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Preferred communication techniques by student-providers and patients during caries management in a teaching practice: a quality improvement study

Franklin Zhang¹, Juanna J. Xie², Supattriya Chutinan³ and Christine A. Riedy^{4*}

Abstract

Background Clear and concise communication between providers and patients is the cornerstone of building trust and delivering effective medical and oral healthcare. The aim of this quality improvement study was to examine patient-provider communication during caries management sessions in an academic dental teaching practice.

Methods Questionnaires were administered to student-providers (3rd and 4th years) and patients (age 18+) in the Harvard Dental Center Teaching Practice from July through December 2022. The student-provider questionnaire assessed challenges, adherence, and communication approaches used during caries management. The patient questionnaire focused on patients' communication preferences, understanding of caries, oral health literacy, and attitudes towards caries management. Descriptive analyses were calculated for both student-provider and patient data, and open-ended student-provider responses were analyzed using a content analysis and organized into themes.

Results Questionnaires were completed by 34 student-providers (50% response rate) and a convenience sample of 110 patients. Among student-providers who reported conducting a caries management session, all reported using simple language and 65.6% focused on discussing limited concepts at a time. Patients preferred simple language (54.8%), motivational interviewing (47.1%), and visual aids, such as models and x-rays (40.4%), to better understand concepts. A subset of student-providers (39.3%) reported challenges in effectively communicating and motivating patients to improve oral hygiene habits. Approximately half of the patients (55.2%) felt confident completing dental forms independently. Regarding their understanding of caries, 54.7% of patients responded that tooth decay will always necessitate fillings and 43.6% of patients responded that they will know when they have tooth decay.

Conclusions These findings highlight the importance of interpersonal communication skill training in dental education to facilitate productive provider-patient communication, particularly in the context of caries risk assessment and management.

Keywords Communication, Education, Dental, Caries management, Students, Professional-patient relations

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Background

Dental caries, the most prevalent oral disease worldwide, is a multifactorial condition that stems from an imbalance in biofilm ecology, leading to the demineralization of dental hard tissues [1]. Historically, the operative treatment approach dominated caries management; however, there has been a shift towards a medical model in which the etiology of the disease is balanced with protective measures to prevent caries incidence and progression [2]. Risk-based approaches, such as Caries Management by Risk Assessment (CAMBRA), prioritize modifying caries risk and preventing disease [3, 4]. The patient-centered caries management approach was created with the primary aim of preserving excellent oral health and ensuring long-term dental well-being for individuals [5]. Within this framework, the provider's role is to educate the patient using effective communication techniques [4].

Effective communication between dental providers and patients is critical to improving oral health outcomes [6]. During the administration of caries management, patient comprehension, risk factor modification, and behavioral adherence hinge on the communication methods employed. Evidence suggests that strong provider-patient communication fosters relationship-building and leads to positive outcomes, including reduced anxiety, increased satisfaction, motivation, and adherence to healthy behaviors, ultimately improving oral health [6]. In contrast, poor communication can hinder care and lead to suboptimal outcomes, further highlighting the importance of effective communication in the management of caries [6].

Oral health literacy (OHL), defined as a patient's ability to obtain, understand and apply fundamental health information to make informed oral health decisions, is a critical factor in the communication process [7]. OHL levels vary, and limited OHL can pose significant barriers to effective communication between providers and patients [7]. Approximately 43% of American adults (93 million) possess low health literacy, with certain populations—such as those with lower income or education levels, English as a second language speakers, racial and ethnic minorities, and individuals with disabilities—at higher risk [8]. Limited health literacy correlates with worse health outcomes, and inadequate OHL with poor oral health outcomes [9–11].

Tailoring communication strategies to each patient's OHL and creating a patient-friendly dental environment can narrow literacy gaps, [6] empowering patients to better understand their caries risk factors and recommended behavioral changes. To enhance communication during caries management and improve OHL, providers can utilize a variety of techniques, such as simple language and the teach-back method [12]. Simple language involves the use of clear, succinct sentences, avoiding technical jargon, pacing the delivery of information, and prioritizing

key points [13]. The teach-back method involves breaking down information into smaller, manageable portions, then asking patients to reiterate it in their own words to help reinforce critical concepts [14]. Visual aids and pictograms are also helpful tools in illustrating complex concepts like caries progression, or the benefits of specific treatment strategies [15]. Additionally, user-friendly electronic health record portals show promise with lower OHL patients [16]. By tailoring communication methods to patients' preferences and health literacy level, providers can enhance patient engagement and adherence, leading to better oral health outcomes.

