Medical Students' Awareness About Value-Based Health Care in Brazil: A Cross-Sectional Study

Gustavo Hirt,[1] Fernanda Gushken,[2] Guilherme Borges Gomes da Silva,[3] Daniel Lacerda Heringer,[4] Luciano Castro Gomes de Mello,[5] Daniel Tavares Malheiro,[6] Marcia Makdisse.[7]

Abstract

Background: Rising healthcare costs demand a transition from the current fee-for-service to a Value-Based Health Care (VBHC) Model. This requires that all future doctors to understand the VBHC Model. We aimed to evaluate the VBHC awareness among Brazilian medical students and to identify it's associated intrinsic/extrinsic factors through a survey-based, cross-sectional study. **Methods:** An online survey was sent to students from Brazilian medical schools. A descriptive analysis based on participants' level of awareness about VBHC was performed. The categorical variables included were absolute and relative frequencies using chi-square tests. A multivariate binary logistic regression analysis was performed by calculating the odds ratio (OR) and 95% confidence intervals (95%CI) to compare each response according to VBHC awareness. **Results:** We collected 3030 responses from 148 Medical Schools across all Brazilian states. Medical students were compared into 2 groups; 1 was familiar with VBHC (14%; 426); 2 were not (86%; 2575). The univariate analysis showed that group 1 was more willing to share clinical outcomes/costs data related to their practice (57.04%) compared to 2 (48.12%), p<0.01. The multivariate analysis showed that internship experience was the most relevant factor associated with VBHC exposure (OR 4.32 [CI 95% 1.82 - 10.24]). **Conclusion:** We found that few medical students understand VBHC concepts, and that exposure was due to self-education efforts. Our results suggest that medical schools have the potential to reinforce both intrinsic and extrinsic factors related to students with regards to VBHC knowledge in order to prepare future doctors to practice in a value-driven context.

Key Words: Delivery of Health Care, Health Care Costs, Medical Students, Brazil (Source: MeSH-NLM).

Introduction

Health care costs increase yearly, representing more than 10% of the world's Gross Domestic Product (GDP).[1] In the United States, 17.07% of the GDP is spent on health, while in Brazil, this rate is 11.77%.[1] However, spending more does not necessarily mean better quality of health. This dissonance between costs and quality results from the current payment model, fee-for-service, which promotes volume of services over outcomes achieved.[2] In 2006, Porter and Teisberg coined the term "Value-Based Health Care" to refer to a strategy aimed at restructuring health care systems and maximizing value for patients. In this proposal, value is the relationship between the outcomes that matter to patients and the costs required to achieve these outcomes.[3]

In Latin America, only a few initiatives have implemented Value-Based Health Care Models (VBHCs).[5-7] These initiatives are necessary to foster the transition from the current flawed model towards one focused on health promotion and outcomes, as well as require the timely inclusion of this topic in medical training programs.[7,8] In order to advance VBHC implementation, it is key to educate all healthcare stakeholders. An analysis of 255 citations of 12 VBHC trend-starting articles pointed out that although the VBHC discussion is spreading through medical journals, a significant proportion of the publications miss the exact understanding of the aspect they are discussing or referring to, and the authors conclude that diffusion of shallow knowledge is underway.[9] In Brazil, a survey conducted in a private nonprofit organization by Makdisse M et al demonstrated that the level of awareness of VBHC is still low among physicians, with only 27% percent of them being familiar with the VBHC concepts.[10] Of note, the percentage was 80% among physicians in executive roles[10]

An effective way to increase the awareness among healthcare professionals would be to include VBHC in medical and other health undergraduate programs curriculum. The first step is to understand the current context and degree of familiarity of medical students with VBHC core concepts. Currently, there are no published studies that assess this degree of awareness in future doctors. Therefore, this study aimed to evaluate the degree of awareness among Brazilian medical students about VBHC and to correlate the intrinsic and extrinsic factors with VBHC exposure. We hypothesize that this awareness is still low, especially due to

Original Article

the recent advent of the topic and its absence in a formal medical school curriculum. In this way, beyond spreading the value concepts, we may establish a baseline level of VBHC awareness and compare it with post-intervention assessments.

Methods

This cross-sectional study was based on an electronic survey applied to medical students from 148 Brazilian medical schools located in the five Brazilian regions, including both public and private schools.

