last manuscript version for publication.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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