Effective communication is pivotal for a successful provider-patient relationship. However, there is a paucity of studies examining dental students' communication skills, compared to those of medical and nursing students [17–19]. Effective communication is as essential in dentistry as it is in other healthcare fields, given the distinctive role of the oral cavity in facilitating ongoing interactions between the body and its surroundings. Furthermore, dental educators stress the importance of active listening, which has been shown to improve patient satisfaction, reduce anxiety, and enhance adherence to oral hygiene practices [17].

This study aims to explore the communication preferences of both providers and patients during clinical caries risk assessment and management sessions. As part of a quality improvement (QI) initiative, we examined student-providers' communication approaches, attitudes, and challenges, and patients' preferred communication approaches, attitudes, understanding of caries, and OHL levels during these sessions. This study contributes to the “Plan” phase of the Plan-Do-Study-Act (PDSA) cycle, a systematic framework for testing and implementing improvements [20]. In this phase, we aim to identify the preferred communication approaches prior to implementation. Once the approaches are determined, the “Do” phase will focus on training students, followed by the “Study” phase, which will assess the outcomes. Finally, the “Act” phase will involve integrating the findings into the HSDM curriculum.

Methods

The IRB of the Harvard Faculty of Medicine determined this study protocol #IRB22-0668 as a QI study and thus exempt from the research guidelines defined by DHHS regulations and FDA regulations.

Participants

Third and fourth-year student-providers ($N=68$) and their patients (ages 18+) at the Harvard School of Dental Medicine (HSDM) Harvard Dental Center (HDC) Teaching Practice, a university-based dental care clinic were included in this QI study. These student-providers

had been trained to utilize the institution's caries management protocol. The inclusion criteria for participating patients were those who were 18 years or older who had at least one appointment with student-providers during the observational period. Patient consent forms and questionnaires were available in English and Spanish to accommodate languages spoken by most HDC Teaching Practice patients.

Questionnaire design

Student-provider questionnaire

The student-provider questionnaire utilized a mix of open-ended, multiple choice, and true/false questions focused on assessing student-providers' communication approaches during the caries management protocol at the HDC Teaching Practice. Communication approaches were derived and modified from communication techniques used by Tseng et al.'s 2020 study [12]. Examples of questions included providers' preferred communication approaches with patients, how often student-providers conducted oral hygiene instruction (OHI) and CRA and patient education as part of caries management, as well as any challenges they faced while discussing caries management. Student-providers were also asked to provide their year in dental school.

Patient questionnaire

The patient questionnaire utilized a mix of open-ended, multiple choice, and true/false questions. The questionnaire focused on assessing patients' communication preferences, knowledge of caries, OHL, and attitudes towards caries management following new patient intake and recall appointments. It evaluated patients' understanding and preferences for certain communication approaches, and the effectiveness of caries management instruction. For example, patients were asked to choose the communication approaches they would like their student-providers to use during caries management discussions. Student-providers introduced the caries management approach prior to administering the questionnaire to provide context and explain caries management in plain language, an aspect that is standard for caries management protocol. OHL questions were adapted from Chew's three health literacy screening questions [21]. Demographic information included sex, age, race/ethnicity, education, and dental insurance coverage. The education level item was sourced from the Behavioral Risk Factor Surveillance Survey [22].

A Spanish version of the questionnaire was professionally translated by LanguageLine Translation Solutions. The patient questionnaire was written at a 7th grade reading level or lower, following the National Institute of Health (NIH) and American Medical Association (AMA) recommendation for patient materials [6]. For patient

clarity in the questionnaire, the concepts of motivational interviewing were simplified. Motivational interviewing was described as "listening and understanding your concerns and worries together" so patients may understand the essence of this communication technique. To ensure general comprehension, both questionnaires were reviewed by ten non-dental/medical individuals, with educational backgrounds ranging from high school to graduate level. Input from two specialists in CRA, cariology, and behavioral sciences was also sought during the questionnaire design.

Data collection and analysis

Both student-provider and patient participants were recruited using a convenience sampling method. Neither the student-providers nor patients were offered compensation for their participation. Consent forms outlining the QI study purpose, anonymity, benefits, and risks, were presented prior to questionnaire administration. Respondents reviewed these forms before beginning the questionnaire and were assured of no negative impact on their dental education or dental care received.