The eligibility criteria consisted of medical students enrolled in Brazilian medical schools between January 2019 to December 2020 and who signed an electronic consent form. The selection method was online-based, with the survey sent through social media, email, and WhatsApp® with no paid advertisements. The survey was open from November 2019 to June 2020. In order to prevent selection bias, the survey was advertised beyond the direct connections of the authors. The authors contacted student organizations from universities in all states of Brazil to assist with adverting. Due to the exploratory nature of this study, the sample size was not calculated. This study was approved by the ethical committee from Universidade Passo Fundo (Brazil) with the reference number 3.681.791 and received no funding.

The survey questions (*Supplementary Material*) were developed based on a similar study adapted to the Brazilian context.[11] The primary endpoint was to determine the self-reported level of awareness of Value-Based Health Care among medical students. Secondary endpoints were to assess intrinsic and extrinsic factors related to this level of awareness. Intrinsic factors included age, gender, previous college degree obtained, medical area of interest, interest in pursuing academic programs other than medical school, participation in extracurricular activities, and interests beyond the medical field. Extrinsic factors included the medical school year, the university name, its location, whether management and health systems classes were included in the curriculum, teaching methodology, and the existence of a health management/health consulting club at their institution.

To compare students regarding their level of awareness of VBHC, answers to Question 6 (How do you rate your degree of familiarity with the topic "Value-Based Healthcare"?) on the online survey were transformed into binary variables, where "yes" (high level of awareness on VBHC) was considered if options "a, b or c" had been selected, and no (low level of awareness on VBHC) for all of the others, in order to make groups homogeneous and to reduce the degrees of freedom of the variables.

A descriptive analysis based on participants' level of awareness about VBHC was performed. The continuous variables were mean standard deviation, median, and interquartile range. The normality assumptions were tested a priori. When normality assumptions were met, t-tests were performed, if not, non-parametric tests (Mann-Whitney U or Kruskal-Wallis) were used.

The categorical variables included were absolute and relative frequencies using chi-square tests. A multivariate binary logistic regression analysis was performed by calculating the odds ratio (OR) and 95% confidence intervals (95% CI) to compare each response according to VBHC awareness. The software used for statistical analysis was R version 3.6.0. Statistical significance considered was 5%.

Results

Descriptive Analysis

A total of 3,030 medical students completed the survey, corresponding to 148 institutions across 24 states of Brazil and the Federal District. Thirty-three responses were excluded due to lack of signed consent or incomplete information (*Figure 1*). Among included participants, 63.6% were female, and the mean age was 22.6 years old, with a standard deviation of 3.1 years. Male respondents had a mean age of 22.7 years and a standard deviation of 3.6 years. Regarding the medical students' profile, 34% were in 1st and 2nd year, 38% in 3rd and 4th year, and 28% in 5th and 6th year. The last two medical school years in Brazil are equivalent to the clinical rotation years in the United States.

Figure 1. Flowchart of Participant Responses.
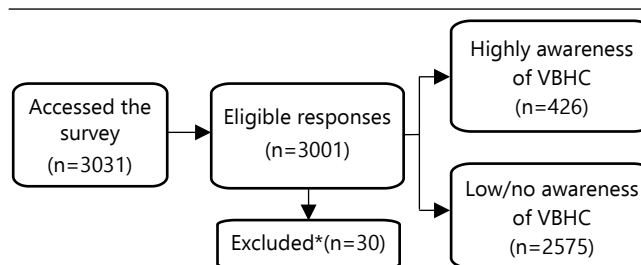
Legend: *Excluded responses were due to no consent form signature or absent response on the degree of VBHC awareness.

In *Table 1*, we divided participants into two groups: group 1 consisted of students who declared to be familiar with VBHC (14.19%; 426) and group 2 with those who were not (85.81%; 2575). Among all participants, 53.91% correctly identified Porter's concept of Value, with no statistical significance between the two groups. However, group 1 was more likely to know Porter's Value equation (9.39% vs 0.43%; p<0.01) and to indicate both components of the formula correctly in order, outcomes (14.08% vs 4.97%; p<0.01) and costs (17.37% vs 5.75%; p<0.01). Altogether, only 4.19% of participants got Porter's formula correct. Regarding their future as healthcare professionals, group 1 noted that knowing the costs of care would impact their practice (82.63% vs 78.64%; p=0.02) and considered that health outcomes should play a key role in reimbursement for care delivery (49.53% vs 41.51%; p<0.01). Likewise, they were more open to being evaluated and compared to other doctors by patients (32.86% vs 25.36%; p <0.01).

INTERNATIONAL JOURNAL of MEDICAL STUDENTS

Original Article

Hirt G, et al.   Medical Students' Awareness About Value-Based Health Care in Brazil: A Cross-Sectional Study

Table 1. Students Characteristics and Career Interests According to Value-Based Health Care (VBHC) Awareness.