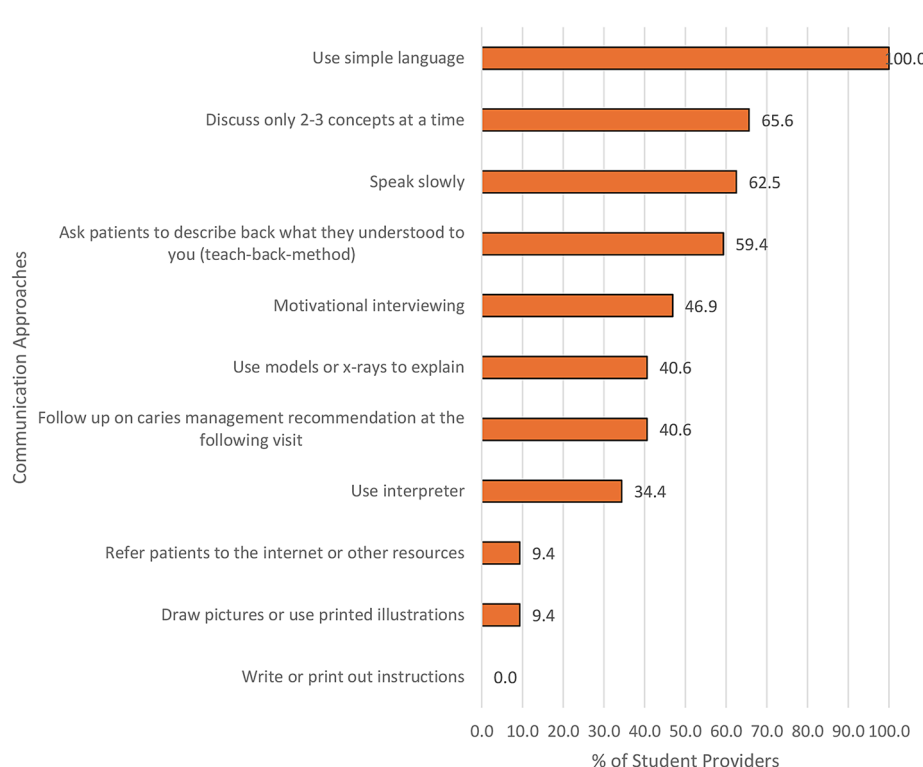
The Qualtrics-based student-provider questionnaire was distributed via the HSDM Class of 2023 and 2024 email groups and open for a period of 6 months, with an anonymous response mechanism. Two reminders were sent, approximately one month apart, to encourage participation. Patient questionnaires, in English and Spanish, were printed and placed in the waiting area as well as handed out by the QI team in the HDC Teaching Practice following initial dental exam and recall appointments. As part of the QI team, a study team member was always present to ensure that consent forms were completed prior to questionnaire administration. None of the patients chose to take it home and return by mail. All questionnaires were collected by the QI administrators daily. The time frame for data collection was over a 6-month period from July to December 2022.

Questionnaire responses were inputted and organized on Microsoft Excel. Descriptive analyses (count and frequencies) were calculated and illustrated in tables and histograms on Microsoft Excel. An average oral health literacy score was calculated by summing the responses across the 3 OHL questions for each participant (range: 3–15 with the higher sum representing higher oral health literacy). Open-ended responses on the student-provider questionnaire were analyzed using a content analysis and organized into themes. Two study team members independently categorized all responses into themes. If there was no initial agreement on themes, team members engaged in discussion until a consensus was reached.

Table 1 Student-provider adherence to oral health instruction and caries risk assessment during a dental visit (N = 34)

Question	% (N)				
	Always	Most	Sometimes	Rarely	Never
How often do you provide Oral Hygiene Instruction (OHI) during a dental visit or recall?	47.1 (16)	41.2 (14)	8.8 (3)	2.9 (1)	0 (0)
How often do you conduct caries risk assessments while completing an oral exam?	38.2 (13)	44.1 (15)	17.6 (6)	0 (0)	0 (0)

*Not all questions were completed by all respondents

**Fig. 1** Communication techniques used by student-providers during caries management (N = 32)

Results

Student-provider findings

Of the sixty-eight 3rd and 4th year student-providers, 34 respondents completed the questionnaires, for a response rate of 50%. The responses were nearly evenly split between 3rd year (53%) and 4th year (47%) student-providers.

Student-provider adherence with conducting caries risk assessment and management

Student-providers were asked about their adherence to conducting oral hygiene instruction (OHI) and caries risk assessments and management, integral and required components of the comprehensive oral examinations within the HDC's Teaching Practice. Most students consistently provided OHI during dental visits; 47.1% and 41.2% reported "always" or "most of the time", while 8.8% reported "sometimes" or "rarely" providing it (Table 1). The majority also reported conducting caries risk

assessments and management during dental visits; 38.2% "always" and 44.1% "most of the time".

For the most recent visit, 91.2% of student-providers performed caries risk assessment, while 8.8% did not. Most student-providers spent 1–5 min on caries risk assessment (88.2%), only a few student-providers took either more than 5 min (2.9%) or 1 min or less (2.9%).

Communication approaches used and preferred by student-providers

Student-providers were asked about their communication approaches during their patient's most recent visit. Out of 32 respondents, all providers reported using "simple language" (100%), 21 student-providers (65.6%) employed "presenting two-three concepts at a time", and 20 selected "speaking slowly" (62.5%) (Fig. 1). Less common communication techniques included drawing pictures or using printed illustrations (9.4%) and referring patients to other resources (9.4%). None of the student-providers reported using written instructions.