Variable	High level of awareness on VBHC (n=426)	Low level of awareness on VBHC (n=2575)	p-value
Gender, n (%)			
Female	242 (56.81)	1670 (64.85)	p <0.01
Male	184 (43.19)	905 (35.5)	
Progression in Medical School, n (%)			
1st year	49 (11.15)	354 (13.75)	
2nd year	81 (19.01)	538 (20.89)	
3rd year	107 (25.12)	642 (24.93)	p=0.29
4th year	67 (15.73)	323 (12.54)	
5th year	65 (15.26)	402 (15.61)	
6th year	57 (13.38)	316 (12.27)	
Does your university have a mandatory healthcare management class? n (%)			
Yes	170 (39.91)	742 (28.82)	
No	100 (23.47)	627 (24.35)	p<0.01
No, but there is an optional	23 (5.4)	120 (5.47)	
I don´t know	133 (31.22)	1086 (42.17)	
Do you have any previous college degree? n (%)			
Yes	30 (7.04)	120 (4.66)	p=0.02
No	396 (92.96)	2455 (95.34)	
What is your medical area of interest? n (%)			
Internal Medicine	233 (54.69)	1514 (58.8)	p=0.09
Surgery	192 (45.07)	1138 (44.19)	p=0.71
Management	50 (11.74)	156 (6.06)	p<0.01
Research	73 (17.14)	349 (13.55)	p=0.03
Do you have interest in pursuing academic programs other than medical school? n (%)			
Residency Program	416 (97.65)	2539 (98.6)	p=0.1
Masters /PhD	241 (56.57)	1400 (54.37)	p=0.36
MBA	85 (19.95)	218 (8.47)	p<0.01
What extracurricular activities have you engaged in? n (%)			
Students/Sports Associations	148 (34.74)	698 (27.11)	p<0.01
Junior Enterprises	23 (5.4)	32 (1.24)	p<0.01
Startups	18 (4.23)	22 (0.85)	p<0.01
NGOs	59 (13.85)	207 (8.04)	p<0.01
Do you have any interest beyond healthcare? n (%)			
Research	225 (52.82)	1207 (46.87)	p<0.01
Innovation	186 (43.66)	919 (35.69)	p<0.01
Patient Safety	156 (36.62)	697 (27.07)	p<0.01
Healthcare Economics	292 (68.54)	2079 (80.74)	p<0.01
Artificial Intelligence	132 (30.99)	500 (19.42)	p<0.01
Healthcare Policies	155 (36.38)	671 (26.06)	p<0.01

With respect to intrinsic factors, group 1 was more familiar with payment models (global budget [55.87% vs 42.6%], fee-for-service [57.04% vs 49.28%], bundles [23.24% vs 12.58%] and pay-for-performance [19.01% vs 9.55%], all p<0.01). The same students were more likely to have completed another undergraduate course before medical school (7.04% vs 4.66%; p=0.02) and to participate in student organizations (34.74% vs 27.11%; p < 0.01), NGOs (13.85% vs 8.04; p<0.01), or Junior Enterprises (5.4% vs 1.24%; p<0.01). Moreover, they intended to follow careers in management (11.74% vs 6.06%; p<0.01) and pursue a Master's in Business Administration (MBA) in the future (19.95% vs 8.47%; p<0.01). Finally, they showed more interests in fields others than medical practice, such as innovation (43.66% vs 35.69%; p<0.01), research (52.82% vs 46.87%; p=0.01), patient safety (36.62% vs 27.07%; p<0.01), health economics (31.46% vs 19.26%; p<0.01), and health policy (36.38% vs 26.06%; p<0.01).

With regards to teaching methodology, students familiar with VBHC were more often taught through active learning methodologies (Problem-Based Learning [11.5% vs 10.83%;] and Team-Based Learning [10.33% vs 5.67%]; p<0.01). Similarly, those aware of VBHC were more often required to attend a mandatory healthcare management course (39.91% vs 28.82%; p<0.01) where payment models were debated (15.02% vs 8.04%; p<0.01) and were also more likely to attend optional management lectures (47.89% vs 23.82%; p<0.01) and participate in Junior Enterprises (10.56% vs 5.01%; p<0.01).