Student-providers were also asked to select their most frequently used or preferred communication technique from their previous choices. The majority chose the “teach-back method” (37%), followed by simple language (33%).

Student-providers’ perspectives on challenges and benefits of caries risk assessment and management

Student-providers were given the opportunity to express their thoughts about performing caries risk assessment and management with their patients. Out of 28 respondents, four main themes of challenges emerged:

Table 2 Themes and example quotes regarding challenges and thoughts about conducting caries risk assessment and management (N=29)

Question	Theme	% (N)	Example Quote
Have you faced any challenges when discussing caries management strategies following caries risk assessment?	Difficulty motivating and communicating with patients	39.3 (11)	<i>“... [Even though] patients will say they [regularly] brush and floss, it’s difficult to kindly encourage them to [do so more] when it’s clear [on exam] that they aren’t really brushing and flossing”</i>
	Language barriers	10.7 (3)	<i>“Sometimes, it can be more difficult discussing caries management through the use of a translator”</i>
	Personal inexperience	10.7 (3)	<i>“I think the challenge is using motivational interviewing [MI]. I feel that we could have more guidance and teaching on MI.”</i>
	Time management	10.7 (3)	<i>“It takes a good chunk of time in what feels like an already short appointment, especially considering it requires another swipe (which is hard to get in the full third year clinic)”</i>
	No challenges	32.1 (9)	–
What are your thoughts on having caries risk assessments (CRA) as a part of the New Patient Intake (NPI)?	Helpful/essential	78.6 (22)	<i>“I think it is a valuable tool to better understand the factors driving caries risk diagnoses and inform an appropriate, individualized management plan”</i>
	Not helpful/essential	21.4 (6)	<i>“At times can be cumbersome and often feels as an overly formal way to repeat what has already been said during a visit”</i>

*Not all questions were completed by all respondents

motivating and communicating with patients, language barriers, personal inexperience, and time management (Table 2). Nine student-providers encountered no challenges in discussing caries risk assessment and management.

Over a third of student-providers (39.3%) noted challenges related to motivating patients to alter oral hygiene habits or effectively conveying necessary measures for proper oral hygiene self-care. A few student-providers (10.7%) mentioned struggles in communicating oral hygiene habits through an iPad translator, finding it challenging to explain proper brushing and flossing techniques in another language. Others (10.7%) reported limited knowledge on certain recommendations, which hindered their confidence in having discussions with their patients about caries management. This encompassed not recalling all components of each caries management plan, types of recommended over-the-counter mouthwashes, or lacking familiarity with motivational interviewing techniques. Some student-providers (7.1%) did not have enough time during appointments to conduct caries risk assessment and management due to the numerous requirements and faculty approvals needed during each patient visit in the Teaching Practice.

Regarding their perception of caries risk assessment and management, most student-providers (78.6%) viewed it as a helpful or essential element of new patient intakes (Table 2). The remaining respondents (21.4%) had concerns about time, the burden of its completion, or believed it had a limited impact on patient care.

Patient findings

A total of 110 patients participated (Table 3). Not all respondents completed every item on the questionnaire, which accounts for the slight discrepancies in the item responses noted in the data tables. Among patient respondents, slightly more were male (56.1%) and 51.7% were 55 years or older. In terms of race and ethnicity, 64.5% self-identified as White, 10.8% as African American, 8.6% as Asian, and 16.1% as other. A third (33.3%) self-identified as Hispanic, Latinx, or of Spanish origin. Less than half (45.9%) of respondents completed a 4-year bachelor’s degree or higher. Regarding dental insurance, 29.8% of patients reported having private insurance, 27.7% had standard Medicaid insurance, 17.0% had limited Medicaid insurance, and 25.5% had no insurance. While standard Medicaid insurance essentially offers full dental coverage, limited Medicaid solely covers emergency dental treatment and extractions at the HDC Teaching Practice [23] When asked about number of visits over the past year, 67.6% of patient respondents had 1–5 visits, 26.7% had 6–20 times, and 5.7% had more than 20 visits.