Multivariate Analysis
The multivariate analysis presented in *Table 2* showed that the most frequent way of contact with VBHC concepts cited by respondents was through internships (OR 4.32, 95%CI 1.82 - 10.24). We hypothesize that students seeking job opportunities during medical school are more inclined to actively learn by themselves and to stay updated on market trends. Similarly, group 1 was more likely to know Porter's Value Formula (OR 6.95, 95%CI 1.74 - 27.9) and to recognize the importance of discussing clinical outcomes during medical school (OR 20.83, 95%CI 1.59 - 272.11). We recognize that future studies are necessary to investigate whether extrinsic factors could increase VBHC awareness. In this study, we found that medical school classes were not a source of VBHC exposure (OR 1.44, 95%CI 0.83 - 2.5). Likewise, the discussion of payment systems in medical school curricula was not significantly correlated to VBHC knowledge (OR 1, 95%CI 0.29-3.42).

Table 2. Results of a Multivariate Analysis Used to Determine Which Factors are Associated with High Value-Based Health Care (VBHC) Awareness Compared to Low VBHC Awareness.

Variable	OR (95%CI)	Respondents (Yes)
Previous exposure to VBHC	**12.53 (7.53 - 20.85)**	599
Exposure to VBHC through internships	**4.32 (1.82 - 10.24)**	73
Exposure to VBHC through conferences and lectures	1.71 (0.99 - 2.94)	194
Exposure to VBHC through extracurricular activities	1.62 (0.87 - 3.0)	126
Exposure to VBHC through articles	1.57 (0.67 - 3.71)	66
Exposure to VBHC through medical school classes	1.44 (0.83 - 2.5)	191
Do you know the "Value" formula presented by Porter and Teisberg (2006)?	**6.95 (1.74 - 27.9)**	51
Do you consider it important to discuss "outcomes" during medical school?	**20.83 (1.59-272.11)**	2949
Do you consider it important to discuss "costs" during medical school?	0.38 (0.1-1.5)	2907
Do you consider it important to discuss "payment systems" during medical school?	1 (0.29 - 3.42)	2882
Are you aware of any payment system?	**0.5 (0.27-0.93)**	1908
Do you think that knowing the costs of your medical practice influences how you practice medicine?	1.02 (0.62 - 1.67)	2377
Do you think that knowing the outcomes of your medical practice influences how you practice medicine?	1.22 (0.52 - 2.85)	2795
Would you be willing to have the outcomes and costs of your medical practice monitored and compared to other physicians' performance?	1.1 (0.47 - 2.6)	2901
Would you be willing to share data of the outcomes and costs of your medical practice in order to contribute to reduce costs and improve healthcare quality?	1.45 (0.94 - 2.23)	2737

Legend: CI=Confidence intervals, OR=odds ratio. In bold, we presented the results with significant p values (p <0.05)

Discussion

In this study, only 14.19% (426) of the assessed population was found to be familiar with VBHC concepts, a rather small percentage of students considering the implications of this sample representing part of the future healthcare workforce in Brazil. We have not found any previous studies that analyzed the familiarity of medical students with VBHC. Compared to doctors in a top-tier, non-profit hospital in Brazil, this percent is also low (14.19% vs 27%).[10] This result suggests that most doctors do not know VBHC concepts and, when they are familiar with them, the exposure happens mostly after they graduate from medical school. Although it is recognized that VBHC is essential to prepare doctors for 21st-century medical practice, several barriers delay this part of education.[12] Therefore, we stand by the hypothesis that VBHC concepts are unknown to most of the future and present medical workforce in Brazil.

The medical students who declared to be familiar with VBHC share specific intrinsic and extrinsic traits. Some characteristics depended primarily on the medical school, such as a mandatory Health Management course, which increases the likelihood of a student being familiar with VBHC concepts (39.91% vs 28.82%). Less than half of the students who declared they had a mandatory management discipline were familiar with VBHC, which points out that this concept is still not a strong facet of the curriculum in medical schools. The existence of a Healthcare Systems discipline, present in more than 90% of the Brazilian medical schools reported, did not increase the likelihood of familiarity with VBHC.

INTERNATIONAL JOURNAL *of* MEDICAL STUDENTS

Original Article

Hirt G, et al.   Medical Students' Awareness About Value-Based Health Care in Brazil: A Cross-Sectional Study

In the United States, despite the effort to include VBHC in medical education through Health Systems Sciences, the VBHC curricula remain non-uniform, varying from multi-year activities during medical school to brief didactic sessions during clerkships.[13] In a recent survey in the US, clerkship directors cited a lack of generalizable curricular materials and local faculty expertise as the main barriers to implementing VBHC education.[14] In order to address these challenges, Dell Medical School at the University of Texas in Austin has incorporated VBHC into the undergraduate curriculum. Throughout the four years of training, students are introduced to the core concepts of VBHC, and they experiment with VBHC-in-practice during their clinical rotations in UT Health Austin's affiliated clinics that have implemented Integrated Practice Units for different medical conditions. Through a partnership with the Value Institute for Health and Care, third-year medical students are also offered the opportunity to participate in a dual degree program, including the Master of Science in Health Care Transformation, which equips health care professionals to lead change, catalyze transformation, and create high-value services in their field. Students can also access the open-online interactive modules called 'Discovering VBHC,' aimed at teaching the foundations of VBHC to different types of health professionals and also can be accessed and incorporated independently across diverse educational settings.[14]

The other two examples of VBHC curriculum implementation are The Mayo Clinic Alix School of Medicine (MCASOM) and Harvard Medical School (HMS). MCASOM developed a program that aims "to ensure that graduating medical students enter residency prepared to train and eventually practice within person-centered, community- and population-oriented, science-driven, collaborative care teams delivering high-value care."[15] This objective is pursued through a four-week course distributed throughout four years of medical school. The course is organized around six domains, one being the High-Value Domain, which focuses on three main desired outcomes: applying scientific literature in patient care, improving the system, and balancing quality and cost in patient care.[16] In HMS, students take two four-week courses. The first one, applied during the first year of medical school, covers foundational topics in clinical epidemiology and population health, health policy, social medicine and medical ethics. The second (after a minimum of 12 months of clinical rotations) includes advanced topics in these disciplines, and is taken in collaboration with Harvard Business School (HBS), using the case method, with which they provide detailed information about a single organization to focus in-class discussions around key elements of VBHC.[16]

Furthermore, a significant proportion of the students familiar with VBHC concepts share intrinsic traits, partially dependent on medical schools. Interest in following a career in management and a desire to pursue an MBA almost doubles the likelihood of a student being familiar with VBHC, 11.74% vs 6.06% and 19.95% vs 8.47%, respectively. Moreover, engagement in extracurricular activities exposes students to VBHC concepts and increases students' awareness of VBHC concepts (16.16% vs 11.74%), demonstrating that this knowledge is still mostly reserved for the students open to seeking knowledge outside the medical school education. Therefore, medical schools interested in promoting VBHC knowledge among their students are more likely to achieve this objective not only through required VBHC curricula but also by promoting extracurricular activities. According to the multivariate analysis presented in *Table 2*, the most frequent way respondents contact VBHC concepts was through internships. Although this result may seem to minimize the effect of intrinsic factors on VBHC knowledge, we believe that successful strategies need to mix both intrinsic and extrinsic factors.

We believe that familiarity with VBHC concepts is correlated to future professional decisions. Based on the survey, there is a correlation between being familiar with VBHC and accepting to have outcomes and costs monitored and compared to peers' data. Also, students familiar with value-based health care are more prone to accept a salary amount according to outcomes and rankings by patients. Therefore, exposing medical students to the concepts of VBHC early in their careers might facilitate future attempts to implement the value agenda.

The limitations of this study include the inherent factors of a cross-sectional study with voluntary participants, the uneven distribution of responses in the country, and the absence of a validated questionnaire. Although we had a representative sample including participants from all states of Brazil, most (86%) of the responses were from southern and southeastern universities, which correspond to the regions where most Brazilian medical schools are located (58%). Furthermore, since all medical schools adhere to a national curriculum under the Brazilian Ministry of Education, we believe that the responses acquired from this study have a relatively high external validity. Another limitation to this study is the absence of a validated questionnaire, including objective measures to evaluate VBHC familiarity, with the exclusive use of the subjective perception of self-awareness about the subject, which can vary widely among survey responders. Furthermore, an active search to analyze curricula of the Brazilian medical schools was not conducted but analyzed indirectly through student reports.

One of the purposes of this study is to spread the word on the VBHC strategy among future healthcare professionals in Brazil, which justifies the selection specifically of the Brazilian population of medical students. Future perspectives include the implementation of interventions to promote the learning of VBHC in undergraduate medical education and the international analysis of VBHC familiarity among medical students from several countries.

Summary - Accelerating Translation

Título: Avaliação da Familiaridade dos Estudantes de Medicina no Brasil sobre Cuidado à Saúde Baseado em Valor: um estudo transversal.