Table 3 Patient characteristics (N = 98)

Descriptive Characteristic	% (N)
Sex	
Female	43.9% (43)
Male	56.1% (55)
Age	
18–24	9.2% (8)
25–34	13.8% (12)
35–44	9.2% (8)
45–54	16.1% (14)
55–64	13.8% (12)
65+	37.9% (33)
Race	
White	64.5% (60)
Black/African American	10.8% (10)
Asian	8.6% (8)
Other	16.1% (15)
Ethnicity	
Hispanic, Latinx, or Spanish Origin	33.3% (27)
Non-Hispanic, Latinx, or Spanish Origin	66.7% (54)
Education	
Less than high school	3.1% (3)
High school/GED	31.3% (30)
2-year college	19.8% (19)
Bachelor's or higher	45.9% (44)
Type of Dental Insurance	
None	25.5% (24)
MassHealth/Medicaid limited	17.0% (16)
MassHealth/Medicaid standard	27.7% (26)
Private Insurance	29.8% (28)

*Not all questions were completed by all respondents

Patient oral health literacy

The modified Chew's health literacy screening questions assessed oral health literacy of patients (Table 4) [21]. More than half of the patients (57.4%) reported never struggling with written oral health information, while 42.6% experienced some level of difficulty. A majority either never (62.9%) or rarely (6.7%) required help from others to read clinic materials. Approximately half (55.2%) expressed confidence in filling out dental forms independently. The average oral health literacy score

was 9.7, suggesting adequate oral health literacy among patient respondents.

Patient's Understanding of caries and caries management

Patients were asked about their understanding of tooth decay, including its detection, treatment, and associated risk factors, which shed light on their perceptions of oral health (Fig. 2a and b).

Among the respondents, 43.6% of patients responded that they are able to recognize caries lesions. In response to whether all tooth decay necessitates fillings, 54.7% of respondents responded that the statement was true. A majority (89.0%) responded that untreated cavities could lead to extractions. When asked which habits could increase caries risk status, 76.4% of patients were able to identify all of the caries risk factors (Fig. 2b). Regardless of their understanding of the caries process, most patients (84.1%) were interested in discussing how to care for their cavities during their visits.

Patients' recall of and preferences for communication approaches used by student-providers

Respondents reported on the most recent communication approach they recalled their student-provider using with them, and their personal preference for a communication approach (Fig. 3). The most recalled communication approaches used by student-providers included simple language (61.5%), motivational interviewing (59.6%) and speaking slowly (49.0%). The least commonly recalled approaches included using the internet, drawing pictures, and translation (Fig. 3).

Patient communication preferences favored simple language (54.8%), motivational interviewing (47.1%), and models/x-rays (40.4%) to explain concepts (Fig. 3). A comparison between patients' recall of their providers' communication approach and their communication preference revealed differences for motivational interviewing, speaking slowly, print-out instructions, and internet referral. Although motivational interviewing and speaking slowly are techniques frequently used, patients favored them slightly less. Conversely, printouts and

Table 4 Patient oral health literacy (N = 108)

Question	N	% (N)				
		Always	Most	Sometimes	Rarely	Never
How often do you have problems learning about your oral health because of trouble understanding written information?	108	4.6 (5)	5.6 (6)	16.7 (18)	15.7 (17)	57.4 (62)
How often do you have someone like a family member, friend, caregiver, or dental assistant help read clinic materials?	105	11.4 (12)	12.4 (14)	5.7 (6)	6.7 (7)	62.9 (66)
		Extremely	Quite a bit	Somewhat	A little bit	Not at all
How confident are you in filling out dental forms by yours?	105	55.2 (58)	19.0 (20)	13.3 (13)	6.7 (7)	6.7 (7)

*Not all questions were completed by all respondents

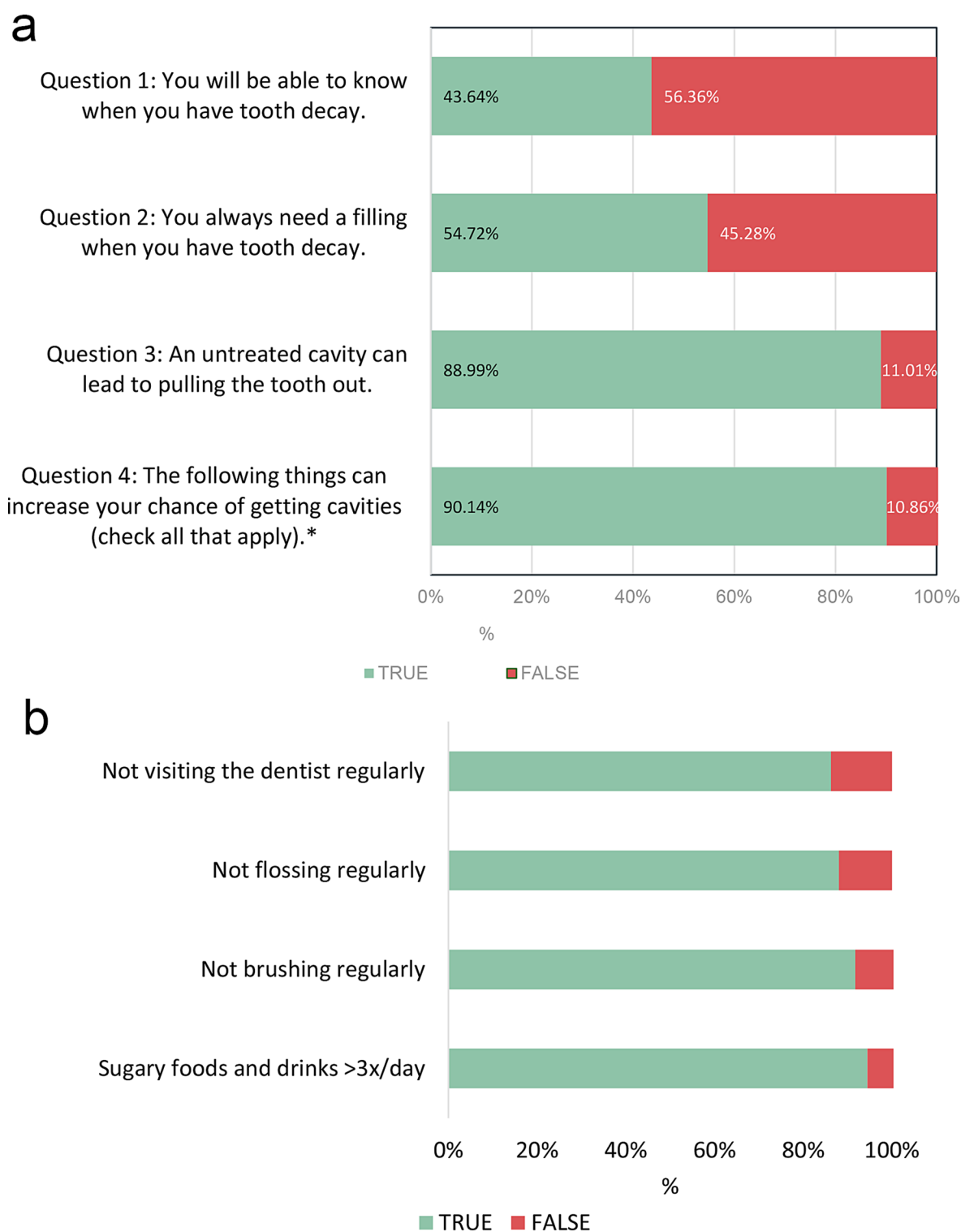


Fig. 2 (a) Responses of Patients (N=) Regarding Their Understanding of Caries, Caries Risk Assessment and Caries Management. (b) Percent of Patient's Responses to Caries Risk Factors in Question 4 of Fig. 2a