Problema: O aumento constante dos custos com saúde exige uma transformação do modelo atual caracterizado por fragmentação do cuidado e pagamento por serviço (fee-for-service) para um modelo de Cuidado à Saúde Baseado em Valor (VBHC). Para que isso seja feito, é fundamental que os futuros

Original Article

Hirt G, et al.   Medical Students' Awareness About Value-Based Health Care in Brazil: A Cross Sectional Study

médicos entendam a teoria por trás do VBHC. **Objetivo:** O objetivo desse estudo foi identificar o nível de familiaridade sobre VBHC entre estudantes de medicina no Brasil e identificar fatores intrínsecos e extrínsecos associados com essa familiaridade. **Métodos**: O trabalho é um estudo transversal, ou seja, uma foto da situação, baseado em um questionário online aplicado a estudantes de medicina de Escolas de Medicina brasileiras. Realizamos uma análise descritiva baseada no nível de familiaridade dos estudantes e uma análise de regressão logística para calcular as probabilidades e intervalos de confiança de cada uma das respostas conforme o grau de familiaridade em VBHC. **Resultados:** Coletamos respostas de 3030 respondentes, representando 148 Escolas de Medicina de todos os Estados Brasileiros. Os estudantes de medicina foram comparados em 2 grupos; o grupo 1 representa aqueles familiarizados com VBHC (14%; 426); já o grupo 2, aqueles não familiarizados (86%; 2575).

Observando cada uma das variáveis, o grupo 1 era mais propenso a compartilhar dados clínicos e de custo relacionados a sua prática assistencial (57.04%) em comparação ao grupo 2 (48.12%), p<0.01. Já observando múltiplas variáveis, experiências prévias com estágios foi o fator mais relevante relacionado à exposição à VBHC (OR 4.32 [IC 95% 1.82 - 10.24]). **Conclusão:** Descobrimos que poucos estudantes de medicina entendem os conceitos de Cuidado à Saúde Baseado em Valor e que sua exposição ao assunto, quando presente, estava relacionada a esforços individuais, sem relação com as Escolas onde estudam. Nossos resultados sugerem que as Escolas Médicas possuem potencial de reforçar tanto fatores intrínsecos, quanto extrínsecos relacionados aos conhecimentos de VBHC para preparar os futuros médicos para atuarem em um contexto de saúde orientado a Valor.

References

1. World Health Organization. World Health Organization Global Health Expenditure database. Available from: http://apps.who.int/nha/database; Last updated 2022 Jan 22; cited 2021 Aug 16.

2. Lee VS, Kawamoto K, Hess R, Park C, Young J, Hunter C, et al. Implementation of a value-driven outcomes program to identify high variability in clinical costs and outcomes and association with reduced cost and improved quality. JAMA. 2016;316(10):1061-72.

3. Porter ME, Teisberg EO. Redefining health care: creating value-based competition on results. Boston, MA: Harvard Business Press; 2006.

4. Porter ME, Lee TH. The strategy that will fix health care. Har Bus Rev. 2013;91:1-19.

5. Katz M, Franken, M, Makdisse M. Value-based health care in Latin America: an urgent discussion. J Am Coll Cardiol. 2017;70:904-6.

6. Makdisse M, Katz M, Ramos P, Pereira A, Shiramizo S, Neto M, Klajner S. What is a value management office? An implementation experience in Latin America. Value Health Reg Issues. 2018;17:71-3.

7. Moriates C, Wong BM. High-value care programmes from the bottom-up... and the top-down. BMJ Qual Saf. 2016;25:821-3.

8. Moriates C, Dohan D, Spetz J, Sawaya GF. Defining competencies for education in health care value: recommendations from the University of California, San Francisco Center for Healthcare Value Training Initiative. Acad Med. 2015;90:421-4.

9. Fredriksson JJ, Ebbevi D, Savage C. Pseudo-understanding: an analysis of the dilution of value in healthcare. BMJ Qual Saf. 2015;24:451-7.

10. Makdisse M, Ramos P, Malheiro D, Felix M,, Cypriano A, Soares J, et al. What do doctors think about value-based healthcare? A survey of practicing physicians in a private healthcare provider in Brazil. Value Health Reg Issues: 2020;23:25-9.

11. Gupta R, Moriates C, Harrison JD, Valencia V, Ong M, Clarke R, et al. Development of a high-value care culture survey: a modified Delphi process and psychometric evaluation. BMJ Qual Saf. 2017;26:475-83.

12. Gonzalo JD, Haidet P, Blatt B, Wolpaw D. Identifying challenges in implementing systems-based curriculum: A qualitative assessment of medical student perspectives. In: National Society of General Internal Medicine Conference 2015 Apr 23.