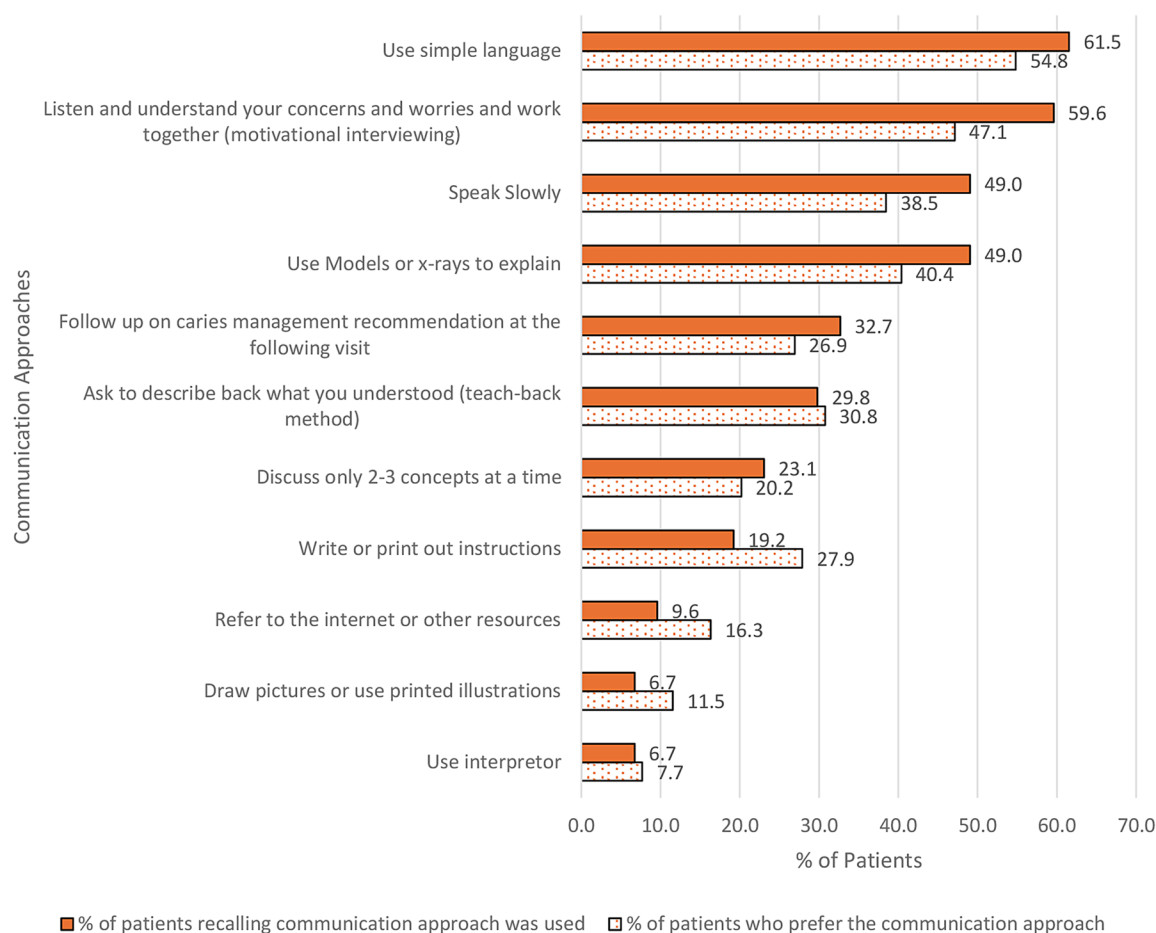


Fig. 3 Patients' Recall of Last Communication Approach Used by Student-Provider and Patients' Preferred Communication Approach (N = 103)

internet resources were slightly more preferred than the actual methods provided by the student-providers.

Discussion

This QI study examined student-providers' and patients' communication preferences during caries management and treatment discussions in the HDC teaching practice. Both groups favored simple language, but patients showed greater preference for motivational interviewing and visual aids such as models/x-rays compared to the communication approaches that students reported using. While completing caries risk assessments and OHI are mandatory components of an oral exam, over half (52.9% and 61.8%, respectively) of student-providers did not perform them, indicating a lack of full adherence to the protocol. Despite student-providers reporting frequently conducting caries management during visits, through the knowledge questions, patient responses showed limited understanding of how early-stage (incipient) caries can develop without noticeable symptoms and that incipient caries can be reversed or stopped with improved oral hygiene, fluoride treatments, or dietary changes [24]

These findings are supported in that even though most patients were aware of cavity risk factors (76.4%) and understand the consequences of untreated dental caries (89.0%), a significant proportion (43.6%) of patients reported that they were able to know when they developed a cavity, and most patients (54.7%) believed that all cavities require fillings. In many instances, interproximal incipient caries can only be seen on radiographs or a dental exam in the clinic [24]. In addition, not all caries require fillings as incipient lesions may not necessitate immediate caries removal and fillings with more motivated patients with improved oral hygiene [24]. These findings suggest HDC patients' limited awareness of early decay and preventive care, an area where improved communication with patients can enhance comprehension of how the caries process works and stress the importance of regular check-ups for early detection.

Applying the Tseng et al [12] communication framework, we assessed student-providers' self-reported communication approaches with patients during their most recent visit. All reported to use simple language, around two-thirds explained 2–3 concepts at a time (65.6%)

or spoke slowly (62.5%), and over half (59.4%) used the teach-back method. Preferences for each method may stem from various factors. Simple language and concise explanations can make information clearer for patients, especially for those without a medical background [13]. Slow speech engages patients and ensures they understand the information [25, 26]. Some providers might lean towards certain methods over others because of their training or because they find them easier to implement [27].

Conversely, patients reported a preference for simple language (54.8%), motivational interviewing (47.1%), and visual aids like models/x-rays (40.4%) during caries discussions. The shared preference for simple language between patients and providers highlights its importance in effective communication [13]. Despite being less utilized by students, patients valued motivational interviewing (MI), a technique effective in the medical field for behavioral change, such as in alcoholism treatment and smoking cessation [28]. Its potential in dental care, especially for modifying behaviors in groups like children with Early Childhood Caries (ECC), is an area of ongoing research [29]. Traditionally, dentistry has preferred surgical to behavioral methods, possibly contributing to the underuse of MI in the caries management philosophy of CAMBRA, particularly when addressing both tooth-level and person-level management [30]. Additionally, it is unclear as to which oral health behaviors benefit most from an MI approach [31]. However, given MI's success in other health fields, its integration into caries management discussions could be beneficial.

Patients also expressed a strong preference for the use of models and X-rays during caries management discussions, even though fewer than half of the student-providers reported using them in their most recent visit. Traditionally, physical dental models have often been used in the field of orthodontics to demonstrate the process of orthodontic treatment planning to patients [32]. They can be helpful in providing clear visual explanations, which is especially beneficial for patients who may face language barriers [33]. Additionally, given that radiographs are often used as an aid to assist clinical cavity diagnoses, [34] using them as an educational tool may be beneficial in enhancing patient understanding of their dental health.