13. Geraghty JR, Young AN, Berkel TDM, Wallbruch E, Mann J, Park YS, et al. Empowering medical students as agents of curricular change: a value-added approach to student engagement in medical education. Perspect Med Educ. 2020;9(1):60-5.

14. Moriates C, Valencia V, Stamets S, Joo J, MacClements J, Wilkerson LA, et al. Using interactive learning modules to teach value-based health care to health professions trainees across the United States. Acad Med. 2019;94(9):1332-6.

15. Starr SR, Agrwal N, Bryan MJ, Buhrman Y, Gilbert J, Huber JM, et al. Science of Health Care Delivery. An Innovation in Undergraduate Medical Education to Meet Society's Needs. Mayo Clin Proc Innov Qual Outcomes. 2017;1(2):117–29.

16. Holtzman JN, Deshpande BR, Stuart JC, Feeley TW, Witkowski M, Hundert EM, et al. Value-based health care in undergraduate medical education. Acad Med. 2020;95(5):740-3.

Supplementary Material

Research Instrument. Online questionnaire sent to medical students.

1. Email Address
2. Informed Consent Form attached
I agree
I do not agree (survey ends if this button is clicked)

3. I am a medical student with active enrollment in the current semester
Yes
No (survey ends if this button is clicked)

Awareness of VBHC
4. Have you ever had contact with the subject of Value-Based Healthcare?
Yes
No

5. If you answered "YES" in the previous question, how did you get in touch? (Open question)
University Lectures
Extracurricular activities
Internships, professional experiences
Scientific Articles
Congresses and seminar lectures
Electronics (YouTube, TED, Coursera, edX or other platforms)
Courses
Other:

6. How do you rate your degree of familiarity with the topic "Value-Based Healthcare"?
I am enthusiastic about the topic, and I try to keep myself updated on initiatives involving VBHC.
I am familiar with the topic and have already read some articles or attended lectures on the topic.
I am familiar with the topic but have never read articles or attended lectures on the topic.
I had little contact with the topic, and I don't feel comfortable discussing it.
I never had contact with the topic.

7. How do you define "Value" in Health?
It is the patient's perception of the benefits obtained from the treatment in relation to the amount paid for it, regardless of the clinical result.
It is the amount of money paid for treatment.
Achieve a high degree of patient satisfaction even if clinical results and costs are outside expected values.
Clinical results (outcomes that matter to the patient) obtained in relation to the costs to achieve these outcomes.

8. In your opinion, how important should each of the following factors be in defining the remuneration for the medical service?

	1. Irrelevant	2. Not very important	3. Important	4. Very Important	5. Fundamental
Quantity of services provided					
Time spent in the service					
Complexity of the service					
Outcomes delivered at the end of the service					

9. When you graduate, you intend to:
Work as a self-employed physician.
Work as an employee in a fixed institution or practice.
Act as an employee physician in a fixed institution or practice and maintain some degree of self-employment.
I do not know.

Original Article

10. Do you think that knowing the outcomes of your clinical practice influences how you carry out your clinical practice?
Yes, knowing the costs influences the way I do my clinical practice.
No, knowing the costs doesn't change the way I do my clinical practice.
I do not know.

11. Do you think that knowing the costs related to your clinical practice influences the way you carry out your clinical practice?
Yes, knowing the costs influences the way I do my clinical practice.
No, knowing the costs doesn't change the way I do my clinical practice.
I do not know.

12. Would you be willing to have the outcomes and costs of your clinical practice continuously monitored and compared to the performance of other physicians?
Not willing
Willing if there was clarity of individual benefit
Willing if there was clarity of collective benefit
Willing if data were anonymous

13. Would you be willing to share data related to the outcomes (outcomes) and costs of your clinical practice for the benefit of cost reduction and improvement in the quality of healthcare?
Not willing
Willing if there was clarity of individual benefit
Willing if there was clarity of collective benefit
Willing if data were anonymous

14. Would you be willing to be evaluated and ranked against other physicians by patients?
Not willing
Willing
Willing if data were not released to the public
Willing if there was a way to assess extreme opinions before releasing it to the public

15. Do you know the formula that defines "Value" developed by Porter and Teisberg (2006)?
Yes   No

16.Check the components of Porter's "Value" formula, which defines the Value-Based Healthcare components:

	Numerator (check one)	Denominator (check one)
Cost		
Price		
Outcomes		
Satisfaction		
Expectation		
Benefits		
I do not know		

17. How important do you think it is to discuss Outcomes, Costs, Compensation Systems and Value-Based Health Care (VBHC) during graduation?

	1. Irrelevant	2. Not very important	3. Important	4. Very Important	5. Fundamental
Outcomes					
Costs					
Payment systems					
VBHC					

IJMS INTERNATIONAL JOURNAL *of* MEDICAL STUDENTS

Original Article

Hirt G, et al.   Medical Students' Awareness About Value-Based Health Care in Brazil: A Cross-Sectional Study

18. Are you familiar with the functioning of the different compensation models for health services practiced in Brazil? Check all that you think are familiar.

-Payment by global budget: The hospital receives a fixed annual fee, generally based on the history of the volume of care and the complexity of the services offered. This model predominates in public hospitals. The model may include penalties (deductions) based on pre-agreed indicators.

-Payment by global adjusted budget: Similar to the item above, but includes the possibility of period adjustments, generally every 3 or 4 months, based on volume, complexity and pre-agreed indicators that define a penalty or bonus.,

-Payment for service - "open account" (Fee-for-service): The provider (hospital, laboratory or doctor) receives for each service provided, regardless of the result obtained with the treatment.

-Payment for care - "procedure packages" or "managed procedures" (Fee-for-service): The provider (hospital, laboratory or doctor) receives per a package that includes services directly linked to the care provided and excludes other care that may be provided due to complications or complications. These extra items are charged "Out of the package."

-Payment for care - "inpatient global per diem" (Fee-for-service): The hospital receives a single fee for a set of services negotiated between the parties, which includes daily rates, most nursing procedures, gas therapy, use of equipment, etc.,

-Episode Bundles: The provider receives a single fee per episode of care, including diagnostic evaluation, hospitalization for the performance of procedures and the post-discharge period, including guaranteeing coverage of complications related to the procedure for a predetermined period and performance guarantee that may generate bonuses or penalties based on pre-defined indicators.,

-Payment by Related Diagnostic Groups (DRG or similar): The provider receives based on the classification of each case by diagnostic grouping. The DRG gives a different weight according to a set of clinical conditions and procedures performed. Ex: A patient hospitalized with myocardial infarction and has diabetes and kidney failure has a lower weight than a patient without the last 2 conditions; therefore, the remuneration of the first will be higher.

-Payment per Capitation: O provider receives a defined value for each registered person assigned to it for a while, regardless of the services that each person will use

-Payment for Performance, P4P: The provider receives remuneration according to the performance presented in the pre-defined indicators. Ex: P4P for Diabetes: A basal remuneration is defined, and a bonus will be assigned according to the number of patients with glycated hemoglobin < 7.

-I am not familiar with any of the compensation models.

Student and University Profile
19. What is your full name?
20. How old are you in years?
21. What is your gender?
Male   Female   Others

22. Where do you study medicine (University and Local)? Ex: USP - Ribeirão Preto/SP
23. What year of college are you in? Write in years, between 1-6
24. What is your registration number?
25. Does your college have any mandatory subjects in Health Management?
Yes
No
No, but it has an optional class
I do not know

26. If you answered "YES" in the previous question: Throughout this mandatory subject of Health Management, is the theme of Health Compensation Systems discussed?
Yes
No
I do not know

27. Does your college usually offer lectures, symposia or other complementary training on Health Management topics?
Yes
No
I do not know

28. During graduation at your university, does any chair discuss Health Systems? (SUS, NHS...)
Yes
No
I do not know

29. Does your university have an Academic Club of Health Management?
Yes
No
I do not know

30. Does your university have a Junior Medical Enterprise?
Yes
No
I do not know

31. What is your university's teaching methodology?
Traditional
Problem-Based Learning
Team-Based Learning

32. Did you complete another undergraduate degree before medicine? If the answer is "YES", which one(s)?
Open question

33. What areas do you intend to pursue in medicine?

Clinical	Management	Radiology
Surgery	Research	I do not know

34. What training do you intend to do in addition to a medical degree?
Residency
Master's/Doctorate
MBA
I do not intend to carry out any of these

35. Do you participate or have participated in any extracurricular activities? Which ones?
Academic Clubs
Academic, Athletic Center/Directory
AEMED, DENEM, IFMSA, COUNCILS, UNIONS
Junior enterprises
Startup
NGOs
I do not participate in any extracurricular activities.

36. Do you have any interests other than medical care?
Research
Innovation
Patient safety
Quality
Health Economics
Artificial intelligence
Health policies
No interest beyond medical care