Notably, printed instructions, visual aids, and references to the internet were the three least employed techniques by student-providers, despite patients preferring these techniques more than what they received during caries management sessions. This disparity may contribute to a misalignment in communication between student-providers and patients. The literature suggests that visual aids are more engaging and easier to absorb than written text when it comes to communicating health

risks [15]. In fact, many dental providers and hygienists consider visual communication to be highly effective in patient education [12]. Additionally, communication studies in the context of prostate cancer have found that providing patients with online resources can offer a sense of empowerment and control over their condition [35]. Employing these techniques may help boost patient engagement in their own care. Since behavior change benefits the most from continual reinforcement over time, [36] the utility of these resources within caries management discussions merits further exploration with our student-providers.

Our study's limitations include convenience sampling, a small sample size, and reliance solely on English and Spanish questionnaire translations. Since both patient and student participants were anonymous, it is unknown if the patients who completed questionnaires were the student-providers' patients. The uncoupling could have resulted in differences between what communication approaches students-providers reported using and what patients reported that student-providers used. For instance, although all student-provider respondents reported using simple language, 61.5% of patient respondents reported recalling simple language was used. Moreover, the definition of "simple language" is subjective, which may have caused variation in responses. The clinical experiences of third- and fourth-year dental students also vary, possibly influencing their communication skills, a factor we could explore in future QI studies. Student-provider responses on communication approaches were also self-reported, which introduces the possibility of bias due to perceived desirability or memory recall. However, the study aimed to minimize bias by using neutrally worded questions and maintaining respondent anonymity. This QI study solely focuses on the "Plan" phase of the PDSA cycle, gathering baseline data on communication approaches used by student-providers in practice [20]. The subsequent "Do", "Study", and "Act" phases remain to be explored further in future QI studies. In a subsequent QI project, we could also observe and analyze direct student interactions with patients. Additionally, this QI study did not account for broader personal contexts, such as visit frequency, educational background, and age. Examining how these factors interact with patient communication approaches and OHL could provide valuable insights. Finally, the findings from this QI study are applicable to the HDC Teaching Practice and not widely generalizable.

Our study utilized a QI approach to evaluate communication technique practices in the predoctoral teaching clinic, aiming to help refine both educational and clinical practices at our institution. The inclusion of simple language and motivational interviewing techniques should be key components of caries management

communication training. The use of radiographs, dental models, and educational materials such as infographics and pamphlets can also be helpful during caries management discussions with patients. Integrating a learning component on motivational interviewing into the predoctoral training can be beneficial. Such focused communication skills training will help prepare students to effectively discuss caries management and promote comprehensive caries prevention. There is evidence suggesting that dental students not only enjoy active learning but find it advantageous, since interpersonal skills are just as crucial alongside technical skills [37–39]. Furthermore, other studies indicated that newly graduated dentists often feel ill-equipped to communicate with patients who have lower literacy levels [17, 40]. Therefore, enhancing and reinforcing communication training in predoctoral dental education, especially at the earliest stage of their dental education, is essential for advancing patient-centered caries management.

Conclusion

This QI study compared the communication strategies used by student-providers to those preferred by patients in the context of caries management at the HDC predoctoral teaching practice. These findings suggest that integrating student practices with patient-preferred communication techniques, coupled with an increased focus on interpersonal communication training, could be advantageous in promotion of caries management. The findings from this project serve as a foundation for implementing enhanced interpersonal communication skills and examining their impact on care.

Abbreviations

HSDM	Harvard School of Dental Medicine
HDC	Harvard Dental Center
OHL	Oral health literacy
CRA	Caries risk assessment
CAMBRA	Caries management by risk assessment
NIH	National Institute of Health
AMA	American Medical Association
OHI	Oral hygiene instruction
PDSA	Plan-do-study-act
QI	Quality improvement
MI	Motivational interviewing
ECC	Early childhood caries

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Author contributions

F.Z. conceived and designed the study with assistance from S.C. and C.R. F.Z. and J.X. performed the statistical analysis and wrote the main manuscript text. F.Z. and J.X. prepared all the tables and figures. All authors examined and revised the manuscript.

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Data availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The Institutional Review Board of the Harvard Faculty of Medicine determined that this QI project was not considered research (Not Research 45 CFR 46.102(1)) as defined by DHHS regulations or FDA regulations, and thus did not require IRB approval before implementation. The determination number was 22–00668. All participants in the study took part voluntarily, provided written informed consent, and agreed to the publication of anonymous data.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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